HISTORY OF THE DRACKETT COMPANY’S WORK WITH SOYBEANS, SOY PROTEIN AND AZLON (1937-2020):
EXTENSIVELY ANNOTATED BIBLIOGRAPHY AND SOURCEBOOK

Compiled by
William Shurtleff & Akiko Aoyagi

Soyinfo Center
2020

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DEDICATION AND ACKNOWLEDGMENTS

This book is dedicated to Robert Boyer and David S. Perkins.

Part of the enjoyment of writing a book lies in meeting people from around the world who share a common interest, and in learning from them what is often the knowledge or skills acquired during a lifetime of devoted research or practice. We wish to give deepest thanks...

Of the many libraries and librarians who have been of great help to our research over the years, several stand out:

University of California at Berkeley: John Creaser, Lois Farrell, Norma Kobzina, Ingrid Radkey.

Northern Regional Library Facility (NRLF), Richmond, California: Martha Lucero, Jutta Wiemhoff, Scott Miller, Virginia Moon, Kay Loughman.

Stanford University: Molly Molloy, who has been of special help on Slavic-language documents.

National Agricultural Library: Susan Chapman, Kay Derr, Carol Ditzler, John Forbes, Winnifred Gelenter, Henry Gilbert, Kim Hicks, Ellen Knollman, Patricia Krug, Sarah Lee, Veronica Lefebvre, Julie Mangin, Ellen Mann, Josephine McDowell, Wayne Olson, Mike Thompson, Tanner Wray.


Lane Medical Library at Stanford University.

Contra Costa County Central Library and Lafayette Library: Carole Barksdale, Kristen Wick, Barbara Furgason, Sherry Cartmill, Linda Barbero.


Loma Linda University, Del E. Webb Memorial Library (Seventh-day Adventist): Janice Little, Trish Chapman.

We would also like to thank our co-workers and friends at Soyinfo Center who, since 1984, have played a major role in collecting the documents, building the library, and producing the SoyaScan database from which this book is printed:

Irene Yen, Tony Jenkins, Sarah Chang, Laurie Wilmore, Alice Whealey, Simon Beaven, Elinor McCoy, Patricia McKelvey, Claire Wickens, Ron Perry, Walter Lin, Dana Scott, Jeremy Longinotti, John Edelen, Alex Lerman, Lydia Lam, Gretchen Muller, Joyce Mao, Luna Oxenberg, Joelle Bouchard, Justine Lam, Joey Shurtleff, Justin Hildebrandt, Michelle Chun, Olga Kochan, Loren Clive, Marina Li, Rowyn McDonald, Casey Brodsky, Hannah Woodman, Elizabeth Hawkins, Molly Howland, Jacqueline Tao, Lynn Hsu, Brooke Vittimberg, Tanya Kochan, Aanchal Singh.

Special thanks to: Tom and Linda Wolfe of Berwyn Park, Maryland; to Lorenz K. Schaller of Ojai, California; and to Wayne Dawson (genealogist) of Tucson, Arizona.

For outstanding help on this Drackett book we thank:

Finally our deepest thanks to Tony Cooper of San Ramon, California, who has kept our computers up and running since Sept. 1983. Without Tony, this series of books on the Web would not have been possible.

This book, no doubt and alas, has its share of errors. These, of course, are solely the responsibility of William Shurtleff.

This bibliography and sourcebook was written with the hope that someone will write a detailed and well-documented history of this subject.

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INTRODUCTION

Brief Chronology/Timeline of Drackett’s Work with Soybeans, Soy Protein and Azlon

1910 – The Drackett Co. is organized as a partnership named P.W. Drackett and Sons. Its main business is distributing a line of bulk chemicals to industrial users. In 1933 the company adopted its present name.

1918-1928 – Drackett is America’s leading manufacturer and seller of U.S.P. grade Epsom salts.

1923 – Drackett starts production of Drano (a chemical composition used to clear clogged drains), which soon becomes the company’s first major consumer product.

1933-1934 – Drackett invents then starts production of Windex (a spray that cleans windows without water), which soon becomes its second major consumer product. Both products are made at Drackett’s plant at 5020 Spring Grove Ave. in Cincinnati, Ohio.

1935-36 – Laboratory studies at Drackett lead to the design of an original pilot plant for oil extraction by the solvent method. Laboratory research is also conducted on the extraction of soy protein from defatted soybean flakes.

1935, fall – Drackett submits samples of industrial soy protein to the Champion Coated Paper and Fiber Co. for examination as to use in paper coatings in place of milk casein.

1936 – A pilot plant for making industrial soy protein begins operation inside Drackett’s plant at 5020 Spring Grove Ave. in Cincinnati, Ohio.

1937 Feb. - A solvent extraction pilot plant begins operation on Spring Grove Ave. and continues for 3 years.

1938 April – The world’s first soy protein fiber (and the first experimental textile fiber made from a plant protein) is exhibited by Robert Boyer of the Ford Motor Co. at the Fourth Annual Conference of the Farm Chemurgic Council in Omaha, Nebraska.

1938 – The Drackett Company purchases 60-75 acres of farmland at Sharonville, Ohio (several miles north of the Spring Grove Ave. headquarters), for a solvent extraction plant. Ground is broken in Sept. 1939.

1940, first quarter – Drackett starts to work cooperatively with The Ford Motor Co. to develop a soybean protein suitable for spinning into fiber from which upholstery cloth could be made.

1941 Jan. – Soybean oil extraction begins at the Sharonville plant. Drackett’s initial investment was about $1.5 million. The plant has an annual capacity of 35,000 tons of soybean meal and 15 million lb of soybean oil.

1941 – Drackett’s first industrial soy protein isolate is sold commercially. 15,018 lb were produced and 7,039 lb were sold during the year. By 1942 this soy protein was brand-named Alysol. Some of it was sold to the Ford Motor Co. to make experimental (noncommercial) soy protein fibers.

1941 Dec. 7 – Japanese military forces attack Pearl Harbor. The United States enters World War II. Henry Ford is soon told to stop making automobiles and to build an assembly line for making bombers for the war effort.

1942 May – The Ford Motor Company produces its first B-24 Liberator bomber using a giant assembly line one mile long that it had constructed at Willow Run in Michigan. Thereafter Ford made one bomber per hour – plus engines, gliders, tanks, armored, cars, jeeps, etc.

1943 Nov. – Drackett purchases the Ford Motor Company’s soy protein and soybean fiber spinning operations. Robert Boyer, Francis (Frank) Calvert, and William Atkinson go to Drackett from Ford as part of the deal.

1943 Dec. 2 – Drackett starts commercial production of Soybean Azlon, the world’s first commercial fiber made from plant proteins. The fibers were used mainly in felt hats by the America Hat Corporation.

1944? – Drackett is now making a new line of industrial soy proteins named Drackett Protein 110, 112, and 220. The first 2 are for use in paper coatings and sizings, the latter for water-based paints. Drackett never made edible soy proteins.

1945 – The Drackett Co. is the largest soybean processor in Ohio.

1946 - Drackett finishes construction of 18 new concrete silos at Sharonville, costing $500,000, to store one million bushels of soybeans.
1947, mid. – Drackett’s plant making industrial soy protein isolates begins operation at Sharonville. It also makes Ortho Protein and Impact Plastic Molding Compounds.

1948 March - Harry R. Drackett, the company’s second president, dies. His son, Roger Drackett, is elected president.

1949 July 12 - Drackett’s soybean plastics operations are discontinued completely.

1949 – Robert Boyer leaves The Drackett Co. when it shut down its Azlon fiber spinning plant. He begins research on developing the world’s first edible soy protein fibers – to imitate muscle fiber in meats.

1949 Sept. - Drackett introduces Charge dessert for dogs, which contains soya bean flour as an ingredient.

1957 July 1 – Drackett sells its entire isolated soy protein business to the Archer Daniels Midland Co. (ADM). William Atkinson goes to ADM as part of the deal. At ADM Atkinson invents TVP – a registered trademark that stands for textured vegetable protein.

1965 Nov. – The Drackett Co. is sold to Bristol-Myers.

1984 – The Drackett Company, now part of Bristol-Myers, celebrates its 75th anniversary with an attractive brochure. It makes some American household cleaning products that are first in their category including Windex glass cleaner, Drano drain cleaner, Vanish bowl cleaners, Twinkle copper cleaner, Renuzit air fresheners, and O-Cedar mops and brooms.


ABOUT THIS BOOK

This is the most comprehensive book ever published about the history of Drackett’s work with soy proteins. It has been compiled, one record at a time over a period of 42 years, in an attempt to document the history of this interesting subject. It is also the single most current and useful source of information on this subject.

This is one of more than 100 books compiled by William Shurtleff and Akiko Aoyagi, and published by the Soyinfo Center. It is based on historical principles, listing all known documents and commercial products in chronological order. It features detailed information on:

- 25 different document types, both published and unpublished.
- 105 published documents - extensively annotated bibliography. Every known publication on the subject in every language.
- 13 unpublished archival documents.
- 18 original Soyinfo Center interviews and overviews never before published, except perhaps in our books.
- 9 commercial soy products.

Thus, it is a powerful tool for understanding the development of this subject from its earliest beginnings to the present.

Each bibliographic record in this book contains (in addition to the typical author, date, title, volume and pages information) the author’s address, number of references cited, original title of all non-English language publications together with an English translation of the title, month and issue of publication, and the first author’s first name (if given). For most books, we state if it is illustrated, whether or not it has an index, and the height in centimeters.

All of the graphics (labels, ads, leaflets, etc) displayed in this book are on file, organized by subject, chronologically, in the Soyinfo Center’s Graphics Collection.

For commercial soy products (CSP), each record includes (if possible) the product name, date of introduction, manufacturer’s name, address and phone number, and (in many cases) ingredients, weight, packaging and price, storage requirements, nutritional composition, and a description of the label. Sources of additional information on each product (such as advertisements, articles, patents, etc.) are also given.

A complete subject/geographical index is also included.
ABBREVIATIONS USED IN THIS BOOK

A&M = Agricultural and Mechanical
Agric. = Agricultural or Agriculture
Agric. Exp. Station = Agricultural Experiment Station
ARS = Agricultural Research Service
ASA = American Soybean Association
Assoc. = Association, Associate
Asst. = Assistant
Aug. = August
Ave. = Avenue
Blvd. = Boulevard
bu = bushel(s)
ca. = about (circa)
cc = cubic centimeter(s)
Chap. = Chapter
cm = centimeter(s)
Co. = company
Corp. = Corporation
Dec. = December
Dep. or Dept. = Department
Depts. = Departments
Div. = Division
Dr. = Drive
E. = East
ed. = edition or editor
e.g. = for example
Exp. = Experiment
Feb. = February
fl oz = fluid ounce(s)
ft = foot or feet
gm = gram(s)
ha = hectare(s)
i.e. = in other words
Inc. = Incorporated
incl. = including
Illust. = Illustrated or Illustration(s)
Inst. = Institute
J. = Journal
J. of the American Oil Chemists’ Soc. = Journal of the American Oil Chemists’ Society
Jan. = January
kg = kilogram(s)
km = kilometer(s)
Lab. = Laboratory
Labs. = Laboratories
lb = pound(s)
Ltd. = Limited
mcg = microgram(s)
mg = milligram(s)
ml = milliliter(s)

mm = millimeter(s)
N. = North
No. = number or North
Nov. = November
Oct. = October
oz = ounce(s)
p. = page(s)
photo(s) = photograph(s)
P.O. Box = Post Office Box
Prof. = Professor
psi = pounds per square inch
R&D = Research and Development
Rd. = Road
Rev. = Revised
RPM = revolutions per minute
S. = South
SANA = Soyfoods Association of North America
Sept. = September
St. = Street
tonnes = metric tons
trans. = translator(s)
Univ. = University
USB = United Soybean Board
USDA = United States Department of Agriculture
Vol. = volume
V.P. = Vice President
vs. = versus
W. = West
°C = degrees Celsius (Centigrade)
°F = degrees Fahrenheit
> = greater than, more than
< = less than
HOW TO MAKE THE BEST USE OF THIS DIGITAL BOOK - THREE KEYS

1. Read the Introduction and Chronology/Timeline located near the beginning of the book; it contains highlights and a summary of the book.

2. Search the book. The KEY to using this digital book, which is in PDF format, is to SEARCH IT using Adobe Acrobat Reader: For those few who do not have it, Google: Acrobat Reader - then select the free download for your type of computer.

Click on the link to this book and wait for the book to load completely and the hourglass by the cursor to disappear (4-6 minutes).

Type [Ctrl+F] to “Find.” A white search box will appear near the top right of your screen.

Type in your search term, such as Azlon or protein isolate.

You will be told how many times this term appears, then the first one will be highlighted.

To go to the next occurrence, click the down arrow, etc.

3. Use the indexes, located at the end of the book. Suppose you are looking for all records about tofu. These can appear in the text under a variety of different names: bean curd, tahu, doufu, to-fu, etc. Yet all of these will appear (by record number) under the word “Tofu” in the index. See “How to Use the Index,” below. Also:

Chronological Order: The publications and products in this book are listed with the earliest first and the most recent last. Within each year, references are sorted alphabetically by author. If you are interested in only current information, start reading at the back, just before the indexes.

A Reference Book: Like an encyclopedia or any other reference book, this work is meant to be searched first - to find exactly the information you are looking for - and then to be read.

How to Use the Index: A subject and country index is located at the back of this book. It will help you to go directly to the specific information that interests you. Browse through it briefly to familiarize yourself with its contents and format.

Each record in the book has been assigned a sequential number, starting with 1 for the first/earliest reference. It is this number, not the page number, to which the indexes refer. A publication will typically be listed in each index in more than one place, and major documents may have 30-40 subject index entries. Thus a publication about the nutritional value of tofu and soymilk in India would be indexed under at least four headings in the subject and country index: Nutrition, Tofu, Soymilk, and Asia, South: India.

Note the extensive use of cross references to help you: e.g. “Bean curd. See Tofu.”

Countries and States/Provinces: Every record contains a country keyword. Most USA and Canadian records also contain a state or province keyword, indexed at “U.S. States” or “Canadian Provinces and Territories” respectively. All countries are indexed under their region or continent. Thus for Egypt, look under Africa: Egypt, and not under Egypt. For Brazil, see the entry at Latin America, South America: Brazil. For India, see Asia, South: India. For Australia see Oceania: Australia.

Most Important Documents: Look in the Index under “Important Documents -.”

Organizations: Many of the larger, more innovative, or pioneering soy-related companies appear in the subject index – companies like ADM / Archer Daniels Midland Co., AGP, Cargill, DuPont, Kikkoman, Monsanto, Tofutti, etc. Worldwide, we index many major soybean crushers, tofu makers, soymilk and soymilk equipment manufacturers, soyfoods companies with various products, Seventh-day Adventist food companies, soy protein makers (including pioneers), soy sauce manufacturers, soy ice cream, tempeh, soynut, soy flour companies, etc.


Soyfoods: Look under the most common name: Tofu, Miso, Soymilk, Soy Ice Cream, Soy Cheese, Soy Yogurt, Soy Flour, Green Vegetable Soybeans, or Whole Dry Soybeans. But note: Soy Proteins: Isolates, Soy Proteins: Textured Products, etc.

Industrial (Non-Food) Uses of Soybeans: Look under “Industrial Uses ...” for more than 17 subject headings.
Pioneers - Individuals: Laszlo Berczeller, Henry Ford, Friedrich Haberlandt, Artemy A. Horvath, Englebert Kaempfer, Mildred Lager, William J. Morse, etc. Soy-Related Movements: Soyfoods Movement, Vegetarianism, Health and Dietary Reform Movements (esp. 1830-1930s), Health Foods Movement (1920s-1960s), Animal Welfare/Rights. These are indexed under the person’s last name or movement name.

Nutrition: All subjects related to soybean nutrition (protein quality, minerals, antinutritional factors, etc.) are indexed under Nutrition, in one of more than 70 subcategories.

Soybean Production: All subjects related to growing, marketing, and trading soybeans are indexed under Soybean Production, e.g., Soybean Production: Nitrogen Fixation, or Soybean Production: Plant Protection, or Soybean Production: Variety Development.

Other Special Index Headings: Browsing through the subject index will show you many more interesting subject headings, such as Industry and Market Statistics, Information (incl. computers, databases, libraries), Standards, Bibliographies (works containing more than 50 references), and History (soy-related).

Commercial Soy Products (CSP): See “About This Book.”

SoyaScan Notes: This is a term we have created exclusively for use with this database. A SoyaScan Notes Interview contains all the important material in short interviews conducted and transcribed by William Shurtleff. This material has not been published in any other source. Longer interviews are designated as such, and listed as unpublished manuscripts. A transcript of each can be ordered from Soyinfo Center Library. A SoyaScan Notes Summary is a summary by William Shurtleff of existing information on one subject.

“Note:” When this term is used in a record’s summary, it indicates that the information which follows it has been added by the producer of this database.

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1. An asterisk (*) at the end of a record means that Soyinfo Center does not own that document. Lack of an asterisk means that Soyinfo Center owns all or part of the document.
2. An asterisk after eng (eng*) means that Soyinfo Center has done a partial or complete translation into English of that document.
3. An asterisk in a listing of the number of references

[23* ref] means that most of these references are not about soybeans or soyfoods.

Documents Owned by Soyinfo Center: Lack of an * (asterisk) at the end of a reference indicates that the Soyinfo Center Library owns all or part of that document. We own roughly three fourths of the documents listed. Photocopies of hard-to-find documents or those without copyright protection can be ordered for a fee. Please contact us for details.

Document Types: The SoyaScan database contains 135+ different types of documents, both published (books, journal articles, patents, annual reports, theses, catalogs, news releases, videos, etc.) and unpublished (interviews, unpublished manuscripts, letters, summaries, etc.).

Customized Database Searches: This book was printed from SoyaScan, a large computerized database produced by the Soyinfo Center. Customized/personalized reports are “The Perfect Book,” containing exactly the information you need on any subject you can define, and they are now just a phone call away. For example: Current statistics on tofu and soymilk production and sales in England, France, and Germany. Or soybean varietal development and genetic research in Third World countries before 1970. Or details on all tofu cheesecakes and dressings ever made. You name it, we’ve got it. For fast results, call us now!

BIBLIO: The software program used to produce this book and the SoyaScan database, and to computerize the Soyinfo Center Library is named BIBLIO. Based on Advanced Revelation, it was developed by Soyinfo Center, Tony Cooper and John Ladd.

History of Soybeans and Soyfoods: Many of our digital books have a corresponding chapter in our forthcoming scholarly work titled History of Soybeans and Soyfoods (4 volumes). Manuscript chapters from that book are now available, free of charge, on our website, www.soyinfocenter.com and many finished chapters are available free of charge in PDF format on our website and on Google Books.

About the Soyinfo Center: An overview of our publications, computerized databases, services, and history is given on our website.

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www.soyinfocenter.com
Dress materials are a blend of our soybean textile fiber and rayon. The soybean fiber imparts a desirable drape and feel to the fabric. A limited quantity of this material and other blends containing soybean fiber should be available for marketing sometime in 1946.
Precision Process Soybean Oil Meal, AAA-1 Soybean Oil, Industrial Proteins, Plastic Molding Compounds, Azlon Fiber

These varied products produced on a low-cost, efficient basis help to assure growers and elevator men a ready market for their soybeans.

THE DRACKETT COMPANY

Cincinnati
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INTRODUCING SOYINFO CENTER

Mission: To be the world’s leading source of information about soyfoods and utilization of soybeans in both printed and electronic formats. Much of our information is free!

Founding: In October 1972 William Shurtleff and Akiko Aoyagi began full-time research on soyfoods in Japan while writing The Book of Tofu. In August 1976 they founded Soyinfo Center (named Soyfoods Center until 2006) in California.

Books in Print: 100+ books on soyfoods and soybeans by Shurtleff and Aoyagi are presently in print. These include three popular books, market studies, and 70 comprehensive histories & bibliographies.

Book Sales: These books have presently sold more than 830,000 copies. Our best-selling book is The Book of Tofu.

SoyaScan Database: SoyaScan is the world’s most comprehensive computerized database on soybeans and soyfoods. It presently contains 108,700+ records from 1100 B.C. to the present. These include four basic types of records providing detailed information on: 92,300+ published documents, 16,700+ commercial soy products, 6,300+ original interviews and overviews, and 8,300+ unpublished archival documents. These records are unique, and have been added one at a time over many years; none have been downloaded from other databases. A Thesaurus of our database is available.

Free Books on Google Books: At least 80+ of our history books and biographies are available free in digital PDF format on Google Books. The same books are also available on our website (see dropdown upper right).

Focus of SoyaScan Database: In descending order of importance: Soybean utilization (for both food and industrial uses), history, market statistics, processing, nutrition, technology, marketing, and soybean production (agriculture).

How to Use the SoyaScan Database: This database is very easy to use. You do not need a computer or any special skills. Simply call the Soyinfo Center and discuss the information you need with our specialists.

Website: At www.soynfocenter.com you will find basic information about us, entire free online reference books, a photo gallery, 1,500 pages of our manuscript history of soybeans and soyfoods (free), a thesaurus to subject headings in our database, information on ordering of all our popular printed books, etc.

Research Library: The Soyinfo Center Library owns about 98,500 documents, almost all of which have a record in the SoyaScan database. Available for use by researchers with an appointment.

Consulting Services: William Shurtleff has been serving as a consultant to the soyfoods industry for more than 25 years. He probably has more personal contacts in this field, worldwide, than anyone else in the world. He has helped to start more than 450 new companies.
HISTORY OF THE DRACKETT COMPANY’S WORK WITH SOYBEANS, SOY PROTEIN AND AZLON (1937-2020)

   • Summary: One client of The Ralph H. James Company is The Drackett Company—maker of Drano and Windex.
   “The sales total of our clients in 1933 was over nine hundred million dollars.
   Note: This is the earliest document seen that mentions Windex. Address: 431 Main St., Cincinnati, Ohio.

2. Product Name: Soybean Oil, and Soybean Oil Meal.
   Manufacturer’s Name: Drackett Company.
   Manufacturer’s Address: Cincinnati, Ohio.
   Date of Introduction: 1937.
   Ingredients: Soybeans.
   How Stored: Shelf stable.
   We are not yet sure when The Drackett Co. started crushing soybeans. We have been unable to find a definitive announcement or ad in Soybean Digest (which began publication in Nov. 1940) or in any magazine. Charles Butke, whom we interviewed on 26 May 1993, went to work for Drackett in 1947. He believes that Drackett began to crush soybeans in about 1937, using solvent extraction at their facility at 5020 Spring Grove Ave. in what was then northern Cincinnati.

   • Summary: “A soybean processing plant, which will provide a substantial market for farmers in southwestern Ohio, is under construction and is expected to be put into operation next September by The Drackett Co., Cincinnati, Ohio. The plant is being built on a 75-acre tract, south of Sharonville, 16 miles south of Cincinnati... An investment of about $1,500,000 is being put into the development.”

   “About six years ago, The Drackett Co. began to consider expanding operations and sought a basic industry where there was an opportunity for continued growth and development. Three years of laboratory experiment and research preceded the opening of the company’s present small single processing unit. In January, 1937, the first carload of soybeans arrived at the plant. Since then, the laboratory research has been continued.
   “Initial operations of the new plant will be confined to extracting oil and making soybean meal. The other steps in the processing will depend upon other steps under way on products derived from the oil and meal.”
   Note: This is the earliest document seen (June 2020) that mentions The Drackett Company’s work with soybeans. Drackett did not officially start production of spun soy protein fibers until 2 December 1943.

   • Summary: “Processes now used for the manufacture of soybean oil meal are: the solvent extraction process, resulting in 44 per cent protein or New Process soybean oil meal, and the hydraulic and expeller processes producing 41 per cent or Old Process soybean oil meal.
   “Our company [ADM] was the first to install the approved continuous method of solvent extraction for soybeans in this country. This installation was made in Chicago in 1934. Since this time the Glidden Co. has installed two similar solvent extraction units—Central Soya Co., Inc., installed a very large unit of a little different design but the same continuous principle a couple of years ago at Decatur, Indiana, and the Clinton Co. of Clinton, Iowa, also put up a continuous solvent extraction unit a few years ago. Three small extraction units of the Henry Ford design are operating in Michigan not far from Dearborn. The Drackett Co. of Cincinnati, Ohio, is processing soybeans by the solvent extraction method and the Honeymead Co. is using a solvent extraction unit of the Allis-Chalmers Manufacturing Co. design in processing soybeans at their plant in Cedar Rapids. Then too, just last year we put up the largest continuous extraction unit in this country of the same design as Central Soya’s. This installation of ours was made at Decatur, Illinois, and has a capacity of better than 400 tons of soybeans per day. We began operating this soybean plant at Decatur in November, 1939.”

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Note: This is the earliest document seen (Oct. 2018) that mentions “Honeymead” or the “Honeymead Co.” in connection with ADM. Address: ADM, Minneapolis, Minnesota.


• Summary: If farm chemurgic interests are to make agriculture no longer a mere pursuit to provide man’s food and raiment, but one to produce the array of chemical raw materials for fashioning a host of new products to fit a myriad of needs, then such interests must not only agitate and promote such activities but they must lend themselves to facing the fact, pertaining to such exploitation. It is all very well to ballyhoo the fine ideas of things chemurgic, it is splendid to land the saving of the farmer for America, it is well to believe that Nature’s bounty accrues for the benefit of mankind, but it is also imperative that we cogitate over ways and means, that we proceed with well conceived plan and program, ever willing to face facts, ever willing to learn more and that we adhere to the real scientists creed of ever seeking Truth.

“The rapid strides in the soybean industry in recent years have brought along many problems. Some of these problems are chemical in nature, some mechanical and many economic. Long years ago there ran an old adage which stated in substance that ‘Every tub should sit on its own bottom.’ The soybean industry is no exception. To fabricate materials from soybeans merely to have them compete with materials made from cottonseed, flax, peanuts, etc., is a pretty short-sighted policy and not particularly effective in solving the problems of the farmer. Enthusiasts are too often too loathe to get down to brass tacks. Products derived from soybeans must be as good as, or better than those they attempt to supplant, they must show some advantage in some way, be it in cost price, specific property, availability, ease of handling, etc., and they must produce equal or superior consumer satisfaction somehow. Solution of the various problems attendant upon soybean processing must therefore involve broad studies from a great many different angles. The farmer, the chemist, the engineer, the salesman, the banker and every other factor must work in cooperation if soybeans are not to be just another crop–just one more to worry about.

“It may be well to sketch briefly a few of the problems before us. The primary processing of soybeans has been for their oil content. Whether hydraulic pressing, expeller processing or solvent extraction operation is employed there is the concomitant meal left in an amount equal to about 80 per cent of the original bean weight. Of what value are this oil and this meal? Purely chemurgically they are something far more than mere commodities.

“First of all the processor must study the markets open to such products. With what does each compete? What price factors pertain? How far shall processing go? Is it more profitable to sell oil for paint purposes or shall it be refined to an edible grade? What competitive factors rule? What about the meal as feed for cattle, swine and poultry. How does expeller meal compare with solvent extracted meal? For such evaluation one must have a complete history of the processing. What about relative nutritive values? What about relative digestibility coefficients? What place do such meals have as bases for human food products? What is the vitamin picture?

“Assuming that we regard the oil and meal as raw materials for the fabrication of other industrial products many similar questions pertain. It is very necessary that every one of them be given full consideration. The manufacturers of soybean enamels on the one hand and oleomargarine on the other require their own definite specifications in each case. If soybean plastics are to be derived from soybean meals, somewhere there must be a lot of research to determine the specific properties and characteristics required. The same holds true in the development of every other product derived from the products of soybean processing.

“From early days the high protein content of the soybean has been most intriguing. A very little research will soon indicate that this protein make-up is a very complex one, that the mechanical problems attendant upon chemical processing multiply with exceeding rapidity and that application for specific uses such as paper size, paper coating, glues, paints, films, fibers, etc., require a detailed tailoring of no small order to enable such products to serve usefully and satisfactorily in competition with a host of other chemical products which too may come from other chemurgic operations. The effect of temperatures, pressures, time factors, etc., are only a few of the items with which research must concern itself.

“Approximately one fourth of the weight of the soybean is made up of a carbohydrate fraction. What can be done with this material? There are galactans, pentosans, arabans, hemi-celluloses, pentoses, hexoses and other bodies in this mixture. No processing beyond the primary meal derived on oil extraction can fail to consider this carbohydrate fraction. A vast amount of research still lies ahead before the problems in this field are worked out. This is one of the fertile fields still pretty much unexplored and unexploited.

“In the few minutes allotted, we have attempted to set forth, as one engaged in a great variety of research studies, some of the problems attendant upon soybean processing. Government laboratories, experiment stations, universities and private industrial laboratory are all busy on chemical and allied research. Marketing research must accompany any of these. The farmer must do his share, the scientist has his place, the salesman his niche and the banker must use both his brains and his educated money. Cooperative efforts
on the part of all can and will make the soybean crop one of real major chemurgic interest and of real value to American agriculture.” Address: PhD, Chemical Director, The Drackett Co., Cincinnati, Ohio.


Article IX, Committees, lists and describes each.


Standing committees: For each committee, the names of all members (with the chairman designated), with the company and company address of each are given—Traffic and transportation. Research. Finished materials standards. Soybean grades and contracts. Trading rules—oil. Trading rules—meal. Soy flour. Crop improvement. Soybean nutritional research council. Trade development. Edible soybean.


Note 1. This is the earliest document seen (July 2005) that mentions Honeymead in Iowa.

Note 2. This is the earliest document seen (Sept. 2005) that mentions Quincy Soybean Products Co. (Quincy, Illinois) or Irving Rosen. Address: 3818 Board of Trade Building, Chicago, Illinois.


**Summary:** A landmark popular book and a good description of the pioneering period of soybean production and processing in the United States.

YEAR BOOK

1941-1942
(Association Year)

National Soybean Processors Association

Constitution and By-Laws, Code of Ethics, Officers, Directors, List of Standing Committees, Names of Members, Trading Rules, etc.

Official Copy

Published by the Association
3818 Board of Trade Building, Chicago

50 cents per copy

Illustrations and diagrams show: (1) Principal centers of U.S. soybean production (p. 19, map). “Almost 90 per cent of all soybeans are harvested in Illinois, Iowa, Indiana, and Ohio. If three other states are included as shown on the map—Missouri, Michigan, and Virginia—the total is 97 per cent. (2) Principal centers of U.S. soybean processing (p. 20, map). Discs of different size show the various centers. Since Illinois produces 52% of the harvested soybeans, central Illinois is the center of soybean processing [crushing] in the USA. “Total processing capacity in late 1942 exceeded 100 million bushels for the regularly established soybean processing plants.” (3) Diagram of uses of the soybean (p. 68).

Chapter 2, “Vignette from antiquity” begins: “Even when the Pyramids were being built, three hundred years before the Tower of Babel, and twelve centuries before Solomon fashioned his temple, the soybean was hoary with age. The earliest writings on the subject go back to the period of the Pyramids.

“But of the science of soybean growing you will find no recorded beginnings in the misty tones [sic, tomes] of oriental history. No book reveals the name of the inquisitive oriental who in the misty long ago began sowing the seeds, harvesting the beans, pounding them into a mash for cooking and eating, and probably boring his friends no end with tales of their merit. There is not record depicting this unsung hero’s foresight in saving the seed of the magic plant against next year’s hunger. Likely as not he was a crude dreamer who fumbled his hunches and accomplished little in a lifetime of wrestling with the problem of proper cultivation.

“Oriental literature of a later date contains much about the plant but of its origin as a food product again there are only legends.

“A choice vignette from antiquity on the initial use of soybeans runs something in this fashion. Long, long ago, far back in the dim past, a caravan pulled out of an eastern China town. It consisted of a number of merchants and their servants... The caravan was bound for a distant inland settlement intent upon disposing of its valuable wares.” After trading in the north, the caravan headed home, “now laden with gold, silver, and choice furs received in payment for the merchandise. Suddenly at dusk on a day when the caravan was still far from home it was surrounded by bandits who had learned of the rich prize at hand. Merchants and servants took quick refuge in a rocky defile easy of defense. Here they were besieged day on day until their scanty provisions ran low and starvation seemed inevitable. At length a servant whispered to his master and pointed to a vinelike plant bearing some sort of legume. No one could recall having seen such a plant before but all were touched with the pinch of hunger. So with grave doubts the men pounded the beans into a thick flour, mixed it with water, and made coarse cakes. Upon these cakes the caravan survived, and with renewed strength fought off the foe until help arrived. And, so the legend goes, from that day forth the miracle bean became the staff of life in China.” Note 1. This story of the caravan besieged by bandits in China is a longer and embellished version of the tale first dreamed up and told by H.W. Galley in Soybean Digest (Dec. 1940).

“True or false, the story has lived through the ages.

“For the first written record of the soybean one must turn to ‘Materia Medica,’ written by Emperor Shen-nung in 2838 B.C. It describes many plants of China including that of the soybean, but even the name is clouded with antiquity. In the early Chinese history the name ‘Shi-yu’ [sic] and the ‘Ta-tou’ were applied to the soybean. These names probably antedate the first authoritative records of the plant.”

Dies then discusses Engelbert Kaempfer, Linnaeus, and Moench.

“Then in 1804 a Yankee Clipper ship in full sail glided down the coast of China searching for ports for a return cargo. Not sure of the length of the return journey, the captain ordered several bags of soybeans tossed into the hold as a reserve food supply. And thus did the first soybeans enter America. Little was done about the soybeans then.

Note 2. This is the earliest document seen (June 2003) that further embellishes the myth of the “clipper ship” with phrases like “glided down the coast of China” or “ordered several bags of soybeans tossed into the hold”–all supposedly in connection with the introduction of the soybean to the United States. This is also the earliest document seen (Aug. 2000) that compares the age of the soybean with that of the pyramids (in Egypt; the oldest and largest was built for Khufu at Giza in the 26th century B.C.), the Tower of Babel (in Babylon [today’s Iraq]), or Solomon’s Temple (in today’s Israel), arguing that the soybean was much older than all of them.

“James Mease of Pennsylvania first mentioned in American literature shortly after this importation that the soybean was adaptable to Pennsylvania and should be cultivated” (p. 9).

In Chapter 3 (p. 14) Dies notes: “The first soybeans
processed in this country were imported from Manchuria in 1911 and sold to Herman Meyer who had a small crushing plant in Seattle, later called the Pacific Oil Mills. From the raw material he produced the two chief products—soybean oil meal for livestock feed and soybean oil, selling the latter locally for industrial use. The meal was advertised and sold as ‘Proteina,’ a high-protein feed. The venture did not last for any considerable period; a few years later Meyer passed away.” Note 3. This is the earliest document seen (May 2010) that mentions Herman Meyer.

“Soybeans grown in this country were first processed by the Elizabeth City Oil and Fertilizer Company at Elizabeth City, North Carolina. W.T. Culpepper, now postmaster at Elizabeth City, was manager of the new mill, started in 1912. The first domestic soybeans were crushed for commercial purposes there in the late fall of 1915. It was a small operation.” Note 4. This is the earliest document seen (May 2010) that mentions W.T. Culpepper.

“At that time, most of the soybeans were grown in North Carolina, and the Winterville Cotton Oil Company at Winterville, North Carolina, purchased expellers for processing purposes, and these operated on soybeans for a limited period. Still another mill, operated by Havens Oil Company at Washington, North Carolina, crushed thirty thousand bushels of beans as an experiment in 1916”

“‘My uncle, Jonathan Havens,’ says J. Havens Moss, ‘was the first to plant soybeans in this section, devoting considerable acreage to the mammoth yellow [Mammoth Yellow] type which grew and matured splendidly from the very start. Its value to the land was obvious’” (p. 14-15). Note 5. This is the earliest document seen (Aug. 2016) which mentions that Havens Oil Co. crushed soybeans as early as 1916.

Note 6. On the first page of the copy owned by Soyfoods Center is a signed inscription, in dark blue ink, which reads: “With kind regards to Russell East, who has done much on behalf of the soybean—Edward Jerome Dies.”

Note 7. Only minor changes were made on about 13 pages of the revised edition published in March 1943. None of the statistics in the many tables were been updated, and the bibliograpy was not changed. Address: USA.


- **Summary:** Page 5: Soybean acreage and production, 1924-1941. United States crop. Soybean harvested for beans. Each crop year extends from Oct. 1 to Sept. 30. Acreage increased from 448,000 acres in 1924 to 5,855,000 acres in 1941. Yield per acre rose from 11.0 bushels in 1924 to a peak of 20.7 bushels in 1939. Production increased from 4,947,000 bushels in 1924 to 106,712,000 bushels in 1941. Sources: (1) Crops and Markets, USDA. (2) Illinois Crop Statistics, Circular 440-441. (3) Latest government reports, 18 Dec. 1941.


Page 19: Principal centers of soybean production in the USA. “Almost 90 per cent of all soybeans [in the USA] are harvested in Illinois, Iowa, Indiana, and Ohio. If three other states are included as shown on the map—Missouri, Michigan and Virginia—the total is 97 per cent. The size of the baskets is proportional to the volume produced.

Page 20: Principal centers of soybean processing [crushing] in the USA. “As Illinois produces about 52 per cent of the soybeans harvested for seed, Central Illinois is the center of soybean processing as shown on this map. The discs indicate relative importance of the processing centers. Total processing capacity in late 1941 probably exceeded 90 million bushels.

Page 25: Illinois acreage and production of soybeans for beans, 1919-1941. Acreage harvested increased from 3,000 acres in 1919 to 2.285 million acres in 1941. Yield, in bushels per acre, rose from 10.0 in 1919 to 21.5 in 1941. Production increased from 30,000 bu in 1919 to 49.128 million bu in 1941.

Pages 38-47: Soybeans: Origin and varietal characteristics. This excellent table contains 18 columns. Variety. Origin (introduction from what country, selection, or cross). Year. Days to mature. Flower color. Pubescence color. Seed characteristics: coat color, germ color, hilum...

Page 53: “United States crop production of soybean oil meal and soybean oil, 1924-1940.” This valuable table is poorly titled. It has 5 columns: (1) Year. (2) Production of soybeans. Increased from 4,947 bu in 1924 to 106.712 million bu in 1941. (3) Crushing [crushed]. Increased from 307,000 bu in 1924 to 64.180 million bu in 1941. (4) Production of meal. Increased from 7,400 tons in 1924 to 1.5369 million tons in 1941. (5) Production of oil. Increased from 2.269 million pounds in 1924 to 565.169 million pounds in 1941.

Page 58: Soybean oil imported and exported, 1912-1940. Imports rose from 24.959 million lb in 1912 to a peak of 335.984 million lb in 1918, decreasing to 4.848 million lb in 1940. Domestic and foreign oil exported decreased from 34.803 million lb in 1919 (For 6 months beginning July 1) to 15.953 million lb in 1940.

Page 61: Soybean oil: factory consumption by classes of products, 1931-1940. Compounds [shortening] and vegetable cooking fats rose from 10,869 lb in 1931 to 212.317 million lb in 1940. Oleomargarine rose from 623,000 lb in 1931 to 87.106 million lb in 1940. Other edible products rose from 180,000 lb in 1932 to 39.980 million lb in 1940. Soap rose from 3.816 million lb in 1931 to 17.612 million lb in 1940. Paint and varnish rose from 6.256 million lb in 1931 to 29.828 million lb. Linoleum and oilcloth rose from 2.612 million lb in 1931 to 29.828 million lb in 1940. Printing ink rose from 33,000 lb in 1931 to 82,000 lb in 1940. Miscellaneous rose from 2.051 million lb in 1931 to 16.538

million lb in 1940. Feets and loss rose from 1.625 million lb in 1931 to 20.924 million lb in 1940. The total of these uses for soybean oil rose from 27.885 million lb in 1931 to 431.641 million lb in 1940.

Page 68: Diagram of uses of the soybean. The major categories are: Green soysbeans, used as fresh vegetables or in canned vegetable salads. Dry soysbeans, used for seed or to make bean sprouts, soup, soy sauce, roasted soybeans, boiled soybeans, stock feeds, vegetable milk [soymilk] (used to make liquid milk products, dry soy milk products, bean curds, soy cheese), debittered soysbeans (used to make full fat soy flour, soy coffee, soy butter, soy cereal). Soybean oil meal, soybean flour, soy lecithin, crude soybean oil (used to make fatty acids, alkyd resins, glycerine, core oils, soft soaps, hard soaps, insecticides, and many non-food products mentioned above). Refined soybean oil (used to make food products–vegetable shortening, margarine, salad dressing, edible oils, frying oils). Address: USA.


• Summary: A full-page ad printed with red and black ink on white. This is one of the few ads in Soybean Digest sponsored by many independent companies. They are:

“Central Soya Co., Inc., Decatur, Indiana.
“Swift & Company, Fostoria, Ohio
“Berea Milling Co., Berea, Ohio
“Hoosier Soybean Mills, Inc., Marion, Indiana
“A.E. Staley Manufacturing Co., Painesville, Ohio
“The Drackett Co., Cincinnati, Ohio
“Elevators & Mills, Inc., Windfall, Indiana
“Soya Processing Co., Wooster, Ohio.

“When rations are balanced with soybean oilmeal. Any livestock feeder can save a like amount in the cost of growing every one of his pigs if he will supplement their grain with a good protein feed such as soybean oilmeal.

“It figures out like this: 25 bushels of corn will feed out a hog to about 240 or 250 lbs. But if he is fed 75 lbs. of a good protein concentrate such as soybean oilmeal with 16 bu. of corn, he will attain the same weight in two or three weeks less time.

“The saving:

9 bu. corn @ 80¢ per bu = $7.20
“Cost 75 lb. soybean oilmeal @ $2.40 per cwt = $1.80
“Net saving per hog = $5.40
“It is good economy to feed more protein.
“Our Workers, Our Armies and Our Allies Depend on the Efficiency of Our Livestock Production.”

A photo near the top of this ad shows the rear ends of 10 hogs standing side by side as they feed. The caption: “This 10-pig litter belonging to Vaughn Craft, Hudson, Iowa, made the largest gain in 180 days of any Duroc-Jersey litter in the U.S. in 1941. Soybean oilmeal was included in the rations.”
10. **Product Name:** Alysol (Industrial-Grade Isolated Soy Protein).

**Manufacturer's Name:** Drackett Company (The).

**Manufacturer's Address:** 5020 Spring Grove Ave., Cincinnati, Ohio.

**Date of Introduction:** 1942.

**New Product—Documentation:** Werner Von Bergen and Walter Krauss. 1942. *Textile Fiber Atlas.* p. 33. “Soya bean fiber was first introduced to the American people at the New York World’s Fair of 1939 at the Ford exhibit. Its base is a protein of the soya bean produced by the Drackett Product Co., Cincinnati, under the trade name of Alysol protein. In its microscopical appearance as seen from Plate XXIII, the fiber is very similar to Aralac and Lanital.”

Interview with Charles Butke. 1993. May 26. “The Drackett Company’s work with ‘Alysol’ soy protein.” Chuck went to work for Drackett in 1946 at about the time when the Sharonville plant began operations. At about that time he recalls reading in a report that a soy protein product named “Alysol” was being made by Drackett before he arrived. The Alysol was made at the Drackett plant at 5020 Spring Grove Ave. in what was then northern Cincinnati. That was the location of Drackett’s original soybean extraction plant which began operations in about 1937.


- **Summary:** The chapter titled “Prolons and Synthons” (p. 33-34) states that prolons are man-made protein fibers, whereas synthons are purely synthetic fibers such as nylon and vinyon. The proteins use to make prolons are casein (from milk; used to make Lanital and Aralac), soya bean protein, zein (from corn), and fibroin (obtained by dissolving silk wastes).

“Soya Bean Fiber: This fiber was first introduced to the American people at the New York World’s Fair of 1939 at the Ford exhibit. Its base is a protein of the soya bean produced by the Drackett Product Co., Cincinnati [Ohio], under the trade name of Alysol protein. In its microscopical appearance as seen from Plate XXIII, the fiber is very similar to Aralac and Lanital.

Proper differentiation of soya bean and casein fibers is possible on the basis of their variation in the amino acids present by qualitative color reactions, as reported by Williams and Tonn” [1941]. Also discusses the fineness and size of the fibers.


- **Summary:** “Robert A. Boyer, who turned soybeans into dozens of industrial products for Henry Ford... has joined The Drackett Co., a chemical firm of Cincinnati, Ohio., it became known in Detroit Thursday.

“At the same time it was revealed that the soybean fiber mill, which was Boyer’s latest project before he resigned July 1 from the Ford Motor Co., had been shipped to Cincinnati, and will be assembled there by The Drackett Co., to enable Boyer to continue the project he began in Dearborn.

“The dramatic, and hitherto unrevealed story of Boyer’s parting with Ford, also has come to light. It happened the week Edsel Ford lay dying, and Henry Ford, faced with the certain grief of the loss of his only son, went to Boyer and sat down with him in the young chemist’s laboratory to tell him that the soybean fiber project, which the elder Ford visited almost daily, would have to be discontinued.

“Henry Ford faced the responsibility he would have to shoulder in resigning the full load of president of the company, and the burden of more than four billion dollars worth of war contracts, and made his decision in order to devote himself to his war job.

“That week dismantling of the soybean fiber mill began, and when Boyer made his new connection, the mill went along.” Address: Free Press automotive editor.


- **Summary:** “Robert A. Boyer has joined the Executive Department of The Drackett Company as Director of Scientific Research. Bob formerly headed up soybean research for the Ford Motor Company. In that position he was responsible for the development of dozens of commercial products from the soybean. In his new position he will have the executive direction of all scientific work both chemical and engineering in the development of new products and the improvement of old.”

Donald C. Spice has been appointed Chemical Director at the Sharon Plant. He was formerly chief chemist. “When the Sharon plant began operations, he was placed in charge of the laboratory supervising both control work and research on soybean oil and meal.”

Dr. W.C. Gangloff, who joined the company in 1925 as Chemical Director, was responsible for building up the research staff now active in developing products from soybeans.

Mr. R.B. Alspaugh, formerly Director of Sales, Soybean Division, has been Elected Vice President of The Drackett Products Company–Soybean Division. He joined the...
company in 1939 and has since handled the sale of soybean meal and oil.

A portrait photo shows each man, as well as H.R. Drackett (president) and his son, Roger Drackett. Roger joined the company in 1934 after completing post graduate work at the Harvard School of Business Administration. He is now Executive Vice President. The Drackett Co. is a manufacturing company; all its products are sold by The Drackett Products Co.

• **Summary:** “H.R. Drackett, president of the Drackett Company, announced today that his company will begin production of a new textile fiber, developed from soybeans, early next month. According to the announcement, it will be produced on a commercial basis at prices competitive with wool.

“The new product is said to be elastic, resilient and moisture absorbent and the first non-animal protein fiber. It can be blended with both wool and cotton and is now used experimentally in hats, underwear, blankets and other textiles. The process, originally developed by the Ford Motor Company, has been taken over, with personnel and equipment, for commercial exploitation.”

• **Summary:** “Contents: History. Soybean processing. Primary industrial raw materials. Derived products for industrial development. Industrial developments: Soybean proteins, soybean paints, rubber-like products (“From the polymerized oil, products like ‘Norepol’ have been worked out.”), coating products (“Soybean protein dispersed in water or suitable alkalies and hardened with formaldehyde has found use in Kraft paper coating, etc. More recently it has found use in laminated paper stock, particularly in conjunction with phenolic resins: urea-formaldehyde resins and melamine resins...”), soybean plastics, soybean fiber as a textile material, soybean film, soybean phosphatides, wider horizons. Address: Technical Consultant, The Drackett Co., Cincinnati, Ohio.

• **Summary:** “Announcement has been made of the resignation of Robert A. Boyer as head of Ford Motor Co. Chemurgic Laboratories. Under his direction, the Ford research laboratory perfected processes for extracting soybean oil, and developed soybean paint. Mr. Boyer in his new position as development director of Drackett Co., Cincinnati, Ohio, will continue work on the development of soybean fibre.”

• **Summary:** “The following list of soybean processing mills is divided into three parts: (1) mills in which soybeans regularly constitute the bulk of the throughput, (2) mills which are currently under construction or whose construction is being seriously considered, and (3) mills which are engaged in soybean processing temporarily or part time, or which have otherwise participated in the soybean program by signing a soybean processor contract. It must be realized that changes are occurring very rapidly at the present time, throughout the entire soybean processing industry.

“Solvent extraction plants in group No. 1 are designated with an asterisk (*). Many of the solvent type mills also contain expellers and screw presses. After the name of each mill in group No. 1, the letter S, M, or L is used to designate whether it is a small, medium, or large installation. These ratings are only approximate and divide mills into three capacity groups: S (small), capacities less than 50 tons of soybeans per day; M (medium), capacities between 50 and 200 tons per day; and L (large), capacities over 200 tons per day.

(1) Mills specializing in soybeans:
Arkansas: West Memphis–Arkansas Mills, Inc. (S). Wilson–Wilson Seed and Feed Company (S).
California: Oakland–Albers Brothers Milling Company (S).
here this week,” according to H.R. Drackett, president of

Cincinnati Enquirer.


“The first commercial production of a new fiber made from soybeans started in Cincinnati December 2 in a plant which is expected to be of major postwar importance, H.R. Drackett, president of The Drackett Company, has announced.”


Drackett Annual Report. 1946. p. 15. A 2-page spread is titled “Azlon®” (Footnote: *Azlon is the new generic name for all man-made protein textile fibers. It is not a trade-mark. No trade name has been chosen for our fiber; it is known in the textile industry as Drackett Azlon.)” The left page, in brilliant color, shows samples of elegant fabrics that look like fine silk. “These fabrics are woven from yarns in which Drackett Azlon was blended with rayon and with wool.”

“The new plant, mentioned in our last report, began making fiber in September [1946]. It is now turning out quality fiber in steadily increasing volume.” Nothing in The Drackett Company’s annual reports of 1944 or 1945 indicate that the company was selling spun soy protein fiber during those years.

Drackett Annual Report. 1947. “Azlon: A market change occurred in 1947 in the textile industry that has postponed the date when Azlon can be expected to contribute importantly to our profit. We realized from the time that we began to sell [note the word “sell”] Azlon in the war period that the shortage of textile fibers was to some degree responsible for its acceptance. We realized that our product must be constantly improved if it were to be continuously successful under normal peacetime conditions.

“During the early months of 1947, the sellers’ market in textiles, that had obtained during the war period, changed rather suddenly to a buyers’ market. Competition again became keen and quality was again an important consideration... We therefore, reduced our production to an experimental level. Orders were placed for new equipment and work was started on the redesigning and rebuilding of

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some equipment already in the plant.

Ad in Soybean Blue Book. 1947. p. 57. “Drackett quality starts here.” The top half of this full-page ad contains a photo of “huge silos, recently completed, to double the soybean storage capacity of The Drackett Company.” The text below states that the company has developed “such high quality products as Precision Process Soybean Oil Meal, AAA-1 Soybean Oil, Industrial Proteins, Plastics Molding Compounds and Azlon Fiber.”

Drackett Annual Report. 1949. p. 4-5. “Another change related to our development program on a soybean protein textile fiber. In last year’s report we stated that production had been halted and further research would be carried on. Early in 1949 it became apparent that the need for such a fiber was largely being satisfied by new synthetics. These new fibers not only were filling a need which we had expected to satisfy, but also they had important raw material and manufacturing cost advantages. Since these cost factors were inherent in the products, and it appeared that it would be difficult to offset them, we continued only basic research work on protein textile fibers.”

Talk with Charles Butke, formerly with The Drackett Co. 1993. April 15. Drackett made and sold Azlon from about 1946 to 1949. Their main customer was the American Hat Co., which used the product in felt hats, but Drackett also had several other smaller customers. Charles is absolutely certain that the Azlon was sold commercially because he was in charge of approving the shipments to go out. It had very good felting properties. Drackett made about 1,000 to 1,500 lb/day of Soybean Azlon, cut the fibers into lengths of about 2½-3½ inches as desired by the hatter, tied them into loose uncovered bales with cord, and shipped them. There were also two other smaller companies that used Azlon. At the time, H.R. Drackett had suits and hats made for his sales force that contained Azlon.

• Summary: “Thursday, December 2 [1943] was a rather momentous day at 5020 Spring Grove Avenue. On that day our new soybean fiber plant was officially declared in operation.

“The Drackett Company is a true pioneer in this promising development. We are now operating the only plant in the country producing this new synthetic fiber.

“This new fiber is as warm as wool. It is resilient, strong and durable, and can be made either moisture absorbent or moisture repellent. It is not a competitor of any other fiber, but is an entirely new raw material with a growing field of usefulness. It may be blended with either cotton or wool or it may be woven or spun into fabrics. It has already been made experimentally into such products as blankets, felt hats, underwear, hosiery, suitings and upholstery fabrics. The manufacturing process can be so controlled as to build into the fiber various desirable characteristics which enable it to meet a variety of requirements. The capacity of the soybean fiber plant will be increased as rapidly as war conditions will permit.

“Production will be stepped up as fast as we can secure additional machinery and equipment. Actually this may be said to be a post-war plant, a part of our post-war planning. While carrying on commercial manufacturing we will make a continuous technical study of the product, the manufacturing process, and of potential uses for the new fiber. In this way when the war ends we will be all set to go into large-scale production. Although it required several years of intensive research and laboratory experiment to develop this process it is relatively simple in actual operation. From the soybean we first extract soybean oil by a method we developed several years ago. After this is done remains soybean meal, which we sell in large quantities for livestock feed. Roughly half of this meal is protein. To manufacture our new fiber we remove the required amounts of protein from the meal. This protein is a powder-like product. Through a special process of our own this is liquefied and converted into a consistency resembling that of molasses. This liquid is then forced under pressure through very fine platinum spinnerettes from which it emerges as hundreds of fine filaments. The filaments are then given a number of treatments and chemical baths, during which they are stretched and hardened. Finally the fibers are dried and then cut into any desired lengths. The end product is a fiber which resembles wool in appearance. By altering the process the fiber can be made with a wide variety of characteristics.

“And so the first of our soybean products—other than the basic products meal and oil—is launched. As fast as conditions permit, others will be put into production.”

Photos show: (1) Robert Boyer, H.R. Drackett, and Bill Atkinson are inspecting a batch of soybean protein which has just been liquefied in a large vat. It will be forced under pressure through hundreds of spinnerettes to emerge ultimately as a fiber. (2) Liquefied soybean protein emerges from the spinnerettes as hundreds of fibers. Mr. Drackett inspects these fibers with tongs as they are being given one of several chemical baths. (3) Mr. Drackett and Mr. Boyer inspect the first batch of fiber produced in the new fiber plant. Behind the two men is a large pile of the white fiber. “Today this fiber, which four years ago was a laboratory curiosity, is finding many commercial uses.” (4) John O’Leary and Fred Wilson are in the laboratory testing the strength of a batch of soybean fiber. (5) Left to right: Roger Drackett (Executive Vice President), H.R. Drackett (President), Arthur H. Boylan (Vice President in Charge of Advertising & Marketing Research), and Robert Boyer (Director of Scientific Research) examine several products [fabrics] made experimentally from the new fiber.

Note: This article seems a bit misleading since it gives the impression that Drackett pioneered in the development of
soy protein fiber. It makes no mention of the following facts:

1938 April–The world’s first soy protein fiber was developed and exhibited by Robert Boyer of the Ford Motor Company at the Fourth Annual Conference of the Farm Chemurgic Council, in Omaha, Nebraska.

1939 May–This fiber was exhibited at the World’s Fair in New York as part of the theme “Textiles from soybean protein.”

1941 Dec.–After several months of operating a pilot plant in Ford’s Highland Park plant, the pilot plant was moved into a separate building and began producing about 1,000 lb/day of soy protein fiber. Many experimental, but no commercial, products were made.

1943 Dec.–The Drackett Co. of Cincinnati, Ohio, purchased the Ford Motor Company’s entire soybean protein operations, including its pilot plant for producing soy protein fiber. Robert Boyer, Bill Atkinson, Fred Wilson, and several others who had developed the product at Ford went to Drackett as part of the deal.

Note that this article, Drackett’s first on the subject, does not even mention Ford, but instead says: “The Drackett Company is a true pioneer in this promising development.”


• Summary: “The commercial production of a new soybean fiber started in Cincinnati on Dec. 2nd in a new plant of the Drackett Co., H.R. Drackett, president, announced last month. This new soybean fiber has yet to be named.” The company plans to increase the capacity of its plant as rapidly as war conditions will permit. A brief description is given of how the fiber is produced.

“The Drackett Company has pioneered in soybean developments. The company’s technologists have made many products experimentally from soybeans including plastics, wallboard and paints. Currently the company produces about 70,000 tons of soybean meal annually, and approximately 30 million pounds of soybean oil.”

Photos show: (1) H.R. Drackett inspecting the new fiber made from soybeans as it emerges from the spinnerettes. (2) H.R. Drackett and Robert Boyer examining the first batch of the new soybean fiber.

Note: This article appears to be based on a similar article published in Drackett’s in-house newsletter The Drackett Dotted Line (5-6 Dec. 1943). It is the earliest article seen in a trade journal stating that Drackett has started commercial production of a new soybean fiber.


• Summary: “The first commercial production of a new fiber made from soybeans started in Cincinnati December 2 in a plant which is expected to be of major postwar importance, H.R. Drackett, president of The Drackett Company, has announced. Less than five years ago, this fiber was a $400.00 a pound laboratory curiosity. Present plans call for marketing it at a price which will permit its widespread use in textiles and fabrics.

“This new soybean fiber, which is so new it has yet to be named, is as warm as wool. It is resilient, strong and durable, and can be made either moisture absorbent or moisture resistant It is not a competitor of any other fiber, Mr. Drackett pointed out, but is an entirely new raw material with a growing field of usefulness. It may be blended with either cotton or wool or it may be woven or spun into fabrics. It has already been made experimentally into such products as blankets, felt hats, underwear, hosiery, suitings and upholstery fabrics. This new product may be so controlled as to build into it various desirable characteristics which enable it to meet a variety of requirements.

“Post-War Plans: ‘We plan to increase the capacity of our soybean fiber plant as rapidly as war conditions will permit,’ Mr. Drackett said. ‘Production will be stepped up as quickly as we can secure new machinery and equipment to carry on additional manufacturing operations. Actually this may be said to be a post-war plant, reflecting our post-war planning. While carrying on commercial manufacturing we will make a continuous technical study of this new fiber and
of new or more efficient manufacturing processes, as well as of potential new uses for the fiber. In this way when the war ends we will be all set to go into large-scale production.'

"Coincident with the opening of the new plant Mr. Drackett and Robert Boyer, the company’s director of research, disclosed for the first time just how this fiber is produced from the versatile soybean:

"Although it has required several years of intensive research and laboratory experiment to develop this process it is relatively simple in actual operation," they explained. "From the soybean we first extract soybean oil. After this is done there remains the soybean meal, which we sell in large quantities for livestock feed. Roughly half of this meal is protein. To manufacture our new fiber we remove the required amounts of protein from the meal. This gives us a powder-like product. Through a special process this is liquefied and converted into a mass with a consistency resembling molasses. This liquid is then forced under pressure through very fine platinum spinnerettes from which it emerges as hundreds of thin filaments. These filaments are then given a number of carefully controlled chemical treatments and baths, during which they are stretched and hardened. Finally the fibers are dried and then cut into any desired lengths.

"The end product is a fiber which resembles wool in appearance. In accomplishing this we have effected a variety of chemical changes. By altering and rearranging the molecules we can secure a product which has a variety of characteristics."

"The Drackett Company first became interested in soybeans about 1936 when, after a long study of this agricultural product, Mr. Drackett believed it had the promise which attended the development of hydrocarbons several decades ago. He felt that once the oil and protein had been taken from the soybean it would be possible to go on to many other products.

"The company’s technologists have made many products experimentally from soybeans including plastics, wallboard and paints.

"Currently the company produces about 70,000 tons of soybean meal annually, and approximately 30 million pounds of soybean oil, which is currently distributed under government allocations."

A large photo shows Robert Boyer (left), director of scientific research, and H.R. Drackett, president of the company, standing by a vat of liquefied soy protein. Bill Atkinson, atop the vat, draws up some of the viscous protein.

24. Soybean Digest. 1944. Grits and flakes... from the industry: The 10th annual Farm Chemurgic Conference will be held at St. Louis [Missouri], March 29-31,... Feb. p. 12.

* Summary: "... with headquarters in Hotel Statler, Managing Director Ernest L. Little has announced. Of special interest to soybeaners will be discussion of the present soybean situation by Lamar Kishlar, president of the Soybean Nutritional Research Council; and the full story about the new soybean fiber by Robert Boyer of the Drackett Co. There will be a session devoted to plastics and one with the theme of chemurgy throughout the world, with representatives from five foreign countries discussing their respective chemurgic problems."


* Summary: "Before the Tenth Annual Chemurgic Conference, St. Louis, Missouri. March 30, 1944.

"In the early days of the Farm Chemurgic Movement, in the days when these annual meetings were held in Dearborn, the subject of the soybean occupied an important place on the programs of the meetings. Although then, the soybean was an infant industry barely out of swaddling clothes, many bold predictions were made forecasting a bright future for it.

"Since then, many world-shaking events have taken place, events that have radically changed our industrial plans and practices. It is satisfying to know, however, that our predictions for the soybean industry made several years ago have withstood the effects of the war and today the soybean industry has fulfilled our early hopes. The war, which has a way of weeding out unimportant industries has clearly established that the soybean is no ‘flash in the pan.’ Few people realize just how much our government is really depending on the soybean and its products today.

"The soybean has always been one of the star performers on the Farm Chemurgic program. For some reason it has had the faculty of attracting the attention and interest of people not ordinarily identified with agriculture. Many of these people have been scientists and industrialists and their work and interest has led to many unusual developments and to wide publicity. Although much of this publicity has been of the ‘hot air’ type, it nevertheless has managed to create a tremendous amount of interest in the soybean on the part of the general public and today the story of the soybean is well known. It is difficult now to pick up a popular magazine and not find some article in it about the soybean.

"In spite of all this publicity, I feel that the real story of the soybean is yet to be told. Although there is no doubt as to its importance and value today; when developments now going forward have finally reached the productive stage the present role of the soybean will seem insignificant before its performance of tomorrow.

"This future which I speak about, involves the use of protein which we find so abundantly in the soybean. As some of you may know, the soybean consists of about 40% protein and it is this protein which has excited the imaginations of many of our scientists. To the average person the term ‘protein’ means very little and therefore it is rather difficult to talk about its uses in the chemurgic program when most..."
of us would prefer to deal with the subject in the form of a tender T-bone steak. However, I am going to attempt to explain in a simple way how we are attacking this protein problem in our laboratories.

“In order to provide a better background for this discussion, I should like to review for a moment the chemurgic program as a whole. In general, it can be said that the products of a farm can be divided into three main groups. These groups would be carbohydrate, fats, and proteins. Now, of course, the greatest market for these groups is food and during war times that is the job which is taxing our farm production capacity to its limit. During peacetime, however, we found that due to increasingly efficient methods, our farms could produce more food than we could consume, consequently we saw several years where large surpluses of farm products threatened to bog down the farmer’s economic position. This condition was one of the contributing factors that led us to the founding of the Farm Chemurgy movement of sponsoring the development of new uses for farm crops.

“This work has been very successful in the carbohydrate and groups. Today we find tremendous industries based on the industrial utilization of carbohydrates such as alcohol from starch and sugars, and rayons from cellulose. In the fat group we find paints, linoleums, explosives, waxes, and a list too long to go into here. But when we review the protein field, we find industrial utilization lagging far behind the other two. Although it is true that we have packing house byproducts of a protein nature which go into adhesives, textile sizings and printing rolls, and milk casein used in the paper coating, plywood adhesive, and fiber fields, the tonnage and value of this protein industry is small when compared to the carbohydrate and fat industries.

“There are several reasons why proteins have lagged behind other farm materials in their industrial development. One of these reasons is their high cost. Until the advent of large scale soybean production we were dependent upon animal sources for our concentrated protein products. As we all know, the animal is an inefficient converter of his food and this has resulted in high cost for our concentrated protein products. Further, these animal concentrates are usually in a moist and unstable form. In order to be stored they must be retained under expensive refrigerated conditions. They are so awkward and difficult to handle that they have seldom been considered as a practical raw material for any industrial operation. The coming of the soybean makes possible a new attitude and approach. Soybean protein can be produced economically and at the present rate of growth of the crop we might say that the supply is almost unlimited. The protein is in a very convenient form to handle, it can be extracted, stored, shipped and produced at will without employing any expensive methods. Because this is a relatively recent condition, science and industry as a whole are not aware of this new potential raw material.

“Already soybean protein has become well established in many interesting uses. Take the case of water paints. Here is an industry that has come to the front during the war and is enjoying a phenomenal success today. These paints consist of an oil and water emulsion generally using a protein as the emulsifying agent as well as a binder. Soybean protein and milk casein are the two possibilities here but casein has suffered from scarcities the same as other animal proteins and so soybean protein is rapidly becoming well established in the paint industry. Paper coating, adhesives, and foaming agents are other uses consuming important quantities of soybean protein today. While the total tonnage of all these uses is respectable it will be a ‘drop in the bucket’ compared to future consumption figures.

“There is another reason and perhaps this is the most important one for the lack of protein development and that is the complexity of the material. Protein is one of the most complicated substances we find in nature and science is only just now developing technology which enable us to intelligently attack the problem. Protein has one of the largest and most complex molecules we find in nature and we are just beginning to understand something about the size and shape of them. Today science is rapidly developing the art of a molecular manipulation. Our synthetic rubber industry and the plastic industry are based largely on the technique of ‘polymerization’ which is the building up of large molecules from small ones. Instead of working with molecules consisting of weights ranging up to 20,000. Man’s effort, however, still is puny compared to nature’s work with the protein molecule. We have reason to believe some forms of protein, among them soybean, are many times larger than any that man has made. Some of the estimates today of the molecular weights of these proteins go up into the millions.

“These tremendous molecules are fashioned by nature into the many wonderful beings and shapes of the animal world, which number well above one quarter of a million. These biologic organisms are creatures built up of protein molecules by nature’s secret methods which so far have been unsolved by man. Now, having for the first time a large potential supply of these wonderful molecules in a practical form scientists can start to apply their newly acquired polymerizing techniques on them and we can predict a bright future for this type of research work” (Continued). Address: Research Div. The Drackett Co., Cincinnati, Ohio.

• Summary: (Continued): “To become more specific, let us consider the development of a fiber from soybean protein which we are undertaking in our own laboratories. Several years ago when we realized that we had available this large supply of protein in the soybean we began to search for ways and means of utilizing it in uses other than food. In
surveying man’s requirements of non-food proteins we found that protein fibers, wool and silk, form the largest and most important uses. It was obvious therefore, that it would be a desirable development to produce the fiber directly from soybean protein rather than put it through the inefficient digestive system of an animal and recovering it in the form of wool. It soon became apparent that we would have to solve some of the problems of manipulating these large molecules both chemically and mechanically. We call this molecular orientation.

“Orientation is a difficult thing to describe or explain but I am going to attempt it by using a simple analogy. I have here in my hand a device which we all know of as a zipper. It is a device which has become very important in our everyday lives and one which is entirely dependent on orientation. If I should take this zipper apart and separate each little hook one from the other, until I had a pile of them which I could hold in my hand, I would have what appeared to be a useless pile of little sticks with a slight hook at one end. In order to assemble a useful piece of mechanism out of these little sticks, it is necessary to arrange them or to orient them as we would say in chemistry, into their proper position to each other so that each hook end could engage the other at just the right time and place. Without this orientation we have nothing of value; with it we have a device so important that much of our war equipment would be seriously handicapped with out it today. Orientation is the key to the whole thing and so it is with our work in protein molecules. I have here in my hand a bottle full of soybean protein molecules. In this form they are quite useless to us but as soon as we arrange each molecule and put it in its proper position we achieve a fiber which is totally different from the form of the original molecules. This fiber is the result of both chemical and mechanical manipulation or orientation of the large soybean protein molecules; and it is convincing evidence that we are beginning to understand the intricacies of protein chemistry. That is the basis for my earlier statement that its most important contribution to the Farm Chemurgic Program will be its pioneering effect on other organizations. While we think that the development of the soybean protein the reverse is true and that when a proper orientation is achieved we shall be limited not only to fiber but films and three dimensional structures which lead into the field of leather, rubber, and plastics will be made.

“When all these possibilities are considered the basis for my statement that the story of the soybean waits the development pending laboratory work becomes apparent. While we think that the development of the soybean fiber is important and will grow into an important industry, it may be that its most important contribution to the Farm Chemurgic Program will be its pioneering effect on other organizations. As is very often the case, one successful development attracts and inspires others in the same field and this field of protein chemistry which has so long been neglected by scientists will be brought into the limelight as one of the most important fields in the scientific frontier.”


“In December 1943, H.R. Drackett, president of the
Drackett Company announced that his company had acquired from the Ford Motor Co. their soybean process including the equipment of the pilot plant and personnel. Robert Boyer, who was chief research chemist of the Ford Motor Co., has joined the Drackett Company in the capacity of Director of Research. The commercial production of the new soybean fiber started in Cincinnati on December 2, 1943, in the new plant of the Drackett Company. This company has pioneered in soybean development and originally supplied the Ford Motor Co. with the soybean protein ‘alysol.’”

“In its general appearance such as lustre, touch, and crimp, it [The Drackett soy protein fiber] very closely resembles rayon staple fiber, but it has a poor light tan color... In the dry state the soybean fiber is approximately 45 per cent weaker than a corresponding grade of wool and 76 per cent weaker in the wet state than a corresponding grade of wool...

“In its present form, soybean fiber still has a low tensile strength, especially when wet. The only improvement which can be noted over the 1939 product, is its higher resistance to alkali, but in achieving this, part of its resistance to acid was sacrificed. The fiber, in its present form, may be suitable for blends with rayon and cotton, but certainly not with wool.”

Address: Director of Research Labs., Forstmann Woolen Mills.


• Summary: “Once again the Sharon Plant will increase its capacity and production, at the request of the Commodity Credit Corporation and the War Food Administration, Governmental War agencies.

“This newest expansion, the second since the plant was completed, will represent three times the originally scheduled production capacity. The plant will be equipped to process 12,000 bushels, or 7 carloads, of beans per three-shift day, and to produce 300 tons of meal and 60 tons of oil every twenty-four hours.

“More Post-War Jobs: ‘Although the planned increase represents mostly the installation of additional equipment,’ said Roger Drackett, Executive Vice-President, ‘it will mean additional jobs both now and after the war. In effect,’ he continued, ‘part of our post-war program is now being accomplished.’ In citing the essential nature of the soybean operation, attention was called to the fact that our first application to the War Production Board for the original expansion was in process 26 weeks, whereas the present application was approved inside 8 weeks.

“Fiber and Plastics Production: Also significant is that these additions to the plant are not planned as mere temporary war-time expediencies. The probabilities are that with the return of peace, the production now used entirely for food will be channeled into the manufacture of fiber, plastics, and the many other by-products which the Research Laboratory is now developing.”


• Summary: “An artificial fiber, with many of the best characteristics of wool, is now being made commercially from soybean protein” by The Drackett Co. A detailed description of the process is given.

Photos show: (1) Robert Boyer, director of scientific research at The Drackett Co. in Cincinnati, H.R. Drackett, president, and Bill Atkinson (atop the tank) inspecting a batch of liquefied soy protein that can be spun to make Soybean Azlon fibers. (2) John O’Leary and Fred Wilson testing soybean fibers in a corner of the laboratory. (3) Soybean fibers emerging from tiny holes in spinnerettes into an acid precipitating bath. The filaments are stretched as they are collected on bobbins or spools. The fiber is then set by long immersion in a formaldehyde bath. After being dried, it is cut into desired lengths. Address: President, The Drackett Co, Cincinnati, Ohio.


• Summary: “Our soybean production is now the largest of any nation. Whether this production will drop back to one hundred million bushels annually, remain about the same, or increase another one hundred million bushels, is the question. It all depends on the price offered the American farmer. As long as he can get a per bushel price as good in comparison to prices of corn, oats and wheat as he is getting today, you can look for no decrease in our soybean acreage. It would be, in my opinion, the height of folly to venture even a guess as to what the price might be a few years after our wars are over.

“The world is overflowing with vegetable oils of low production cost ready to pour into our country just as soon as ships are ready and available for such use. What about the postwar tariffs? Will markets for fats and oils be developed abroad? Will renewed imports of vegetable oils lessen the demand for soy oil? Will proteins, other than those derived from the soybean, depress the price of the soybean when we have fewer animals to be fed?

“These are some of the factors which will determine our production in the postwar years. Of one thing we can be certain—progress will be made in securing better yielding varieties, in more efficient methods of removing the oil from the bean, and in developing many new uses for various bean products. Of the newer varieties, we should consider the Earlyana and the Lincoln—both discovered and developed by Cornbelt agricultural colleges, and experiment stations.

“The Earlyana is a new variety released by Purdue in
1943. It is one of the earliest varieties of satisfactory oil content recommended for northern Indiana and northwestern Ohio, being 5 to 7 days earlier than the Richland. It is taller than the Richland, does not set beans so close to the ground and will out-yield the Richland on lighter soils.

“The Richland will continue to be a popular early variety on very fertile soils in northern Ohio and Indiana, but it is expected that the Earlyana will largely replace the various other early varieties, on all lighter soils.

“The Earlyana will give growers wanting to follow soybeans with wheat, ample opportunity in the shorter season areas to get wheat in the ground by fly-free date or soon after and will yield within 2 to 4 bushels of the midseason varieties such as Dunfield, Illini, Manchu and Mandell, which mature 10 days to 2 weeks later than the Earlyana and are generally too late for wheat seeding. These early varieties will mature when planted later than the midseason varieties can safely be planted.

“No Earlyana seed was available for general use in 1944, but there will be quite a little for 1945 and probably plenty for 1946.

“Lincoln variety: The Lincoln soybean is the most outstanding of all soybean varieties yet introduced. It is a product and development, primarily of the Illinois Experiment Station and the Illinois College of Agriculture. We Ohioans wish we might claim some credit, yet we are forced to admit that we never saw it until 1939. The Lincoln has been tested for the past 6 years in 82 cooperative tests throughout the soybean belt. Ohio, Indiana, Illinois, Iowa, Missouri and Nebraska cooperated with the U.S. Regional Soybean Laboratory in these tests. The Lincoln has averaged 4 to 6 bushels, or 20 percent higher yield in these tests than such other standard midseason varieties as Dunfield, Illini, Mingo, Mandell and Scioto. Lincoln should now replace all of these varieties including the various strains of Manchu. It also lodged less, had better quality seed, matured at about the same time as the Dunfield and Illini and averaged 8 percent more oil with a higher iodine number. In regional tests in the above states it yielded 5.9 bushels more than Mandell and contained 2.3 percent more oil. With these definite figures of superiority, it is reasonable to state that the grower, who has Lincoln seed for his soybean acreage, can cut his production costs 25 percent. That is, if it costs him $1.00 to grow 1 bushel of Dunfield, he can grow a bushel of Lincoln for 75¢ which is a material saving in anybody’s business.

“There was no Lincoln seed available for 1944 except to growers who have agreed to increase it for seed purposes only. Considerable seed will be available for 1945 and enough for everyone, we hope, by 1946. Along the line of new uses, we may also expect many new chemurgic developments which, in the aggregates will require an increasing percentage of our soybean production.

“Last February in Columbus we had a two-day meeting sponsored by the National Forecast Council of the Ohio Development and Publicity Commission. A number of outstanding men made very wonderful talks relative to what the postwar years had in store for us. One of these talks was of especial interest to me. It was made by Robert A. Boyer, formerly of Ford Motor Co. and now with The Drackett Co.—you all know him. Mr. Boyer, as a research man, tried to pass on to his listeners some of his enthusiasm for the future of the soybean, along with some practical reasons for his enthusiasm. I am going to attempt to give you sort of a brief of a portion of Mr. Boyer’s talk.

“Mr. Boyer said that in spite of the large amount of publicity given the soybean oil and the use of the residue meal, containing the high percent of protein, the most promising and interesting part of the story has not been told.

“In our childhood days we learned to classify objects and materials in the so-called ‘Animal, Mineral or Vegetable Kingdoms.’

“It is with the mineral group that we, as a people, have reached our highest degree of achievement. As we think of this accomplishment, we must acknowledge that the mineral deposits of the earth’s surface have been pretty well discovered and probably are on the way to exhaustion. Sooner or later we are going to have to obtain our mineral supplies from more distant and remote points, or from materials bearing a smaller percentage of the desired elements. Costs will go up. Some nations will not have desirable supplies of necessary minerals.

“Let us consider the vegetable world. Man’s accomplishment in this kingdom is not impressive. There are over 250,000 species of plants already identified by botanists. Of this number we make use of less than 1 percent, and this 1 percent includes our agricultural industry.

“In this vegetable world we find an awful lot of what our scientists call cellulose. The wood from the trees, the stalks and leaves of all plants and crops are mainly cellulose. Today we have vast industries in lumber, cotton, rayon and plastics, all products of a certain type of mechanical manipulation of cellulose. The vegetable world will repeat itself year after year. The science of farming today is, in part, simply a method of controlled production of a very few vegetable plants. Nature really does the job. She gives us an inexhaustible supply, a definite advantage over the limited minerals.

“In the plants, the seed is the only part in which we find any quantity of fats and protein. As I said before, the stems and leaves are cellulose.

“Highest form: The animal kingdom represents nature in its highest and most complex form. In the animal kingdom protein plays the same role as cellulose in the vegetable kingdom. Protein is the essential and all important element in every moving thing and living creature on this earth. But when we look for important industries other than food based on protein to compare with the cellulose developments of the vegetable world, we find none.
“Here is where the soybean comes into the picture. This new chemurgic crop makes available to industry for the first time an almost unlimited supply of low cost protein that can be easily stored, handled and extracted in a pure form.

“A few years ago, when it was first realized that such an inexhaustible supply of low cost protein could be secured from the soybean, our research laboratories, which were devoted to this type of experimentation, immediately started a program to convert the protein directly from the soybean into fiber instead of feeding it to the sheep and harvesting the wool from the sheep. These research men, after many years of tireless work, are able today to produce a useful fiber directly from the soybean. Although they feel that their present results are crude in comparison to what they will develop within a few years, their present product indicates, positively, that they are on the right track. It requires the produce of 1 acre of land to support 1 sheep for 1 year to produce 8 pounds of wool. If the acre of land is used for the production of soybeans, the scientist can produce 200 pounds of soybean fiber.

“All other fibers produced from the vegetable world, such as cotton, flax, hemp, are composed of cellulose. All fibers produced by the animal kingdom are composed of protein. In spite of the fact that many of the cellulose fibers are cheaper and sometimes stronger, man is still dependent on the protein fibers, such as wool, for all uses which require warmth, resilience and the ability to retain a desired or given shape. And so we have the protein fiber made directly from the vegetable world. It is but the start of a new industry which can be highly important and far reaching in its effects. A new use for the soybean, which at present is profitably utilizing 14 million of our American farm acres.

“We will all agree that the soybean is a desirable crop from the farmers’ standpoint, if and when the unit price is sufficient to give the farmer some money advantage over other crops. Since laws already passed provide for a floor on farm products, for 2 years after our wars are over, of 90 percent parity, it is certain, in my opinion, that we will have for each of the next 2 years an acreage planted little less than the 14 million we have in 1944.

“From 1946 on I am most optimistic. I have the greatest of confidence in the soybean and in the men behind the soybean industry. I have been intimately associated with both for many years. Difficulties have been met and overcome in the past, and difficulties will be met and overcome in the future. You, my readers, have a similar feeling.”

A portrait photo shows G.G. McIlroy. Address: Director, National Farm Chemurgic Council; President, Farm Management, Inc., Irwin, Ohio. A former president of the American Soybean Assoc.


Article IX, Committees, lists and describes each.


Note: This is the earliest document seen (March 2008) that uses the name “North Iowa Cooperative Processing Association.” The word “Cooperative” is spelled without a hyphen. Address: 3818 Board of Trade Building, Chicago 4, Illinois.

Executive of Products Co., sells the products made by its parent. Address: 

Co. is a manufacturing company; its subsidiary, The Drackett early 1934, passed Drano in sales in mid-1944. The Drackett equipment at the Sharon Plant.

Two large photos show the soybean processing on 5½ acres in northern Cincinnati. The plants are about 7 miles apart. Two large photos show the soybean processing equipment at the Sharon Plant.

The company has 2 plants: The Sharon Plant, which is used solely for processing soybeans, is located on 75 acres 25 miles east of the Cincinnati business district; Construction is now underway of a protein extraction plant which will be in operation early in 1945. Most of the Sharon buildings were erected from 1939 to 1941. Access is by both rail and truck. The Spring Grove Plant (built in 1917-18) is located on 5½ acres in northern Cincinnati. The plants are about 7 miles apart. Two large photos show the soybean processing equipment at the Sharon Plant.

The company has two major consumer products—Windex and Drano—which it advertises extensively in the media. A graph (p. 21) shows that Windex, introduced in early 1934, passed Drano in sales in mid-1944. The Drackett Co. is a manufacturing company; its subsidiary, The Drackett Products Co., sells the products made by its parent. Address: Executive offices: 5020 Spring Grove Ave., Cincinnati, Ohio.

Sales rose 57% over the previous year to $9,084,838. Net earnings (profits) rose 8% to $353,178. A large portrait photo (p. 4) shows H.R. Drackett.

“Organizing for the future: Scientific research and engineering. “When, in 1934, the management envisioned an attractive future for products from the soybean, the first step was expansion of its research staff. This program brought in specialists in the fields of vegetable oils, plastics, adhesives, proteins, textile fibers, sizings, paints, nutrition, and others.” A photo (p. 10) shows a man “Determining the flow characteristics of an experimental run of high-impact phenolic molding compound. The Drackett plastics laboratory has perfected a high impact molding material that produces molded parts with new and desirable characteristics [Note: These plastics contain soy protein.] A photo (p. 12) shows another man, with skeins of soybean fiber on a table, “gauging the denier (diameter) of soybean protein textile fiber. This fiber is made in a wide variety of sizes and in any required length. It also is made with different characteristics for use in different textiles such as felts, knitted goods, upholstery, etc.

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ANNUAL REPORT

1944

THE DRACKETT CO • CINCINNATI, OHIO
ANNUAL REPORT
THE DRACTETT COMPANY
FOR THE FISCAL YEAR ENDING SEPTEMBER 30th — 1944

Executive Offices — 5020 Spring Grove Avenue
Cincinnati, Ohio
Plants at Cincinnati and Sharonville, Ohio


Fremont: Pete Marr Soybean Processing Company (S). Omaha: Allied Mills, Inc. (M).


Tennessee: Memphis: Buckeye Cotton Oil Company (M).


“Wisconsin: Milwaukee: Archer-Daniels-Midland Company (M).” Address: 1. Principal Chemist, Southern Regional Research Lab., New Orleans; Northern Regional Research Lab.; 2. Senior Chemical Engineer, Northern Regional Research Lab., Peoria, Illinois.


Date of Introduction: 1944? 

New Product–Documentation: The Drackett Products Co. 1944? “Drackett Proteins.” This undated, 44-page, spiral-bound catalog describes the three types of industrial isolated soybean proteins made by The Drackett Co. and sold by The Drackett Products Co. in about 1945–Drackett Protein 110, Protein 112, and Protein 220. The first two were low-viscosity proteins of low molecular weight used in paper coatings and sizings. Drackett Protein 220 was used very widely in water-based paints.

Talk with Charles Butke, formerly with The Drackett Co. 1993. April 15. Charles had a booklet (which he recently sent to Bob Griffin at Drackett) that described the two types of industrial soy proteins made and sold by Drackett when he arrived in 1945–Protein 120 and Protein 220. One was used very widely in water-based paints and the other was used in paper sizings and coatings. A man named Sam Wise (now deceased) held one of the original patents for making water-based paints. Mr. Drackett sold that patent to a big paint company so that they could get into the water-based paint business.


• Summary: This catalog describes the various types of industrial soy proteins made and sold by The Drackett Co. in about 1945–Drackett Protein 110, Protein 112, and Protein 220. The first two are “high-purity isolated soybean proteins of low molecular weight and size,” Low in viscosity, they are used in paper coatings and sizings.

Drackett Protein 220 was used very widely in water-based paints. Address: Cincinnati, Ohio.


• Summary: See next 3 pages, Sales rose 42% over the previous year to $12,929,090. Net earnings (profits) rose 16% to $409,342. A photo (p. 2) shows a “new protein extraction plant” under construction at the site of the present Sharon Plant. It is expected to go into production in mid-1946.

An illustration (p. 3) shows an “Architect’s drawing of the new soybean storage elevator [with 18 tall concrete silos for storing the soybeans], expected to be ready for use by July 1946. It will tower high over all other structures, even the water tank, at the Sharon Plant.”

Page 11: “What’s Ahead for Soybean Products: Soybean oil and oil meal. Will continue through 1946 as critically short items. Under government directive, the oil must be utilized for human food and the meal for stock foods. The expansion of our extraction facilities, announced in last year’s report, has been accomplished, increasing our former capacity by fifty percent. Despite this and several other new extraction units in the industry, the demand for meal and oil is still far in excess of supply. Findings of the Department of Agriculture, other governmental agencies and our own market analyses indicate that this situation will continue for some time to come.

“When the world food situation eases, we will be able to direct a portion of our production of meal and oil to industrial uses. This was an important market for these materials before the war.

New Storage for Soybeans: To improve our program of procurement of soybeans, we have under construction a new warehouse elevator which will double the storage capacity at our Sharon Plant. The facilities will be such as to handle soybeans as rapidly as they are harvested in the fall season.
Some of the items for which our molding compounds have been tested and found suitable:

1. Naval gunsight housing.
2. Hand wheel for machine tool.
3. Watch makers tray.
4. Adding machine housing.
5. Breaker box for electrical switch.
6. Heavy duty part used in electrical installations.

Parts molded of Drackett material by:
Square D Company, Peru, Indiana.
Recto Molded Products Company, Cincinnati, Ohio.
Dress materials are a blend of our soybean textile fiber and rayon. The soybean fiber imparts a desirable drape and feel to the fabric. A limited quantity of this material and other blends containing soybean fiber should be available for marketing sometime in 1946.
Mixing the "spinning solution" for textile fiber in the pilot operation at the Spring Grove Plant. Expanded facilities being constructed at the Sharon plant location are expected to be ready in 1946.
by farmers and shipped to us by country shippers.

A large photo on the bottom half of the page shows:
“A section of the new soybean extraction unit completed in 1945.”

Page 12: A full-page photo shows some of the items for which our molding compounds have been tested and found suitable. 1. Vaval gunsight housing. 2. Hand wheel for machine tool. 3. Watch makers tray. 4. Adding machine housing. 5. Breaker box for electrical switch. 6. Heavy duty part used in electrical installations. These parts are molded of Drackett material by four different plastic molding companies.

Note: Henry Ford made similar molded parts for his cars before the war. A major ingredient was soy protein.

Page 13: “Impact Plastic Molding Compounds.” “So far, our plastics have been produced in a small pilot plant and these are not usually profitable operations. A new plant of commercial capacity is now being designed, which will give us both the volume and the efficiency to make this a profitable operation.”

A 2-page spread is devoted to Drackett’s “Textile Fibre.” A full-page black-and-white photo shows 3 stylish ladies sipping tea. The caption reads: “Dress materials are a blend of our soybean textile fiber and rayon. The soybean fiber imparts a desirable feel and drape to the fabric. A limited quantity of this material and other blends containing soybean fiber should be available for marketing sometime in 1946.”

“The new plant, now being equipped, will begin operations in 1946... There is reason to expect that during 1946, this product will begin to pay dividends on the investment we have made in research and development work.”

“Industrial Proteins: For several years, the Company has, in a small pilot plant, manufactured a variety of proteins for use in such products as paints, adhesives, textile sizes and finishes, and polishes. Research work has been continuous on proteins since 1938. Long before the war’s end, the engineering planning of a protein extraction plant was well under way. The plant is now under construction and is expected to be in operation during 1946.

“We have supplied a small group of companies in different fields with proteins from our pilot plant for several years. These contacts have enabled us to observe our material in use and helped us tailor it to fit the needs of industry.

“There are many sources of protein such as milk (casein), meat scraps, corn, peanuts, even chicken feathers. The soybean is one of the lowest cost sources. It has the further advantage of being readily available in adequate quantity and not subject to wide price fluctuations. The potential market for soybean proteins would seem to offer great opportunity for expansion in future years.”

A photo (p. 27) shows a man holding a drizzling spatula over a swirling vat of black dope. The caption reads: “Mixing the ‘spinning solution’ for textile fiber in the pilot operation at the Spring Grove Plant. Expanded facilities being constructed at the Sharon Plant are expected to be ready in 1946.” Address: Executive offices: 5020 Spring Grove Ave., Cincinnati, Ohio.


• Summary: This historic meeting—the first ever to discuss the flavor stability of soybean oil—is held under the auspices of the Soybean Research Council, National Soybean Processors Association.

In his introductory remarks (p. 2-3), Edward J. Dies, chairman of the board, National Soybean Processors Association, Edward J. Dies, described the purpose of the meeting and made a plea for a joint effort: “I cannot too strongly emphasize the economic advantages of a rapid solution of the problem of flavor stability in soybean oil and soybean oil products. This is essential as a means of increasing the nation’s supply of high grade edible fats. Solution of this problem also should ultimately lower the average cost to the consuming public by reason of greater ease in handling by the various manufacturing units involved.”

“This meeting today was a deliberate move to bring together the best research minds in the nation who are engaged in work on this subject. The basic hope has been that we might be able to facilitate a free exchange of ideas and subsequently promote special collaboration among the workers engaged in this field. It is my humble opinion that the success of the conference will depend upon the degree to which those present are willing to exchange knowledge and viewpoints on this subject which would prove of benefit to all, and, moreover, to the extent that the several laboratories engaged in research on the problem are willing to cooperate.”

“Any advantage to an individual or a corporation in attaining a solution before the answer were generally known generally would be of only temporary and transitory value. It would appear to be a problem of general interest, and one whose solution could be brought about speedily through the composite talents of the group, and by reason of free and open exchange of ideas and recommendations.”

The 28 attendees, listed alphabetically, included: O.H. Alderks (The Procter and Gamble Co.), H.C. Black (Swift and Co.), R.A. Boyer (The Drackett Co.), G.N. Bruce (Durkee Famous Foods), John C. Cowan (Northern Regional Research Lab.), B.F. Daubert (Univ. of Pittsburgh), Edward J. Dies (National Soybean Processors Assoc.), Maurice Durkee (A.E. Staley Mfg. Co.), Herbert J. Dutton (Northern Regional Research Lab.), Egbert Freyer (Spencer Kellogg and Sons, Inc.), Calvin Golumbic (Univ. of Pittsburgh), Warren Goss (Northern Regional Research Lab.), Arne Gudheim (Lever Brothers), J.K. Gunther (Central Soya
at which papers were presented concerning “flavor stability in soybean oil” by leading researchers in the field. An open discussion followed each paper. These conferences were important in solving the problem of off-flavors in soybean oil, which was generally considered the biggest problem facing this oil and the industry that made it. Great progress was made during these 12 years and, largely as a result, soy oil came to be the leading edible oil in the USA. Address: [3818 Board of Trade Building, Chicago, Illinois].


**Summary:** This article is about the 3-day meeting of the American Soybean Association in St. Louis, Missouri. The soybean industry thrived during the depression, more than doubled in size during World War II, and is now continuing to grow. The A.E. Staley Manufacturing Co., America’s largest soybean processor, has just started construction of a new $1 million plant that will turn soybeans into monosodium glutamate (MSG), making one million pounds a year. MSG has been previously made on a small scale in the USA from wheat, but Staley’s plant will be the first to make it on a large scale from soybeans.

The Drackett Co. in Cincinnati is putting the finishing touches on a commercial plant that will make a wool-like fibre from soybeans. Robert A. Boyer, the firm’s research director, said the new fibre will be used mostly for blending with rayon. He thinks it may sell for less than wool.

ADM, one of America’s four largest soybean processors, earlier this year completed a plant to make a “whipping agent” from the versatile soybean; it can replace egg albumin, which is much more expensive.

Dr. Harry W. Miller, president of the International Nutrition Laboratory (Mt. Vernon, Ohio), “started making soybean products in Shanghai, China, in 1935. Bombed out in 1937 by the Nips [Nipponese = Japanese], he came to this country and began making similar products here in 1939. Now his firm does a $500,000 a year business and could do a lot more if sugar and other ingredients used with soybeans were available.” His most popular items are [soy] milk, cutlets, and canned green soybeans. He says the milk tastes “rather like malted milk and is especially good for infants and others allergic to animal milk. His company has also developed a cheese made from soymilk [tofu], a prepared mix for ice cream from the soymilk, and “albumen sheets” [yuba], which are very popular in China.

These sheets aren’t much thicker than a piece of paper and are used in China to make the layers of a loaf filled with mushrooms. The Chinese also use soybeans [yuba] to make products that taste like both fish and chicken. In American kitchens, an excellent substitute for butter can be made “by combining soya oil, soya milk,” carotene oil for color, and

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One big American breakfast cereal maker is said to be planning to introduce a "soya flake cereal soon, similar in appearance to cornflakes. Another may soon market a puffed soyabean cereal, a third may introduce a cooked cereal made from soybeans, oats and wheat."

During the past few years, soybean processors have been switching to the solvent extraction systems, from the expeller system, for obtaining oil from soybeans. Most newer plants use hexane solvent. The advantage of the solvent system is that it removes all but about half of one percent of the oil, compared with 3½% to 5% left in the meal when expellers are used. The meal currently sells for 3 cents/lb compared with 11.75 cents/lb for the oil.

NRRL has recently developed a process that uses alcohol instead of hexane. This yields superior "soyflour." Before the war, production of soyflour was 25 million lb/year; this year it is expected to top 400 million lb. Roth Products Corp. of Chicago has already used 6 million pounds of soyflour this year in its dehydrated soups, baked goods, pancake flour mixes, and sausage filler.

The soybean industry (especially the NRRL) is also working to make soybean oil more stable. It "has a tendency to develop a grassy or painty flavor on standing." A process obtained from Germany "goes a long way toward preventing the development of these objectionable flavors."

The Lincoln soybean variety, developed at the U.S. [Regional] Soybean Laboratory at Urbana, Illinois, and first made available to farmers during the war, is playing a major role in increasing yields. Today farmers in the corn belt are getting 25-30 bushels/acre with Lincoln, compared with only 15-16 bushels/acre in the early 1920s with varieties then available. Moreover, today's soybeans contain 20-21% oil compared with only 15-17% about 20-25 years ago.

Drackett has developed the following soybean products:

**Precision Process Soybean Oil Meal, AAA-1 Soybean Oil, Industrial Proteins, Plastic Molding Compounds, and Azlon Fiber. Address: 5020 Spring Grove Ave., Cincinnati, Ohio. Phone: Kirby 6670-7988.**

41. **Product Name:** Ortho Protein. Renamed Drackett Industrial Protein by 1950.

**Manufacturer’s Name:** Drackett Company (The).

**Manufacturer’s Address:** Executive offices: 5020 Spring Grove Ave., Cincinnati, Ohio. Factory: 2781 E. Sharon Rd., Sharonville, Ohio. Phone: Kirby 6670-7988.

**Date of Introduction:** 1946 September.

**New Product–Documentation:** Drackett Annual Report. 1946. This product can be used to replace casein. A 2-page spread features Ortho Protein. “Our production and sale of protein have increased steadily during the past year and are expected to attain real importance in 1947. The new protein extraction plant will operate on a continuous process, 24 hours a day... Buttons, wall paper and glazed wrapping paper are a few of the products in which Ortho Protein is used.”

Business Week. 1948. May 8. p. 32. “Drackett’s stake in soybeans,” Ortho Protein is an industrial soy protein, which “acts as an emulsifier, an adhesive, and a dispersion agent. It is used in paper coatings, plywood, textile finishes, and as a base for water-mixed paints.”


- **Summary:** “Impressive evidence of a thriving sideline is the battery of 18 new silos under construction at Sharonville, Ohio, where Drackett Co. plans to house a million bushels of soybeans from this fall’s crop. Drackett, manufacturer of the chemical cleaner Drano, branched out in 1937 into the promising soy field. Its new $500,000 construction project will expedite the program for converting the beans into meal, oil, protein, textiles, plastics.” A photo shows the new silos.

43. **Soybean Digest.** 1946. Grits and flakes... from the world of soy: The Drackett Co., Cincinnati, has under way in Sharon, Ohio, construction of a $500,000 plant... Oct. p. 22.

- **Summary:** "... to handle about 1 million bushels of soybeans a year."

Note: The Drackett Co. may have been a soybean crusher since late 1941. At least they were a member of the National Soybean Processors Association at that time.


- **Summary:** McMillen, an outstanding popular writer with a solid knowledge of the history of the chemurgic movement, gives here the single best account ever written. Contains extensive information on the role of soybeans in the chemurgic movement.

“Chemurgy may be accurately defined as a concept devoted to advancing, through applied science, the development of new industrial uses for farm-grown crops, and the establishment of new farm crops. Chemurgy is exclusively concerned with the vegetable kingdom (which reproduces itself), and not with the mineral world (which
Exhibits included foods, paints, wallpaper, soap, was pitch and varnish made from soybean oil. The interior was adorned with material manufactured from the soybean. Exhibits included foods, paints, wallpaper, soap, was pitch and varnish made from soybean oil. The interior was adorned with material manufactured from the soybean.

Chapter VII, titled “Soybeans: A new crop that has arrived” (p. 90-110) gives an excellent overview, discussing: soybean foam that extinguished fires on ships during World War II; Mr. Russell G. East of the Pennsylvania Railroad; I.F. Laucks who developed soybean glue for the young plywood industry in the Pacific Northwest; Robert Boyer, Henry Ford, The Drackett Co. and soybean fiber; and soybean plastics. “While their individual stories are infinitely more fascinating, the non-food uses of soybean meal so far have probably not exceeded five percent of the total production.”

Concerning Russell G. East (p. 91): “It was Mr. East who, as general agricultural agent of the Pennsylvania Railroad, conceived and executed in the late thirties an educational dramatization of soybean progress. He persuaded the railroad to build and exhibit over its lines a soybean exhibit car. The car ran on wheels which were cast with the aid of soy protein and oil used in the foundry cores. Inside and out, ‘from rails to roofs,’ it was adorned with paint and varnish made from soybean oil. The interior finish was plywood put together with soybean glue. The car was filled with material manufactured from the soybean. Exhibits included foods, paints, wallpaper, soap, flyspray, automobile parts, linoleum, explosives and livestock feeds, among other soybean products. The car paid off, incidentally, by stimulating farmers’ desire to produce the crop. In subsequent years the railroad hauled more soybeans as freight and took more goods back to the farm towns to be sold for soybean money. Other railroads borrowed the car for display later on their own lines. During 17,643 miles of travel through eighteen states 198,286 people inspected the exhibits.”


**45. Product Name:** Impact Plastic Molding Compounds.  
**Manufacturer’s Name:** Drackett Company (The).  
**Manufacturer’s Address:** Executive offices: 5020 Spring Grove Ave., Cincinnati, Ohio. Factory: 2781 E. Sharon Rd., Sharonville, Ohio. Phone: Kirby 6670-7988.  
**Date of Introduction:** 1946.  
**New Product–Documentation:** Drackett Annual Report.

Drackett Annual Report. 1949. p. 4. “Research, new products and product development: Changing market conditions caused several changes in our plans as laid down a year ago. One such change was the withdrawal from our plastics development. We originally entered the plastics field to provide an outlet for a soybean raw material. As our laboratory developed the formula and process we found that less and less of soybean raw materials was necessary until the amount became insignificant.”

**Summary:** See next 2 pages. Sales rose 26% over the previous year to $16,262,010. Net earnings (profits) rose 50% to $614,075. A photo (p. 8) shows a sheet of soybean protein (to be used for making Ortho Protein) coming off a large roller at the Sharon Plant. A photo (p. 10) shows the huge new series of concrete silos that will store one million bushels of soybeans. Though not yet completely finished, it is storing soybeans from last year’s harvest.

A 2-page spread titled “Plastics” explains that Drackett has now started to sell its molding compounds to the molder in the form of “preforms” such as discs, squares, cubes, etc. instead in the form of a bulky, fluffed-up material. “As predicted a year ago our plastic operation did not make an important contribution to earnings during the past year. Our production has been small and still is, due to plant limitations. However, a new plant at the Sharon location is progressing satisfactorily, and should be producing by mid-year 1947.”

A 2-page spread is titled “Azlon*” (Footnote: *Azlon is the new generic name for all man-made protein textile fibers. It is not a trade-mark. No trade name has been chosen for our fiber; it is known in the textile industry as Drackett Azlon).” The left page (p. 14), in brilliant color, shows samples of elegant fabrics that look like fine silk. “These fabrics are woven from yarns in which Drackett Azlon was blended with rayon and with wool.” “Nothing has occurred in the past year to dim our enthusiasm for this product. On the contrary, new yarns and fabrics made by various textile mills, are creating a great deal of interest. It is generally accepted that soybean Azlon when blended with rayon or cotton imparts

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a “handle” or feel to a fabric that is not contributed by any other material... The new plant, mentioned in our last report, began making fiber in September [1946]. It is now turning out quality fiber in steadily increasing volume.

A 2-page spread features Ortho Protein. “Our production and sale of protein have increased steadily during the past year and are expected to attain real importance in 1947. The new protein extraction plant will operate on a continuous process, 24 hours a day... Buttons, wall paper and glazed wrapping paper are a few of the products in which Ortho Protein is used.” “We are finding a strong demand for Ortho Protein [soy casein]. The need for such material is rapidly increasing, while casein production has declined due to an increased demand for dried skim milk and other factors of an economic nature.” Address: Executive offices: 5020 Spring Grove Ave., Cincinnati, Ohio.

• Summary: Pages 1-5: The idea of man-made fibers is not new. As early as 1664 Robert Hooke was suggesting that fibers might be spun by man using methods similar to those of silkworms and spiders. It may not be remembered today that the first rayon was made before 1889; this was the first big break from nature. But true synthetic fibers were not manufactured until about 10 years ago, when nylon and vinyon emerged.

The first man-made fibers were based on cellulose. Next came protein–derived from casein (milk protein), soybeans, peanuts and corn. Soybean fiber–or azlon–is among the protein-base fibers discussed. Most of the new fibers started as plastics.

Chapter X (p. 183-88), titled “Soybean protein fiber,” notes that Soybean fiber is the first protein fiber made directly from a plant rather than from an animal product. The Drackett Co., manufacturer of the soybean fiber, expects soon to maintain a limited scale of commercial production. “Soybean fiber was first developed by the Ford Motor Company about 1939. Pilot plant production started in early 1941, and by the end of 1942 output was reported to have reached a level of 1,000 lbs. a day. In December 1943, H.R. Drackett, president of The Drackett Company, announced that his company had acquired from the Ford Motor Company their soybean process and pilot plant equipment. Robert Boyer, who was chief research chemist of the Ford Motor Company, joined The Drackett Company as its research director. The Drackett Company had pioneered in soybean development work and originally supplied the Ford Motor Company with the soybean protein ‘alysol.’”

Discusses the manufacture, properties (incl. microscopic characteristics, tensile strength, moisture regain, heat resistance, chemical properties, and carbonizing and dyeing), applications, economic aspects, and status of development of soybean protein fiber in 1945. The product is still in the development stage. A large photo shows H.R. Drackett inspecting a batch of soybean fiber as it emerges from spinnerets.

Peanut protein fiber, developed in England, was known as “Ardil.”

Table 11.3 (p. 207) shows the qualities of fiber prepared from different proteins. The proteins are casein, gelatin, zein, edestin, arachin, glutenin, and soybean protein. The flexibility of formaldehyde-hardened fibers is good for casein, gelatine, and soybean protein but brittle for the other four.


• Summary: See next page. In this full-page black-and-white ad, a photo shows 9 tall concrete silos [9 more on the other side are not visible] and an adjacent elevator. “These huge silos, recently completed to double the soybean storage capacity of The Drackett Company, are now receiving beans–rapidly and efficiently.

“Here in these silos, with the incoming beans, is where Drackett’s rigid laboratory control starts–and it continues all through the processing operations for the development of such high quality products as Precision Process Soybean Oil Meal, AAA-1 Soybean Oil, industrial proteins, plastics molding compounds and Azlon Fiber. These varied products, produced on a low-cost, efficient basis, help to assure growers and elevator men a ready market for their soybeans. The Drackett Company–Soybean processors.” Address: 5020 Spring Grove Ave., Cincinnati, Ohio. Phone: Kirby 6670-7988.

Drackett Quality
STARTS HERE

These huge silos, recently completed to double the soybean storage capacity of The Drackett Company, are now receiving beans—rapidly and efficiently. Here in these silos, with the incoming beans, is where Drackett’s rigid laboratory control starts—and it continues all through the processing operations for the development of such high quality products as Precision Process Soybean Oil Meal, AAA-1 Soybean Oil, Industrial Proteins, Plastics Molding Compounds and Aslon Fiber. These varied products, produced on a low-cost, efficient basis, help to assure growers and elevator men a ready market for their soybeans.

THE DRACKETT COMPANY
SOYBEAN PROCESSORS
5020 Spring Grove Avenue
Cincinnati, Ohio
Kirby 6670-7988

• Summary: During the first 6 months of 1946, France imported: 335 metric tons of soybean seeds & 2,428 metric tons of soybean oil.
  The stock of soybeans at Port Bouet (Abidjan, French Equatorial Africa) as of October has increased to 97 tons.
  In Cambodia, about 3,000 to 4000 ha were planted to soybeans.
  The soy products industry (L’industrie des dérivés du soja) has doubled its production since the end of World War II. A long article follows, including A.E. Staley making monosodium glutamate. Drackett Co., General Mills, Roth Products Co. (according to the Wall Street Journal).

• Summary: “Henry Ford, who died at his home in Dearborn, Michigan, April 7, left a name that will be closely associated with the soybean for years to come.
  “The Ford Motor Co. had discontinued all its soybean operations at the time of the great industrialist’s death. But Ford did some of the pioneering work in developing new uses for the crop; and gave soybeans publicity that vastly increased the interest of the public in them...
  “Ford’s policy was to produce raw materials as close to the point of processing as possible. With this in mind, he gave a great deal of effort to increasing soybean acreage near the Ford plants in southern Michigan. Then in 1937-39 the Ford Motor Co. built three solvent extraction plants at Saline, Milan and at the Rouge plant in Dearborn.
  “Before the war Ford was using soybean products in many ways in the manufacture of automobiles. For a number of years the car body enamel contained 35% soybean oil. In 1937, 300,000 gallons of soybean oil was used for this purpose. The firm used thousands of gallons for shock absorber fluid. The foundry used both soybean oil and meal, the latter as core binder.
  “But by far the most spectacular in the public mind was Ford’s work with plastics. The actual usage was small compared with the tremendous publicity resulting. But some auto parts were made for several years from soybean molding compound. These included coil cases, accelerated pedals, horn buttons and distributor heads.
  “Work on soy fibers was done at the Ford plant. This was under Robert Boyer, who has continued the project with The Drackett Co. Ford also experimented with soy food products, manufacturing soy milk and canning edible soybeans.
  “It was the efforts of the Ford publicity machine, probably more than anything else, that caused the soybean to become associated chiefly with paint and plastics in the public mind, although other uses have always been far more important.
  “Most soybean usage was discontinued by the Ford firm during the war and all its soybean processing plants have been sold.
  “Ford offered considerable inspiration to the farm chemurgic movement. He was one of the founders of the National Farm Chemurgic Council.” A small portrait photo shows Henry Ford at about age 60.

• Summary: The author, who is director of scientific research at The Drackett Co. in Cincinnati, Ohio, notes that “This fiber has been produced for several years on a pilot plant basis. Today a new plant, the first of its kind in this country, is under construction which will produce this soybean fiber in large volume... It has been found that fabrics made from a blend of soybean fiber and rayon or cotton have a ‘hand’ that is unique; a ‘hand’ in fact that cannot be obtained with any other fiber—even wool. Although the fiber in its present state cannot be considered a true wool substitute, it does have, for instance, the warmth which is characteristic of animal protein fibers and also an ability to improve the draping properties of fabrics in much the same manner as wool.
  “A great deal of work remains to be done, but already enough is known about soybean fiber to be able to predict for it a bright future. The Federal Trade Commission,
recognizing the potential and increasing importance of man-made protein fibers, last year adopted for them the generic name ‘Azlon,’ following the same pattern of using the word ‘Rayon’ for all man-made cellulose fibers. And so, as time goes on, it will become more and more a common occurrence, when purchasing one of the popular new sport shirts that has the warmth and appearance of wool but the softness of cotton flannel, to see on the label ‘50 percent Rayon, 50 percent Soybean Azlon.’”

A photo (identical to that in the Jan. 1944 issue of this magazine, p. 8) shows Boyer and H.R. Drackett, president, inspecting a batch of liquefied soy protein that can be spun to make Soybean Azlon fibers. Address: Soybean Research Council.

53. **Product Name:** Precision Process Soybean Oil Meal, AAA-1 Soybean Oil, Industrial Proteins, Plastic Molding Compounds, Azlon Fiber (Ad).
**Manufacturer’s Name:** Drackett Company (The).
**Date of Introduction:** 1947 September.
**New Product–Documentation:** A half-page horizontal aerial photo shows Drackett’s new soybean plant [located at Sharon, Ohio]; it manufactures the products listed above. The huge concrete silos and the elevator at the top of the photo are only a part of the large, sprawling complex.

Note: Drackett made and sold Soybean Azlon (spun soy protein fibers) from about 1946 to 1949. Their main customer was the American Hat Corporation (in Connecticut), which used it in felt hats.


*Summary:* See next 2 pages. Sales rose 40% over the previous year to $22,681,897. Net earnings (profits) rose 58% to $975,131. “The reported increase of 58% in profits of the last year over the preceding year has been due largely to very favorable market conditions in the purchase of soybeans, and in the sale of soybean oil and soybean meal.”

“Proteins: During the past year our laboratories and plant made quality improvements in our isolated industrial proteins far beyond our expectations. Our present product is so superior to that of a year ago, that we have been able to enter large and important fields that heretofore were closed to us. In one industry we are now supplying about 10% of the total tonnage of such products used by that industry... Plans are under way for the expansion of our production facilities.
Plastics: The company’s “new plant went into production about mid-year and is now turning out high strength molding compounds in considerable volume... The method which we developed for making this material into preforms of a size and shape to fit the molders particular job has gained us a marketing advantage.”

Page 18: “Azlon: A market change occurred in 1947 in the textile industry that has postponed the date when Azlon can be expected to contribute importantly to our profit. We realized from the time that we began to sell [note the word “sell”] Azlon in the war period that the shortage of textile fibers was to some degree responsible for its acceptance. We realized that our product must be constantly improved if it were to be continuously successful under normal peacetime conditions.

“During the early months of 1947, the sellers’ market in textiles, that had obtained during the war period, changed rather suddenly to a buyers’ market. Competition again became keen [especially from DuPont’s nylon, which had been used by the military during World War II] and quality was again an important consideration. While we had made considerable improvement in our product, it did not meet the higher quality standards in the textile industry. It became apparent that to attempt the marketing of our product under these changed conditions, even though quality was improved over that considered satisfactory a year before, might inflict permanent injury on our product’s potential. We, therefore, reduced our production to an experimental level. Orders were placed for new equipment and work was started on the redesigning and rebuilding of some equipment already in the plant.”

Page 20: “But we know that there is a most attractive potential market for Azlon when perfected. We continue to carry on an aggressive program of research and plant development and that program is obtaining important results. It is our judgment that we should not aggressively market a product that is merely salable, but rather proceed slowly with that phase of the program until research has established a quality and dependability that will make this Azlon product as highly appreciated in the textile industry as other Drackett products are elsewhere.”

Large sepia photos show (p. 2-3) Drackett soybean oil in railroad tank cars, Drackett 44% protein soybean oil meal in 100 lb gunny sacks.

Page 3. Plastic preforms ready for molding. Ortho Protein being sealed in 100 lb multiwall paper sacks, and a skein of white “Azlon Fiber.”

Page 19: A woman “testing fiber in the Azlon laboratory.” Address: Executive offices: 5020 Spring Grove Ave., Cincinnati, Ohio.

55. Soybean Digest. 1948. H.R. Drackett dead. April. p. 27. • Summary: “Harry R. Drackett, president of the Drackett Co., one of the Midwest’s leading chemical manufacturing and soybean firms, died in Holmes Hospital at Cincinnati March 5 at the age of 64.”

“Mr. Drackett, who was born in Cleveland, was a graduate of Ohio State University. In 1943 Ohio State awarded to him an honorary Doctorate of Science. Mr. Drackett was past president of the Grocery Manufacturers of America. When the NRA [National Recovery Administration] was set up in 1933, he was chosen to head the code authority for his industry.”

“Surviving are his widow, Mrs. Stella Moorerman Drackett, and three sons, Roger, executive vice president of the Drackett Co., Bolton, also associated with the firm, and Charles Drackett, who operates a large farm near Richmond, Indiana.” A portrait photo shows H.R. Drackett.


• Summary: In addition to an industrial protein named Ortho Protein, soybean meal, phosphatides (crude lecithin extracted from soybean oil), and soybean oil, Drackett also makes Drano and Windex. Ortho Protein is an industrial soy protein, which “acts as an emulsifier, an adhesive, and a dispersion agent. It is used in paper coatings, plywood, textile finishes, and as a base for water-mixed paints.”

“History–Drackett Co. was organized in 1910 as a partnership. P.W. Drackett, grandfather of the present president, headed up the firm. Its original business was distributing a line of bulk chemicals to industrial users. In 1915 the company was incorporated as P.W. Drackett & Sons Co. Later it began making its own chemicals, principally epsom [sic, Epsom] salts and lye. By 1922 it had changed its name to Drackett Chemical Co. and had practically discontinued selling chemicals of other manufacturers. In 1933 the company adopted its present name.

“The company began putting up its soybean extraction plant in 1939. When the plant went into operation in 1941 it had an annual capacity of 35,000 tons of soybean meal and 15 million lb. of soybean oil. Today, annual production is 105,000 tons of meal and more than 45 million lb. of soybean oil.

“Finances–Drackett’s entry into the soybean field did not turn out to be a cheap financial venture. During the first two years the company lost money on it. And it has since proved to be a job that could not be financed solely out of earnings. Since June, 1944, the company has poured over $4-million into its soybean operations.

“The company’s first step on this road was selling $1½-million of new 5% debentures [bonds], plus $800,000 worth of new $1-par stock. In 1946 Drackett had to borrow an additional $2½-million. Metropolitan Life Insurance Co. put up $1.75-million of this on a 15-year, 3% term loan. New
York’s Bankers Trust Co. and Cincinnati’s Fifth Third Union Trust Co. loaned Drackett the rest on $2%, 5-year serial notes.

“New Issue–Drackett also worked up a third piece of financing in 1946: taking advantage of the then-active market for new issues in Wall Street, Drackett sold 108,000 shares of new 4% $25-par preferred. The proceeds (some $2.6-million) went to pay off the 5% debentures of 1944, as well as some of the company’s 5% preferred still outstanding.

“Thus far, all this financing seems to have paid off. In 1943, the company’s total sales (household products plus soybean products) came to only $5.8-million. By 1946, total sales had zoomed to well over $16.2-million, with soybean products accounting for 71% of the gross. In 1947 total sales rocketed to $22.7-million.

“Profits have also kept pace. In 1943 the company earned $326,000. By 1946, earnings had risen to $614,000. Last year they were just under $1-million.”

“New Products–Drackett’s diversification route has had a few rough spots, production wise. A textile fiber, Drackett Azlon, faded rather badly. Harry Drackett said it ‘did not meet the higher quality standards of the textile industry... We, therefore, reduced our product to an experimental level.’

“Drackett has a laboratory crew of 50 who are constantly searching for soybean products revolutionary enough to meet stiff marketing competition. Two years ago the company went into the production of phenolic molding compounds. Today production of plastics continues to expand at the Sharonville plant.

“Competition–Among other soybean-based products that the company has come up with are: a film similar to cellophane, a water-mixed paint with a soybean oil base, and a tasty cereal. But none of these three has got beyond the laboratory stage.”

Photos show: (1) A side view of Drackett’s new plant at Sharonville, Ohio. (2) A large sheet of soy protein coming off a roller in a continuous process. (3) Plastic materials being mixed in a machine. (4) Roger Drackett, the founder’s grandson.

Note: Webster’s Dictionary defines a debenture as “a bond backed by the general credit of the issuer rather than a specific lien on particular assets.”

57. USDA Northern Regional Research Laboratory. 1948. Soybean processing mills in the United States. USDA Bureau of Agricultural and Industrial Chemistry. CA-5. 14 p. Sept.

• Summary: Footnote: “This is a revision of AIC-26 [Nov. 1943]–Revised June 1946 under the same title.”

“The following list of soybean processing mills is divided into three parts: (1) Mills specializing in soybeans. (2) Mills processing soybeans on part-time basis. (3) Distribution of soybeans processed by solvent extraction, screw press, and hydraulic press methods (Estimates based on data compiled by Bureau of the Census in cooperation with the Northern Regional Research Laboratory). A year by year table from crop year 1936-37 to 1946-47 (Oct. to Oct.) shows the number of tons processed and the percentage of the total processed by each of the three processes. The percentage processed by solvent extraction doubled from 13.2% to 26.6% while the percentage processed by hydraulic press dropped by half from 18.4% to 9.5%. The total tons of soybeans processed rose 8.2 fold from 619 to 5,107 during the 11 year period.

Processors are listed by state (alphabetically), and within each state alphabetically by city. Three symbols are used (in parentheses) to express each plant’s processing capacity in tons of soybeans per day: S = Small–less than 50. M = Medium–50 to 200. L = Large–more than 200. Three other symbols are used to express the type of soybean processing equipment used: X = Extraction (solvent). P = Screw press [or expeller]. H = Hydraulic press.


“Mills processing soybeans on part-time basis.”

Alabama (6 mills), Arkansas (13), California (7), Florida (1), Georgia (7), Illinois (2), Iowa (2), Kansas (1), Louisiana (9), Minnesota (2), Mississippi (13), Missouri (1), New York (2), North Carolina (14), North Dakota (1), Ohio (2), Oklahoma (13), Pennsylvania (2), South Carolina (4), Tennessee (4), Texas (27), Wisconsin (1).

Note: This is the earliest document seen (June 2018) that mentions Crown Iron Works Co. in connection with soybeans or with solvent extraction plants.


- Summary: Sales rose 22% over the previous year to $27,719,329. Net earnings (profits) fell 21.5% to $765,367. The drop in profits is said to be due to abnormal market conditions in the soybean industry.

In March 1948 Harry R. Drackett (born 1885), the company’s second president, died. He was a builder. In 1922 he decided to build Drano into a major product. “By 1936 a second product, Windex, was successfully established and he announced his intention of entering the soybean industry. ‘I consider,’ he said, ‘that the development of products from the soybean is now at about the same stage as was the development of products from petroleum 25 years ago.’ Today the Company’s soybean operation, while not the largest is one of the most successful in the industry.”

Roger Drackett was elected president of The Drackett Co. by the Board of Directors on 25 March 1948. His biography is given and large photos show the father and son.

During the year, production of Ortho Protein increased by more than 50% over the previous year. It was sold in 101 lb paper sacks “for use as a coating agent for book and label papers, cardboard and wallpaper, as an adhesive in the manufacture of shotgun shells, box board and similar products, also in shoe polishes, fire fighting foam and other miscellaneous uses.” Production and sale of impact molding compounds for plastics increased more than 50% over the previous year.

Note: This is the last year that plastics are mentioned as being produced.

A 2-page spread photo shows the entire plant at Sharon, Ohio. Address: Executive offices: 5020 Spring Grove Ave., Cincinnati, Ohio.


- Summary: In Unit Six, titled “Synthetic fibers: Science in competition with Nature,” the author discusses Rayon, and synthetic fibers made from protein, resin, glass, and metal. The most important synthetic fibers made from a protein base are casein azlon fibers, for which the casein of skimmed milk is the raw material. The first fiber of this type was made in
Italy and is known as Lanital. Similar casein fibers are called Tiolab in Germany, Polan in Poland, Cargau in Belgium, Casolana and Lactofil in Holland, Cortauld’s casein fiber in England, and Aralac in the United States. The process for making this fiber is similar to that of viscose.

Soybean azlon fibers: “The commercial production of a textile fiber from soybeans began in 1943 [at The Drackett Co., in Cincinnati, Ohio]. The raw material for this fiber is the meal that remains after the oil has been extracted from soybeans. The powderlike protein removed from the meal is liquefied and formed into a mass of the consistency of molasses. This liquid is forced through a spinnerette by processes similar to those used in the production of other synthetic fibers. The filaments are stretched and hardened during carefully controlled chemical treatments... The soybean staple fiber is similar in luster, touch, and crimp to a rayon staple fiber but it is light tan in color. Dry soya fiber is approximately 45 per cent weaker than wool of the same grade and the wet fiber is 76 per cent weaker than the corresponding wool fiber.” A photo shows the longitudinal and cross section of soybean fibers.

“Ardil azlon: A British vegetable protein fiber produced from peanuts or groundnuts is called Ardil.” Address: Assoc. Prof. of Clothing and Textiles, Kansas State College of Agriculture and Applied Science.


61. **Soybean Digest.** 1949. Grits and flakes... from the world of soy: “The Drackett Co.: A Case Study—Another Example of How Consistent Advertising Pays Off...” Feb. p. 34, 36. • **Summary:** “... was an article in Dec. 31 Tide. Article is mainly concerned with Drackett products ‘Drano’ and ‘Windex’, but also mentions the industrial line of soy products that now accounts for major part of Drackett sales.”

62. **Soybean Digest.** 1949. Azlon not yet on market. May. p. 31. • **Summary:** “No attempt has been made yet to market the improved soy fiber developed in the pilot plant and laboratory of The Drackett Co., Cincinnati, Roger Drackett, president, told stockholders in a message accompanying the annual report. ‘We cannot say when Azlon textile fiber will be ready,’ he declared. There are still many problems unresolved that relate to measurement and control variables of which there are many in a chemical process of this kind, Mr. Drackett pointed out.

“... was an article in Dec. 31 Tide. Article is mainly concerned with Drackett products ‘Drano’ and ‘Windex’, but also mentions the industrial line of soy products that now accounts for major part of Drackett sales.”

63. **Chemurgic Digest.** 1949. Soybean fiber pending. June. p. 32. • **Summary:** “Commercial production of ‘Azlon,’ a textile fiber obtained from soybeans, is awaiting further developments, according to a message to stockholders of the Drackett Company, Cincinnati, from the president of the concern, Roger Drackett. ‘It is our judgment that we must proceed cautiously rather than risk a false start,’ he wrote. The company has been developing the product in a pilot plant.”

64. **Product Name:** Charge Candy for Dogs. Renamed Charge Treat for Dogs by 1950. Renamed Super Charge Healthful Dog Candy (New Improved) by 1951. **Manufacturer’s Name:** Drackett Company (The). **Manufacturer's Address:** Executive offices: 5020 Spring Grove Ave., Cincinnati, Ohio. Factory: 2781 E. Sharon Rd.,

Handwritten: Soybean Farming is now available; prices are given for non-members and members, for 100 to 1,000 copies. Assessments: Regular $.0004 per bushel, 40 cents per 1,000, $400 per million. Max. $3,200 per year. Min. $100 per year. July 6 meeting decreases the regular assessment to $0.0003 per bushel.


Standing committees: For each committee, the names of all members (with the chairman designated), with the company and company address of each are given. Traffic and transportation. Technical. Soybean grades and contracts. Oil trading rules. Meal trading rules. Crop improvement. Soybean research council. Uniform rules and standards for soybean oil meal. Safety and insurance. Lecithin. Regional: Ohio, Michigan, and East; Illinois, Indiana, Kentucky, Wisconsin; Iowa, Minnesota, Nebraska, South Dakota; Missouri, Kansas, and Mississippi River Delta Sections. Handwritten on blank facing pages: Nominating committee. Reception committee. Official weights committee. Crop Improvement steering committee. Two new members (people; Francis E. Calvert, The Drackett Co., Oct. 1949).


• Summary: In recent weeks Drackett’s soybean extraction plant has passed the 500 tons/day mark several times. Prior to Dec. 2 it was topped 15 times. The record run as of today is 516.8 tons. This is equivalent to 10 boxcar loads per day or 11.5 bushels per minute around the clock.

• Summary: Compared to the previous year, sales fell 23% to $21,380,991. Net earnings (profits) fell 24.3% to $579,785.
  “Research, new products and product development:
  Changing market conditions caused several changes in our plans as laid down a year ago. One such change was the withdrawal from our plastics development. We originally entered the plastics field to provide an outlet for a soybean raw material. As our laboratory developed the formula and process we found that less and less of soybean raw materials was necessary until the amount became insignificant... “Another change related to our development program on a soybean protein textile fiber. In last year’s report we stated that production had been halted and further research would be carried on. Early in 1949 it became apparent that the need for such a fiber was largely being satisfied by new synthetics. These new fibers not only were filling a need which we had expected to satisfy, but also they had important raw material and manufacturing cost advantages. Since these cost factors were inherent in the products, and it appeared that it would be difficult to offset them, we continued only basic research work on protein textile fibers.... “With the elimination of research on plastics and the reduction of the textile fiber program we applied more research time to proteins, waxes, lecithin, oil, oil meal and other soybean products... “For almost the entire year covered by this report we acted as exclusive sales agents for the manufacturer of Charge, Candy for dogs. This arrangement was under the terms of an option to purchase the trademark, formulas and manufacturing facilities. We first became interested in this product because the formula includes a considerable amount of soybean products. Our experience with the product caused us to decide, in September, 1949 to take up this option as of November 1.”

Photos (p. 10) show a package (including the list ingredients) of Charge Candy for Dogs; many ads are also shown. “Charge is a dog confection, to be fed as a reward for good behavior, in training, or as a pleasant, beneficial supplement to the regular diet. It is made under all the safeguards used in making human food products.”

The main ingredients in Charge are: “Dextrose, corn syrup, dry skimmed milk, edible oils, soya bean flour, sterilized ground bone, brewers dried yeast,... calcium propionate added to retard spoilage. U.S. verified color added. Net Wt. 3 oz.” Address: Executive offices: 5020 Spring Grove Ave., Cincinnati, Ohio.

• Summary: Contents: 1. Introduction. 2. Indices of unsaturation: Iodine value, thiocyanogen value, hexabromide value, tetrabromide value, Dienes value, Maumené value, Mackey test. 3. Indices related to fatty acids: Free fatty acids, acid value, neutral oil, Wesson loss, refining loss, Gehner value, Reichert-Meissl value, Polenske value, saponification value, Crismer value. 4. Indices of oxidation: Peroxide value, Kreis test, hydroxyl and acetyl values, carbonyl value. 5. Indices of nonglyceride constituents: Unsaponifiable matter, break test, kerosene-insoluble matter, moisture and volatile matter. 6. Summary of chemical characteristics of soybean oil. Address: Oil Development Section, The Drackett Co., Cincinnati, Ohio.

• Summary: Compared to the previous year, sales were about the same at $21,392,465. Net earnings (profits) rose 1% to $585,901.
  Sales of Charge Dog Candy increased and soybean oil volume increased. “The quality of our phosphatides (crude lecithin—a by-product of oil production) was improved during the year so that we were able to get a much better price for it. Its contribution to earnings is expected to increase as we further refine the product.
  “During most of the year covered by this report, our protein plant was unable to keep up with sales requirements despite a much larger production than in the previous year... The decision was made to expand our plant. This expansion will be completed as early as possible in 1951. Our proteins are being sold to paper, paint, shoe polish and shotgun shell manufacturers.”

Notes to financial statements (p. 19): The Azlon Research Equipment was idle for the entire year.
A photo (p. 8) shows a sack of Drackett Soybean Oil Meal—called “soybean meal” in the accompanying text. Photos (p. 10) show a 100-lb sack of “Drackett Industrial
Chapter 14, titled “Ardil,” notes that “Ardil” is a name of a vegetable protein fibre made from the proteins in ground-nuts or “monkey nuts”. It is a product of research carried on by a private company that decided to make fibres from casein were unsuccessful, and it was not until 1935 that the problem was really solved. An Italian, by name [Antonio] Ferretti, carried out a series of researches in 1924-1935 and succeeded in making pliable fibres with certain wool-like characteristics. The Italian rayon producers, Snia Viscosa, purchased Ferretti’s patents and undertook large-scale production of casein fibre from milk. This fibre they called ‘Lanital’ (lana is Latin for wool), and in 1937 some 1,200 tons of this fiber was made. In the U.S.A. the Atlantic Research Associates, Inc., carried out research independently, and in 1939 undertook production of a casein fibre, to which they gave the name ‘Aralac’. The company which manufactured this material is named Aralac Inc., and in 1943 the production was about 5,000 tons. However, in 1948, Aralac Inc. sold their entire plant and property [in Taftville, Connecticut] to the Virginia-Carolina Chemical Corporation of Richmond, Virginia, so that production could be started when the supply of corn permitted. In 1948 this organization purchased the fibre plant in Taftville [Connecticut] which had formerly been used [by Aralac] and re-tooled and re-designed, and the production of ‘Vicara,’ which is an attractive fibre, is now a commercial undertaking.

Chapter 15, titled “Zein Fibres—‘Vicara,’” begins: “The production of a fibre from zein or maizin, the protein of corn, has been developed by the Corn Products Refining Co. of Illinois and by du Pont de Nemours and Co. The former company patented in 1939 a process for the production of zein from corn protein, but afterwards little more was heard of fibre production until 1948. Probably the hiatus was due to the world shortage of corn; but despite the shortage, research was carried on by the Virginia-Carolina Chemical Corporation of Richmond, Virginia, so that production could be started when the supply of corn permitted. In 1948 this organization purchased the fibre plant in Taftville [Connecticut] which had formerly been used [by Aralac Inc. and Atlantic Research Associates] for the production of ‘Aralac,’ the casein fibre. The factory was re-tooled and re-designed, and the production of ‘Vicara,’ which is an attractive fibre, is now a commercial undertaking.

Chapter 8 (p. 86-126), titled “Viscose, is about viscose rayon, a regenerated cellulose. “Development of Viscose: The greatest single factor in the development of the viscose process has undoubtedly been the support given to it by Courtaulds, Ltd., although there have naturally there have naturally appeared other viscose producers. The pioneer work was undoubtedly carried out by Courtaulds, who not only founded and developed an important new industry, but also introduced it to America under the name ‘The American Viscose Co.’ During the 1939-45 War this American company was sold to American interests in order to provide dollars for Britain... The present happy position of the viscose industry not only in this country [England], but throughout the world is undoubtedly due to the industrial genius of the late Mr. Samuel Courtauld.” World production increased from 1,000 tons in 1900 to 8,000 tons in 1910, to 15,000 tons in 1920, to 200,000 tons in 1930, to 1,100,000 tons in 1940.


Note: This is the earliest document seen that refers to “regenerated protein fibers.”

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of properly designed and constituted taste panels in the
detection of off-flavors.

Contents: Minutes (p. 1-9).

I. Taste Panel Procedures and Methods of Evaluation–
General.–Procedures and Methods Used by The Drackett
Company, Stewart Bauer, The Drackett Company. Armour
Outline History of Taste Panel for Edible Oils at Edgewater
Plant, Lester D. Chirgwin, Spencer Kellogg and Sons, Inc.
Taste Panel Procedures at Pillsbury Mills, Inc., Warren H.
Goss, Pillsbury Mills, Inc. Taste Panel Procedures of the
A.E. Staley Manufacturing Company, Hans W. Wolff, A.E.
Staley Manufacturing Company. Oil Tasting Problems–M.M.
Durkee, A.E. Staley Manufacturing Company. 7 pages

II. Training and Control of A Taste Panel–Helen A.
Moser, NRRL. 7 pages and 3 pages of figures (Floor plan of
taste panel room, Control charts, and Scatter diagrams)

IIIa. Design of Experiments–Cyril D. Evans, NRRL. 3
pages

IIIa. Significance of Taste Tests for Small Organoleptic
Panels–C.D. Evans and Earle Lancaster, NRRL. 4 pages

IV. Methods of Evaluating Salad Oils and Mayonnaise–
Dr. Jack Rini, Kraft Foods Company. 1 page

V. Methods of Evaluating Shortening–P&G Method
of Evaluating the Flavor Stability of Soybean Oil Products,
R.T. Clause, Proctor and Gamble Company. The Evaluation
of “Off-Odor” in Hydrogenated Soybean Oil Shortening,
Edward Handschumaker, Lever Brothers Company.

Procedures and Methods Used by Wilson & Company in
Organoleptic Evaluations of Shortenings and Their Flavor
Address: Washington, DC.

72. Porterfield, W.M., Jr. 1951. The principal Chinese
vegetable foods and food plants of Chinatown markets.

• Summary: The soybean “is referred to by Chinese as ‘the
poor man’s meat and the poor man’s milk.’” In New York
City, soybeans are sold in Chinese shops in three main
forms: seeds [whole dry soybeans], bean sprouts, and bean
curd. Soy sauce and soybean oil are also available. Soy sauce
“is a heavy dark fluid which is used as a condiment to supply
saltiness that brings out flavor,...”

When soybean milk is heated, a skin [yuba] such as
forms on milk rises to the surface. Other [Western] uses of
soybeans include soybean flour, meal, lecithin, shortenings,
and margarine.

Nitrogen fixation takes place in the nodules of the
soybean plant, which makes it useful as a green manure.
Crude soybean oil goes into the manufacture of soap (both
soft and hard). Soybean meal can be used to make plastic and
“protein fibers” which are called “soybean wool.” “During
the war about 1,000 pounds of soybean wool were produced
each day, and all of it went into the winter uniforms of the
armed forces.”

Note: Which company produced this “soybean wool”?

Drackett?

Some 36 different varnishes with 100% of their oil
content as soybean oil have been developed and given
exposure tests. A rubber substitute named “norepol”
[Norepol] has been developed and can replace rubber in
“insulation, shoe heels, fruit-jar rings, gaskets, and tubing.”
Soybean protein has been used as a stabilizer in fire-fighting
foam. Other industrial uses [of soy oil and protein?], which
are too numerous to mention, include enamels, printing ink,
linoleum, foundry cores, glycerin, notepaper, and billiard
balls. In the United States, soybean crops and products create
an annual income of $45 million.

Tables show: (1) Nutritional composition (on an “as-is”
basis) of: “Bean cheese (Tou-fou; 13.5% protein). Soybean
milk (3.13% protein). Bean oil (Tao-yu; 7.49% protein). Soy
sauce (Tao-jung; 12.67%). (2) Nutritional composition of
soybeans.

Half-page photos (each with a black background) show:
(1) Bean sprouts ready for cooking. (2) A square of firm
“Tou-fu, bean curd, a cheese made from soybeans.” Address:
3334 Prospect Ave., N.W., Washington & DC.

Vol. II. New York: Interscience Publishers or John Wiley &
Sons. xvi + 1145 p. See p. 1003-54. [139 ref]

• Summary: One of the best early summaries of industrial
uses of soybeans. Contents: 1. Manufacture of soybean
protein: Introduction, nature and evaluation of protein
modification, choice of raw materials, industrial isolation
and modification processes, improvement of color, plant
operation and equipment. 2. Industrial utilization of soybean
flour and isolated protein: Introduction, control of bacterial
and mold growth, plywood glues, soybean flour paper-
coating adhesives, Soybean protein [isolate] paper coating
adhesives, paper and textile sizes (paper sizes, textile sizes),
water-thinned paints, plastics, textile fibers, fire foam
stabilizers, tacky and remoistening adhesives, printing inks,
miscellaneous uses.

“The first large-scale industrial use of soy flour was
the development of plywood glue in the Pacific Northwest
about 20 years ago by I.F. Laucks and Glenn Davidson, who
imported specially prepared hydraulic pressed soybean meal
from Manchuria. The Douglas fir plywood industry needed
a cheap, water-resistant adhesive. While casein was suitable
for the purpose, it was more costly and subject to wide
fluctuations in price and availability. Soybean flour adhesives
produced a strong bond which, although not waterproof, is
highly water resistant. Because the adhesive mixtures are not
tacky, the glued veneer is easy to handle, and therefore the
manufacturing process can be speeded up considerably... In
1942, 60 million pounds of soybean glue (dry basis) were
used for gluing plywood. This amount, together with a small amount of casein glue, represented 85% of the total plywood glue production. By 1945, the amount had fallen to 70%. In 1947, consumption of soybean glue was 25 million lb. Dike (pers. comm. 1947) estimates that two-thirds of the 1947 production of Douglas fir plywood was glued with soybean adhesive and hence intended for interior use, while one-third (wet basis) was glued with phenolics and intended for exterior use. In the plywood industry as a whole, soybean glues represent, on a dry basis, by far the largest tonnage of any type of adhesive."

“It is noteworthy that the single largest use of casein and [isolated] soybean protein is in paper coatings. The average 1940-46 consumption of casein in the U.S. was about 65 million lb and of soybean protein about 15 million lb, approximately one half of each amount being consumed in paper coatings.

“Production of soybean fiber had reached 900,000–1,200,000 pounds by 1939 in Japan. No production of soybean fiber in Japan during and after the war has been reported. Pilot plant production of soybean fiber by the Ford Motor Company reached 5,000 pounds per day in 1940, but production was subsequently discontinued and the plant and equipment disposed of to The Drackett Company.

“The Federal Trade Commission, recognizing the potential and increasing importance of man-made protein fibers, has adopted for them the general name ‘Azlon,’ following the same pattern of using ‘Rayon’ for synthetic cellulose fibers... All protein fibers made on a commercial or pilot plant scale possess low dry and especially low wet strength.”

Synthetic protein fibers can be classified and discussed in terms of the “wool model” or the “silk model.” The mechanical properties of each of these two fibers is related to its structure. Wool has long-range elasticity but moderately low strength, whereas silk has much greater strength, but a significantly lower range of elasticity. The “full realization of the fact that that textile fibers are, for the most part, made of fibrous molecules has undoubtedly been one of the major factors contributing to the present activity in the field of synthetic fibers.”

“During World War II, the greater part of the isolated soybean protein produced was hydrolyzed and used by the U.S. Navy to prepare a foam for fighting oil and gasoline fires on war ships. A soybean protein solution was fed into a water stream and the mixture converted into a foam by means of an aerating nozzle.”


Figures show: (203) Graph of viscosity-pH curves for 14% solutions of unmodified soybean protein, 18% solutions of modified soybean protein, and 18% solutions of casein. (204-210) Graphs concerning paper coating with isolated soybean protein: Parts of adhesive per 100 parts of pigment in Denison wax test; amounts of casein, soybean protein, oxidized corn starch, and thin boiling starch that must be used with clay and calcium carbonate to produce a coated paper with Denison wax test of 4-5; brightness of papers coated with clay and calcium carbonate, sized with soy protein and other sizings; opacity of papers coated with clay and calcium carbonate, sized with soy protein and other sizings; receptivity of ink on papers coated with clay and calcium carbonate, sized with soy protein and other sizings; smoothness of papers coated with clay and calcium carbonate, sized with soy protein and other sizings; gloss of papers coated with clay and calcium carbonate, sized with soy protein and other sizings, to produce a coated paper with Denison wax test of 4-5. Address: Protein By-Products Research, Research and Technical Div., Wilson & Co., Chicago, Illinois.


• Summary: Compared to the previous year, sales increased 16% to $24,817,599. Net profit for the year increased 35% to $792,042. Inside the front cover, photos show the executive offices on Spring Grove Ave. in Cincinnati, and the plants at Cincinnati and Sharonville. New facilities installed early in 1951 increased production of protein [Drackett Industrial Protein] by 35% in fiscal 1950-51. Address: Executive offices: 5020 Spring Grove Ave., Cincinnati, Ohio.


• Summary: The idea of a plastic car or plastic parts that were made from soybeans was a natural outgrowth of Henry Ford’s interest in chemurgy and Robert Boyer’s research in that area. “Actually I think that the statement that this plastic automobile body, which was eventually built, had anything to do with soybeans was a complete misnomer. It was a plastic body, but the plastic wasn’t made from soybeans. It was a phenolic plastic and reinforced. Mr. Boyer, in Dearborn, developed a combination of phenolic and protein plastic. Protein plastics are not new...”

“The plastic that Boyer is credited with having started

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and which we equipped the Glass plant to make, and made in quite a substantial volume, actually was a phenolic plastic in which some of the soybean protein just replaced some of the filler, such as wood or asbestos fiber. We used to kid Mr. Boyer and I used to kid Hud McCarroll about it, that all they did was to raise sawdust on bean vines in order to use up the product of the bean vine. It annoyed Hud but he knew damn well that that was about all they succeeded in doing.

“Of course, the fact is it didn’t continue because it just wasn’t economical. Furthermore, while it was perfectly successful for the part, you can’t keep on pulling yourself up by your bootstraps and paying more money than you can buy it, so the manufacture of plastics was discontinued...

“The plastic body that was produced, however, was a phenolic plastic. The only soybean that got anywhere near it was soybean oil that was used to paint it, and the only reason that it was painted was because it was never possible to put the plastic body together in such a good way that it had a good finish without painting it. Consequently the plastic body which was made actually was painted and as all automobile bodies were then and now painted with soybean oil paint...

“I would say that the first big thing that Mr. Boyer did was this development of a combination of a phenolic plastic with a protein plastic which we used for quite a little while and successfully in electrical insulation parts such as the distributor and so on. That was very good. The only trouble was that it wasn’t economical.

“The other thing was the actual production of protein fibers. Of course, there was little poetic license in that, because Mr. Boyer never succeeded in Dearborn in purifying protein produced around here to the extent that it was possible to spin and make fibers. He actually had to buy the purified protein from some other people [Note: Boyer probably bought Alysol brand industrial soy protein from The Drackett Co., at least during the early 1940s]. That was a step that was blithely jumped. Mr. Ford undoubtedly realized this. He felt that that was a detail or hurdle that could have been overcome. Probably the answer is correct. It probably could have been overcome if Mr. Boyer had a little more time.

“The third thing that I would say that Mr. Boyer did was the making of a continuous percolator or extractor. Several of them were built in Dearborn. I think some of them are actually running now.”

Concerning the solvent extractor, there existed a type of roller press used in the oil extraction industry that was better than one press designed by Ford and Boyer. “Mr. Ford wouldn’t let Boyer buy one of these because he wanted to make his own, and for that reason it [the extraction system] wasn’t as successful as it ought to have been, but he just wouldn’t accept such a combination... The Rouge extractor was eventually sold to a Canadian company. One of the men who worked under Mr. Boyer who remained here and had charge of this extractor after Mr. Boyer left went along with the sale of this outfit to the Canadian company, and to the best of my knowledge the Canadian company uses this extractor, and this man is in charge of it.”

The soybean solvent extractor at Milan had the advantage of railroad access, so you could bring in soybeans by rail and send out the oil and meal by rail. But a study indicated that the soybean operations at Milan were not very successful economically, so the equipment was moved to Saline. In Saline it had two other handicaps. First there was no railroad access, so all soybeans had to be brought in by farm wagon and the product sent out by truck. Second the soybeans could not be purchased at the best times for the best prices because of insufficient soybean storage silo facilities. “They had to buy from hand to mouth in Saline.” In addition they had no equipment to process the oil to produce a non-break oil, the type Ford used in making varnished.

“Mr. Ford’s interest in the extraction of oil from soybeans for developing a cash crop was lost before he retired from the Company. He lost interest in it in the beginning of World War II, when his attempt to get the Government backing failed. From that time on there was never any evidence of Mr. Ford’s personal backing of the soybean business, including oil.

“I would say that Mr. Ford thought the plastic car was just a stunt and that it had been proven, but from this point on it would depend upon whether or not anybody wants to take it up enough to successfully make it. He had no idea of setting up a small pilot plant of his own to produce that plastic car. I would say that he gave Mr. Boyer a terrific backing for a while, even to the annoyance of a good many people in the Company by actually diverting and earmarking presses in the Dearborn Tool and Die plant that were brought in for some other purpose to work on this plastic car job. It just stymied some other work in the Ford Motor Company. Unless Mr. Ford saw to it continuously that Mr. Boyer did get the backing for the job of making the plastic car, Mr. Boyer wouldn’t get it.

“There was a very definite break in the relationship between Mr. Boyer and Mr. Ford. I didn’t know any of the circumstances except that Mr. Boyer seemed to get going along and was riding quite high...

“It was progressing along along a pretty good clip, and when it was obvious that the Government wasn’t going to give Mr. Ford backing on the thing, Mr. Boyer was given his walking papers. Who Mr. Ford delegated to do this, I don’t know. We just got word that Mr. Boyer was out. I saw Mr. Boyer and he told me he was going to leave.

“About that time one man who was a pretty capable man and had been working under Mr. Boyer was up here. He was working for The Drackett Company in Cincinnati [Ohio] and was supplying Mr. Boyer with purified protein which Mr. Boyer was using to make the protein fibers. He had tried to lure Boyer away from the Ford Motor Company.
“Mr. Boyer had considered that he was going very well in the Ford Motor Company, so he wanted to stay. When it looked like he was slipping, Mr. Boyer immediately said that he would reconsider what he had told him and that he would go with The Drackett Company.

“The Drackett Company offered to buy practically all the equipment that Mr. Boyer had for making soybean fibers, and anything that Mr. Boyer said goes with the making of soybean fibers just went. We didn’t save much of anything except some laboratory benches. Drackett got just about everything they wanted in that respect from the Dearborn setup.”


“In 1934, The Drackett Co. desired to expand its operations in chemical processing. J.N. Lawrence and W.C. Gangloff brought to the attention of management the possibilities indicated in the rapidly growing soybean industry. A coordinated program was suggested wherein soybeans would not be processed merely for oil and meal content but one wherein a variety of secondary derived products might be developed. It was pointed out that the large volume operations were requisite.

“The program set up in addition to Soybean oil Extraction processing included the development of (1)–Soybean protein extraction and isolation as a product comparable and competitive to milk casein; (2)–Utilization of the oil-free meal and the residual protein scalped meal in soybean plastics; (3)–Food products from the meal; (4)–Products like soybean protein, water paints, from the isolated protein; (5)–Utilization of the phosphatides obtained on soybean oil processing. All of these angles were studied in the Drackett Laboratories at the Spring Grove plant for about 6-7 years. From these studies stemmed the later operations at the Sharonville plant.

“Soybean Oil Extraction: Pioneer work in soybean oil extraction by The Drackett Company goes back the Company’s initial interest engendered in the latter part of 1934. Laboratory studies during 1935 and 1936 led to the design of an original pilot plant for oil extraction by the solvent method by C.F. Frazier, W.C. Gangloff, and J.F. Johnson. The pilot plant unit was constructed on the Spring Grove site in 1936 and operations begun in February 1937 and continued for three years. Patents were secured on this extraction equipment by C.F. Frazier. During this same period laboratory studies on production of soybean protein were conducted and carried through to round the clock pilot plant operations by W.C. Gangloff, J.N. Lawrence and R.H. Hieronymus.

“In 1938, The Drackett Co. purchased some 60 acres of farmland at Sharonville and proceeded with solvent extraction plant layout plans at the site... The first undertaking was the construction of flat storage for soybeans. Ground was broken in September 1939 and between Oct. 7th and Dec. 31, 1940 a total of roughly 85,000 bushels of soybeans were taken in for an operations start. The original extractors, using hexane as solvent, were constructed as twin units of 60 tons per day bean throughput capacity.

“Soybean Oil Extraction Operations: Actual extraction operations began at the Sharon Plant in January 1941, under N. McKay, N.L. Eudaly, W.C. Gangloff and J.F. Johnson. This was a very disturbed period under the government defense program... from the start and the plant operated to about 80% of planned throughput. From the very beginning a premium soybean oil was obtained and at no time was it impossible to move all the soybean meal produced. R.B. Alepough and Roger Drackett handled soybean oil and meal sales from the start.” After World War II the plant expanded. In “June 1952 there are 208 hourly paid workers and foremen, about 20 laboratory workers, and 50 salaried workers at the Sharon plant. Operations have, from the start, been on a 24 hour per day, seven days per week basis.” Operations at the Sharon plant began in Jan. 1941. The number of bushels of soybeans processed by Drackett increased rapidly. The following figures [a table shows] are in bushels per fiscal year (from Oct. 1 of one year to Sept. 30 of the next year). 1938-39–84,308. 1939-40–105,413. 1940-41–651,200. 1941-42–1,327,362. 1943-44–2,656,237. 1944-45–3,801,916. 1945-46–4,794,309. 1947-48–5,216,793. 1951-52–6,013,560 (projected). In 1949-50 the plant produced 140,421 tons of soybean meal (some of which was used for soy protein extraction), 60,159,756 lb of soy oil, and 1,346,171 lb of soybean phosphatides (Continued). Address: PhD, Technical Consultant.


- Summary: Continued: “Soybean Protein Development: Laboratory work on the extraction of soybean protein from oil-free soybean flakes was started in The Drackett Co. in 1935 by W.C. Gangloff, J.N. Lawrence and R.H. Hieronymus. In the last quarter of that year samples of soybean protein were submitted to the Champion Coated Paper and Fiber Co. for examination as to use in paper coating formulations in place of milk casein. In 1936 a pilot plant scale of operation on the batch system was started at...
the Spring Grove plant site. This was extended during 1937 and 1938 despite the decline of milk casein prices from about 25¢ per lb. down to 8½¢ per lb. New procedures for proper extraction and a study of tailoring the product to particular use was undertaken. This resulted in securing a number of patents in this field and a large technical background was built up.

“Development work was carried on continuously through the war period and the pilot plant operated round the clock. All output was grabbed up at once by concerns like Beaunit Mills, Shinola Shoe Polish Co., etc. Expansion and installation of a new unit at Sharonville was not possible until 1946 due to war restrictions. By 1947 the new unit was under operation on a full 24 hour basis. Many changes and improvements had to be made. In 1950 capacity was expanded by installation of greater drying capacity...

“Soybean Protein Production: Prior to 1940, all the Pilot Plant production of soybean protein was used in connection with experimental studies from process and utilization angles. During the latter part of 1939 the price of milk casein jumped from 5½¢ per lb. to 20½¢. This made soybean protein production much more interesting and calls for samples in various industries came in. During the last quarter of 1939 about 1500 lbs. were supplied to Champion Coated Paper and Fiber Co. and many smaller samples to others interested.

“It was soon learned that different industries required different types of protein, varying as to modification for adhesive character, molecular breakdown or unfolding. During the first quarter of 1940, 500 lbs. of one type were furnished Miami Valley Coated Paper Co., Franklin, Ohio; 350 lbs. to Lowe Paper Co., Ridgeway, New Jersey; and 1000 lbs. to Ford Motor Co., Detroit, Michigan. The latter were interested in developing soybean water paints and also a spinning fiber for later weaving into upholstery cloth, so 200 lbs. of a different type were furnished to them at Dearborn, Michigan for experimental work at the Edison Institute. About 1500 lbs. of soybean protein were produced in the Pilot Plant during this quarter.

“In 1941, about 15,018 lbs. were produced and 7,039 lbs. sold. [Note: This was the first soy protein sold.] In 1943, about 112,704 lbs. total were produced and 118,157 lbs. sold. Following several years cooperation with the Ford Motor Co. on soybean fiber development with the isolated protein produced in The Drackett Co. pilot plant, war conditions and the death of Edsel Ford caused The Ford Motor Co. to terminate its work in soybean development in 1943 and the equipment for fiber spinning and the staff available, under R.A. Boyer were taken over for further exploitation. The spinning equipment previously set up in the Drackett Laboratories by S.O. Fiedler was thus augmented to a pilot plant scale of operations. Information as to soybean protein extraction was pooled. W.C. Gangloff was moved to other executive duties as Technical Consultant and R.A. Boyer was named Director of Scientific Research with chief duties on soybean fiber development. Concentration on soybean fiber work took the majority of isolated soybean production during 1944, 1945 and 1946. A shift to continuous extraction in place of batch operation was made and operations moved from the Spring Grove plant to the new unit at Sharonville. In addition to producing material needed for fiber operations, during 1944 about 78,245 lbs. were sold and in 1946 about 60,350 lbs. were sold during the second half. In 1947 regular continuous protein production operation was in full swing and has progressed rapidly ever since.”

Soybean protein production grew as follows each fiscal year [a table shows]: 1947–908,975 lb. 1948–2,496,797. 1949–2,995,272. 1950–4,284,090. 1951–6,088,469. Thus from 1941 to May 1952 a total of 21,661 million lb were produced beside that used in experimental production.

“In 1950-51 production facilities were increased and a continually increasing tonnage of isolated soybean protein has been sold. Much has found its way into paper coating, adhesive use and more recently as an important component of the protein-latex water paints which are rapidly supplanting the earlier milk casein and soybean protein water paints.” A chart compares soybean protein sales (in pounds) with production from 1941 to 1951. In 1941 some 15,018 lb of isolated soybean protein were sold. In 1951, the peak year, 6,086,350 lb of isolated soybean protein were sold.

Note: No mention is made of the brand names under which this protein was sold–such as Alysol, Drackett Protein 110, 112, and 220, Ortho Protein, or Drackett Industrial Protein (Continued). Address: PhD, Technical Consultant.


• Summary: Continued: “Soybean Plastics: In connection with a correlated program for utilizing oil-free soybean meal and residual scalped meal from isolated soybean protein operations, laboratory work was started in the latter part of 1936. During 1937 equipment was installed at the Spring Grove plant on a small pilot plant basis and personnel hired for soybean plastics research and development. By early 1938 soybean plastics had been worked out to a point where bottle caps could be produced from them. The type of plastics developed was a modified phenolic of the general purpose type. During 1938 cooperative work was carried on with Owens-Illinois Glass Co. at Toledo on a Lauterbach machine for making plastic caps for Windex bottles. Piano keys and phonograph records from soybean plastics were worked out in a cooperative effort with the Starr Piano Co. and Decca Records at Richmond, Indiana. Much cooperative work was done with the local Recto Molded Products Co. and with Kurz-Kash Co. at Dayton, Ohio on a wide variety
of custom moldings.

“In 1939 a larger pilot plant was set up at the Spring Grove plant and a production of about 100 lb. per day obtained. During 1940 material satisfactory for bottle cap molding was successfully produced on a tonnage basis. Products using either oil-free meal or the residual meal from isolated soybean protein operations were successfully produced in quantity. Regular and repeated sales of product were made to the local Recto Molded Products Co.

“During 1941 tonnage of general purpose stock was produced with the pilot plant operating on a semi-commercial production basis. Toward the end of the year, scarcity of formaldehyde under war conditions hampered production. Research was then pointed to the production of high-impact material. Several patents resulted from the studies of P.A. Bury and F.E. Calvert.

“During 1942, scarcity of phenol showed the advantage of soybean protein plastics as modified phenolics. By proper tailoring a plastic averaging 6000 lbs. per square inch tensile strength and 9000 lbs. per square inch flexural strength was produced. Practically all production went into war contract material. Experiments on suitable high impact stock for supplanting aluminum, magnesium and their alloys resulted in the production of a satisfactory M-18 flare breach cap and housing for use in star shell flares for the Signal Corps. Another application was for gun sight housings.

“During 1943 attention was turned to developing satisfactory soybean plastic resins as modified phenolic adhesives, especially for wood lamination. This research work resulted in a patent to Hieronymus. A start was made on tailoring soybean plastics for extrusion operations, particularly for button manufacture. Contacts were established with the Waterbury Button Co., Waterbury, Massachusetts and the George Morrel Corporation at Muskegon, Michigan.

“In July 1943 the direction of further work in soybean plastics was turned over to R.A. Boyer. Pilot Plant production on general purpose and high impact stock was continued with concentration of sales effort on a variety of outlets. In 1947 a new unit for soybean protein manufacture was set up at Sharonville and production continued.

“In 1946 the production of preforms for the molding industry was begun. Both bulk molding powder and preforms were produced and sold until July 12, 1949 when soybean plastics operations were entirely discontinued.”

A chart shows production and sales of soybean plastics and preforms each fiscal year (Oct. 1–Sept. 30) from 1940-41 to 1948-49. Production in 1938 and 1939 were for experimental and development purposes only. Production of bulk plastics increased from 19,810 lb in 1940-41 to a peak of 140,697 lb in 1947-48. Production of preforms increased from 115,536 lb in 1946-47 (the first year) to 286,361 lb in 1948-49. The sales value of both types of soybean plastics increased from $3,079 in 1940-41 to a peak of $142,262 in 1947-48 (the peak year), falling to $134,464 in 1948-49 (Continued). Address: PhD, Technical Consultant.


• Summary: Continued. “Soybean Fiber: As indicated previously in this report, The Drackett Co. worked cooperatively with the Ford Motor Co. [apparently starting in the first quarter of 1940] to develop a soybean protein suitable for spinning into fiber from which upholstery cloth could be made.

“Following the purchase of equipment from the Ford Motor Co. in the summer of 1943 and the taking on of the personnel who had worked on soybean fiber at The Edison Institute, a pilot plant scale operation was set up at the Spring Grove plant. Soybean protein processing was tied in with this venture to supply soybean protein as needed.

“During several years of experimental work, the operations were moved to a new pilot plant at the Sharonville plant. Production was shipped to various mills for use as a blend fiber, particularly for admixture with wool. The chief fault of soybean protein fiber as well as all other protein fibers lay in its weak wet strength and its tendency to become brittle on aging. These drawbacks were never overcome and the operation was never successful from either a product or cost standpoint. In July 1949 the production operations were discontinued and a few months later all further research on soybean fiber was dropped and much of the personnel dispersed. R.A. Boyer who had been connected with this work from its start at the Edison Institute of The Ford Motor Co. severed connections with The Drackett Co. early in 1950.”

Note: It is not clear from the above whether or not The Drackett Co. ever sold their soy protein fiber commercially, and if so, to whom and for what uses. Address: PhD, Technical Consultant.


• Summary: Compared to the previous year, sales increased 12% to $27,725,639. Net profit for the year decreased 10% to $712,667. The soybean division had narrow crushing margins caused in part by “unrealistic governmental controls and regulations. Protein tonnage sales were increased 16% over the previous year. Several new specialized protein products were developed and introduced to industrial customers. Others are going through various stages of laboratory research.” Address: Executive offices: 5020 Spring Grove Ave., Cincinnati, Ohio.


**Summary:** Among these proteins, those of soybean are isolated in the United States to the extent of about 30 million pounds annually, more than half of which are used in pigment coating of paper. Others, also discussed in this article, are derived from the seed of flax, sunflower, castor, peanut, cottonseed, and corn.

**Introduction:** Vegetable protein isolation on a large scale for use in industrial processing operations is comparatively new, having its beginnings in 1935 in a small plant in Chicago [run by the Glidden Co.]. The development of a process for vegetable protein isolation was preceded by the use of vegetable protein concentrates for plywood glue [by I.F. Laucks Co.], in the form of soybean meal containing 40 to 50 percent protein, by the Douglas fir plywood industry of the Northwest in the early 1920s... Looking backward it is easy to see that the slow development of protein utilization, even in recent history, is attributable to the highly complex structure of the protein molecule... The chemistry of protein lags far behind the chemistry of the other two classes of major agricultural chemicals produced in such abundance.
by nature, namely, the carbohydrates and fats.” The “process of building one pound of animal protein requires six to ten pounds of vegetable protein...” (p. 291).

Worldwide, the soybean is by far the largest oilseed crop, followed by peanuts, then cottonseed. Before the soybean became a major crop in the USA, peanuts led all other oilseeds in world production. (p. 292).

“Soybean protein is the only industrial protein isolated from oilseeds in the U.S.” Soy protein has a higher yield and better color.

“The largest potential use of soybean protein is for textile fibers, but this use has not yet been developed. Fibers comparable to the casein fiber, Aralac, which was produced during World War II, have been made experimentally by the Ford Motor Co. (1937), The Drackett Company (1940), and the U.S. Department of Agriculture (1942). The great weakness of Aralac was its wet strength, and commercial production did not prove feasible. The Japanese, who were experimenting with soybean fibers before the war, have resumed their research. The British development of a commercial fiber from peanut protein and the American development of a protein from zein support the belief that a successful fiber can be made from soybean protein. Such a development might very well double the present rate of soybean protein production.”

Soybean meal, when dehulled, contains about 50% protein and has several industrial uses including plywood glue, wallpaper coating, and adhesive formulations for the manufacture of paper products. A 1951 survey stated that 51.5 million lb of soybean meal were used in such industrial products. The largest single use, 35 million lb, was for plywood glue in Douglas fir plywood. Recent reports indicate this application has increased to 60 million lb.

Large amounts of wheat gluten and some corn gluten are used to make monosodium glutamate (MSG), which originated in Japan under the name “ajinomoto.” The MSG shaker is rapidly finding a place in American homes next to the salt and pepper shakers. Smaller amounts of wheat gluten are used to make a taste product somewhat resembling pork chops.

Table I (p. 293) shows U.S. production of 7 oilseeds (soybeans, cottonseed, flax, peanut, castor bean, safflower, and sunflower) and protein concentrates made from them in 1951-52. Apparently soybean meal is considered a protein concentrate, since 5,704,000 tons were made in 1951-52. By far the largest amount of “protein concentrate” is made from soybeans, followed by cottonseed (2.5 million tons), flax (495,000 tons), peanut (150,000 tons), and safflower (6 tons). Address: Northern Utilization Research Branch, Peoria, Illinois.


• Summary: Compared to the previous year, net sales decreased 22.3% to $21,651,491. Net profit for the year increased 1.2% to $588,224. A photo (p. 13) shows the company’s plant in Evendale, Ohio. This plant was formerly said to be in Sharonville or Sharon, Ohio—even though it’s location has not changed.

“In September, 1954 we introduced Twinkle, a paste cleaner for copper-clad kitchen utensils, in several test cities.” Address: Executive offices: 5020 Spring Grove Ave., Cincinnati, Ohio.


• Summary: Soybean proteins develop water resistance rapidly on aging of the dried coatings at room temperature. Address: The Drackett Co., Cincinnati, Ohio.


Standing committees: For each committee, the names of all members (with the chairman designated), with the
company and company address of each are given—Traffic and transportation. Technical. Soybean grades and contracts. Oil trading rules. Meal trading rules. Crop improvement council. Soybean research council. Uniform rules and standards for soybean oil meal. Safety and insurance. Lecithin. Regional: Ohio and East; Illinois, Indiana, Kentucky, Wisconsin and Northwestern Missouri; Iowa, Minnesota, Nebraska, South Dakota; Kansas, and Western Missouri; Southeastern Missouri and the Mississippi River Delta Sections.


Address: 3818 Board of Trade Building, Chicago 4, Illinois.

87. **Product Name:** Drackett Assay Protein C-1.  
**Manufacturer's Name:** Drackett Products Co. Chemical Sales Div.

**Manufacturer's Address:** Executive offices: 5020 Spring Grove Ave., Cincinnati, Ohio. Factory: 2781 E. Sharon Rd., Sharonville, Ohio.

**Date of Introduction:** 1955.

**New Product–Documentation:** Soybean Blue Book. 1955.

p. 104. “A protein free of elements that limit results of diet experimentation.”

Cincinnati, Ohio. 13 p. 28 cm. For the fiscal year ended Sept. 30, 1955.

**Summary:** Compared to the previous year, net sales decreased to $19,454,547. Net profit for the year increased to $871,641.

“Financing: During the fiscal year, the Company secured a long term loan of $2,500,000 from its five major banks. The proceeds were used to retire a loan from the Metropolitan Life Insurance Company and to restore our working capital position after acquiring the Calmar and Maclin companies.

“The Company also issued to Plastics, Inc., a Puerto Rican Corporation, $1,000,000 worth of 6% Cumulative Preferred Stock, Series B, in exchange for a like amount of Class B Common Non-voting Stock of Plastics, Inc.

“Soybean Oil and Oil Meal: During the year ended September 30, 1955, we operated our soybean oil extraction facilities primarily to supply raw material (soybean oil meal) to our protein extraction operation. As long as market conditions are such that soybeans cannot be purchased, processed, and the primary products, oil and meal, marketed at a satisfactory profit, our extraction operation will continue on a restricted volume. Our plans for the current year do not anticipate any material change in this situation although as the new crop came to market in September, margins were somewhat improved. We shall continue to operate our excess grain storage facilities, storing grain for others on a contract basis. Considered separately this is a profitable operation.

“Soybean Proteins: Profit from the protein operation improved during the year, meal prices were lower, and plant yields increased, permitting an increase in sales volume. Prices were firm throughout the year.

Drano and Windex: These products responded to increased sales and advertising pressure by climbing to an all-time high in volume and profit. Higher costs in wages, freight, raw materials and stores were partially offset by improved efficiency in production, marketing, and distribution.

“Dazy and Twinkle: Dazy air-freshener and Twinkle copper cleaner continued to show well during the year in test markets. As of September 30, 1955, we had secured national distribution on Dazy in the grocery field. Advertising began early in October in national magazines and Sunday newspaper supplements.”

A photo (p. 3) shows the company’s plants in Evendale and Cincinnati, Ohio, and San Leandro, California. The 18 tall concrete silos and towering elevator still stand at the plant in Evendale, Ohio. Address: Executive offices: 5020 Spring Grove Ave., Cincinnati, Ohio.


**Summary:** “Five replicates of 10 White Rock males were fed a basal diet containing 25% Drackett protein and a mineral mixture similar to that of Dannenburg et al. (*Poultry Science* 34:1023) except ZnCl2 was omitted and 0.5% KCl was added. Analysis of the diet indicates that it contains about 50 ppm [sic, ppm] of zinc.”

Zinc in soy protein was found to be less available than zinc in animal proteins. Address: Depts. of Agricultural Chemistry & Poultry Husbandry, Univ. of Missouri, Columbia, MO.


**Summary:** “Archer-Daniels-Midland Co., Minneapolis, Minnesota, has purchased from The Drackett Co., Cincinnati, their isolated soy protein business and all facilities located at Evendale, Ohio.

“Announcement of the transaction, which will be effective July 1, was made by the two companies. The purchase price was not disclosed. Acquisition of the isolated soy protein facilities will be another step in the diversification of ADM’s operations, according to A.C. Hoehne, vice president and manager of ADM’s soybean division.

“R.G. Brierley, ADM vice president, will be responsible for operation of this new business under Hoehne’s direction. The plant employs about 200 persons. Brierley said no organizational changes are contemplated. Isolated proteins, on which ADM has done extensive research, are versatile ingredients of many industrial and food products. They are produced from soybeans by a series of chemical extraction and purification processes. Largest present use of the proteins is an adhesive in the manufacture of high grade printing papers, while another major market is as an...
emulsion stabilizer in water base paints. The proteins also have numerous applications in foods such as soups, icings, meringues and baby foods.

“ADM has two other plants in Ohio, a chemical manufacturing facility at Ashtabula, and a foundry products plant at Cleveland. The company is one of the largest processors of agricultural commodities, ranking as a major manufacturer of vegetable oils, flour, chemicals, resins, industrial cereals, and plasticizers with 147 plants and elevators in the United States and manufacturing operations in several foreign countries.”


• Summary: The plant where ADM produces isolated soy proteins is another step in the Minneapolis [Minnesota] company’s diversification program. The isolates are ingredients of many industrial and food products. Their lowest present use is in adhesives employed in the manufacture of high grade printing papers. Another major market is water base paint, where the soy proteins are used as emulsion stabilizers. The Evendale plant, which ADM purchased from The Drackett Co. of Cincinnati, employs about 200 persons. A aerial photo shows the plant.


• Summary: Contents: Introduction. Isolated soy protein compared to soy flour. Availability and forms of edible soy protein isolate: Soy protein and soy proteinate, modified forms of soy protein isolate, partial isolates of soy protein and by-products. Properties of unmodified isolated soy protein: Methods of dispersing protein and proteinate, viscosity behavior—effect of high temperature, flavor. Nutritional value of edible isolated soybean protein: Nutritional value for human beings and animals (isolated soy protein, soybean oil meal, soybean curd, and Oriental products), amino acid composition, supplementation (mutual supplementation, isolated soy protein as a source of lysine). Food uses of edible isolated soy protein: Dairy-type products (including recipes for All-vegetable coffee “cream,” All-vegetable whipped topping, All-vegetable “cream cheese,” Non-milk chocolate frozen dessert [ice cream], All-vegetable high-protein chocolate drink, All-vegetable high-protein non-starch chocolate pudding) meat-type products (including recipes for All-vegetable “meat loaf,” and All-vegetable “frankfurters”), baked and cooked products based on dough, cereal-type products, macaroni-type products, oriental-type foods, specialty foods, confections and preserves, coatings, feed uses, modified soybean protein products, summary and conclusions.

Pages 400-401: Several types of edible isolated soybean protein... have already appeared in the United States market in both commercial quantities and pilot amounts. They range in price from 28 to 90 cents per pound (1957).

Note 1. The name of the manufacturer of this edible isolated soybean protein is not given. However hints on page 402 suggest that it was either The Glidden Co. (Chicago, Illinois), The Drackett Products Co. (Cincinnati, Ohio), or Gunther Products, Inc. (Galesburg, Illinois).

Note 2. This is the earliest English-language document seen (Dec. 2015) that uses the term “soy protein isolate” (or “soy protein isolates”) or the term “edible soy protein isolate” (or “edible soy protein isolates”) to refer to its food uses. However Circle generally prefers the term “isolated soy protein.”

Pages 401-02: “Modified forms of soy protein isolate: There are also available modified, hydrolyzed, isolated soy protein products, about which there has arisen some confusion. Soy protein mildly hydrolyzed with alkali (Circle et al. 1952, U.S. Patent 2,588,392) is used in many industrial applications (Burnett 1951, vol. 2, chap. 24), mainly for its adhesive properties. It is not recommended for food uses, since its nutritional value has been damaged to some extent, and its physical properties adversely modified for some food applications. (See also Chapter 10.)

“The enzyme- and acid-hydrolyzed types (Burnett 1951, vol. 2, chap. 23) are usually extensively hydrolyzed and can no longer be considered proteins. The enzyme-hydrolyzed soybean protein products are sometimes referred to by the misnomer soy albumen, although they are mainly polypeptides; they are employed in food products chiefly for their whipping properties. They have, however, some disadvantage flavorwise unless used in relatively low concentration. The acid-hydrolyzed types are mixtures of peptides and amino acids high in content of monosodium glutamate, have meat-like flavors, and are used mainly as condiments; the latter must compete in price with similar products made from corn and wheat glutens.” Address: The Glidden Co., Chicago, Illinois.


• Summary: “Soybean oil meal is an excellent source of growth promoting as well as antiperotic factors for turkey pouls, and these can be concentrated in methanol extracts of soybean oil meal (Kratzer et al., 1959).”

Table 1 shows the effect of the following supplements on the growth and perosis of turkey pouls in three different diets fortified with different amounts of zinc: None, soysterols, stigmasterol acetate, Beta-sitosterol, stigmasterol acetate + Beta-sitosterol, genistin, and methanol extract of soybean oil meal. Purified diets containing isolated soy protein (Drackett C-1) were used. Only the methanol extract
gave a significant growth response (16-21%), however it improved perosis only when the diet was supplemented with zinc. The growth promoting behavior of the methanol extract is associated with its acetone insoluble fraction which contains phospholipids, and sterols in free, fatty ester, and glucoside form.

All of the diets fortified with 83 parts per million of zinc reduced perosis significantly. Note: This is the earliest and only document seen (April 1996) that contains the word “soysterols.” Address: Univ. of California, Davis, CA.

94. Product Name: Adpro Isolated Soy Proteins (Industrial) [112, 220, or 410].
Manufacturer’s Name: Archer-Daniels-Midland Co.
Manufacturer’s Address: 735 Investors Building, Minneapolis 2, Minnesota.
Date of Introduction: 1959.
New Product–Documentation: Ad in Soybean Blue Book. 1959. p. 95. “Some ADM products from soybeans.” Seventeen products are listed, including “Adpro isolated soy proteins.” Note: In July 1957 ADM purchased The Drackett Co., and their factory for making isolated soy proteins. This marked ADM’s entry into soy isolates. Both of these Adpro products are industrial soy protein isolates. Adpro 220, of high viscosity, is recommended for use in latex paints or as an adhesive. Adpro 410, of low viscosity, is most widely used in high-solids paper coatings and board coatings. Adpro 112 is a medium viscosity material.


Page 227 states that the Ford Motor Co. has pioneered in the spinning of soy protein into fibres. Production was begun in 1939 and reached more than 3 tons a week by 1942. The fiber was used for making car upholstery. Production was taken over in 1943 by The Drackett Products Co. of Cincinnati, Ohio, but discontinued after a few years. Address: Ph.D., F.R.I.C., England.

• Summary: This brochure, with a red protruding tab that reads “Adpro 220” has a red, white and blue cover with the large logo, including an illustration of an archer, and the company name and address in Ohio. Adpro 220 is an industrial soy protein isolate, recommended for use in latex paints or as an adhesive. Contents: Accent on science. Adpro isolated soy proteins. Specifications and uses. Preparation of alkaline dispersion. Preparation of short mixing type dispersion (Sodium hydroxide as solubilizing alkali). Preparation of long mixing type dispersion (Sodium hydroxide as solubilizing alkali). Preparation of long mixing type dispersion (Bleaching agents and fluidizing agents). Preparation of short mixing type dispersion (Potassium hydroxide as solubilizing alkali). Viscosity data. pH characteristics of Adpro solutions. Methods of controlling foaming. Preservatives. Fluidizing, buffering and bleaching agents.

On the title page is a half-page black-and-white aerial photo of ADM’s soybean processing plant in Evendale, Ohio—“Source of Adpro isolated soybean proteins.” Below that are listed three types of these proteins: Adpro 112—A medium viscosity material. Adpro 220–A high viscosity material. Adpro 410–A low viscosity material. On page 2 are large photos of ADM soybean plants at Decatur, Illinois, and Mankato, Minnesota (built in 1950).

The section titled “ADM Products” (p. 4) states: “ADM was founded in 1902... It is the nation’s largest flax crusher and producer of core oils and other additives for the foundry industry. One of the three largest soybean processors in the country...”

The section titled “Soybeans” (p. 4) states: “Since ADM first started processing soybeans during the ‘twenties’ [1920s], it has pioneered in many new developments. In 1934 it introduced solvent extraction processing to this country. In 1949 it marketed the nation’s first 50% dehulled soybean meal. Throughout the years ADM has been a constant leader in perfecting and popularizing industrial and edible soy proteins and oils.

“During the past several years ADM has devoted considerable pioneering research to the isolated soybean protein. The results of this effort led logically to the purchase of the Drackett Company, Evendale, Ohio, in July 1957. ADM also has large, modern soybean plants at Decatur, Illinois, and at Mankato, Minnesota.” Address: 2795 Sharon Rd., [Evendale near] Cincinnati 41, Ohio. Phone: PRinceton 1-3220.

• Summary: “Robert A. Boyer has been named technical director, protein products sales, in the soybean division of the Ralston Purina Co., it has been announced by Donald B. Walker, Purina vice president in charge of the soybean division.

“Mr. Boyer will headquarter at the company’s general office in St. Louis. For the past 2½ years he has been serving
as consultant to Purina on a full-time basis. His work has been in product development and technical sales in the special soy products department. He will continue in that field, working with Wayne E. Tjossem, manager of the special soy products department.

“Mr. Boyer has been a consultant in the edible protein field since 1949, serving a number of large food manufacturers both in the United States and Europe. He developed and patented the technique for producing man-made edible protein fibers to be used in the fabrication of food products. The process developed by Mr. Boyer has far reaching implications in the food field. For the first time it makes possible the fabrication of food products to specifications, since now protein is prepared in a form that can be engineered into any desired form of human food.

“Mr. Boyer’s career in research and product development goes back 35 years... In 1930 Mr. Boyer joined the Ford Motor Co... From 1943 to 1949 he was research director for The Drackett Co., Cincinnati, Ohio. Mr. Boyer and his wife and family have moved their home from Cincinnati to St. Louis [Missouri].”


• Summary: “Francis E. Calvert, nationally known chemist in the industrial protein field, has joined the staff of the special products research laboratories for the Ralston Purina Co. Mr. Calvert will headquarter in the company’s research laboratories in St. Louis and will work with W.B. Brew, manager of the special products research laboratories. He will be concerned with research in the utilization and production of isolated soy protein for industrial and edible purposes. He will also engage in customer service work. He assumed his new duties Nov. 5.

“Since 1957, Mr. Calvert has been technical director, Evendale operations, for Archer Daniels Midland Co. at Evendale, Ohio. Prior to that he was research director for the Drackett Co. in Cincinnati. His principal fields of research have been organic and polymer chemistry.”


• Summary: “The deal involves an exchange of Bristol-Meyers stock for Drackett stock and will aggregate more than $150 million.”

Drackett’s headquarters will remain in Cincinnati. Bristol-Meyers has long had its headquarters in New York.

Drackett makes and markets household products including Windex, Drano, Vanish and Endust. The company employs about 1,500 persons. Sales in 1963 were more than $50 million.

Note: The acquisition was apparently finalized in Nov. 1965.


• Summary: “A plan for the reorganization of the Drackett Co. with the Bristol-Myers [sic] C. was approved Tuesday when Drackett shareholders agreed on an exchange of 100 shares of Drackett common stock for 46 shares of Bristol-Myers common. Stockholders also approved a plan for liquidation and dissolution of the Drackett Company.”


• Summary: William T. Atkinson invented the method for manufacturing textured vegetable protein (TVP), a new and versatile soybean-derived food. “Atkinson started his soy research in the 1930s when he developed an automobile upholstery fiber from soybean meal while working for Henry Ford. He continued with the fiber operation after it was sold to The Drackett Co. and moved to Archer Daniels Midland Co. when Drackett sold the agricultural portion of its business to Archer Daniels.” Atkinson is now active in other area’s of ADM’s food research program. A photo shows William T. Atkinson.


• Summary: Henry Ford had an eye for promising young men. And two of Ralston Purina’s key research men, Frank Calvert (R&D director for new venture management) and Bob Boyer (senior scientist, central research) received a truly unique education.” In 1930 the new Chemical Laboratory opened in Greenfield Village; Calvert and Boyer were among the 15 boys from the Ford Trade School, Henry Ford’s technical school in Massachusetts, who were chosen to work there. Boyer, age 21, who had attended the Ford Trade School [at the Rouge Plant in Dearborn, Michigan] from 1927 to 1930, was put in charge of the project. After deciding to focus on soybeans in 1931, they developed a process for extracting soybean oil. Every morning at 8:00 sharp, Henry Ford used to appear at Boyer’s office to see how his pet project was going.

“In 1938 Frank Calvert joined The Drackett Company in Cincinnati [Ohio], and he was followed in a few years by Boyer. ‘At Ford we were trying to make synthetic wool out of [soy] protein but the war cut these efforts short,’ says Boyer.

The work on ‘soybean fabric’ continued at The Drackett Company during the early 1940s. ‘We tested the wool fabric for salt content and other factors and one day—I’ll never forget it–it occurred to me that if we could make something for the outside of man, why not for the inside.’ That’s how it came about that in 1949 Bob Boyer filed the patent for edible soy protein fiber.

“He obtained the use of a textile pilot plant and hand made samples of ‘synthetic meats.’ Later that year, armed
with a soy protein ‘ham loaf’ he contacted Worthington Foods, a firm making meat substitutes for people who shun meat for religious, health or other reasons. ‘If they hadn’t shown interest I probably would have dropped it because I had no income at the time.’

‘Swift was the first company to take out a license on the patent and Worthington followed not far behind. Soon several companies were licensed to use the patent and Boyer was kept busy with consulting work...

‘In 1957 The Drackett soybean operation was sold to Archer Daniels Midland, and Calvert became technical of their protein operations. The paths of Boyer and Calvert crossed again in 1962 when they both joined soybean research activities at Ralston Purina. Boyer had worked as a consultant to Purina when the company began investigating industrial and edible uses of soybean. When he joined the company he assigned his patent ownership to Purina.’

‘‘Back in the 1930s many people thought our work was crazy,’ recalls Boyer. ‘But Mr. Ford was shrewd enough to know’ better. ‘The best thing he did was to help popularize the soybean.’”

Photos show: Calvert and Boyer, together and separately. The automotive products made at Ford’s lab being displayed in New York in 1931; Calvert and Boyer are present. Boyer and Ford conversing. Ford and Boyer standing behind the famous white “plastic” car.


• Summary: A brief chronology of major food and industrial developments with soy proteins from 1917 to 1969.

“From fertilizer and cow feed, glues and plastic Fords to spun fibers and meat analogs is the story of soy protein uses from 50-some years ago into the future.

“This ‘bean hull’ sketch of studies on meal and protein uses in the U.S., excluding whole beans and full-fat products, begins in 1917. W.J. Morse described ground soy cake as yellow, with a sweet, nutty flavor and containing 46% to 52% protein and 5% to 8% oil. ‘Considerable quantities’ of domestic meal were going into fertilizers; value in stock feed was ‘well established’ by practical experience and research and ‘extensive tests’ had been conducted by USDA in making bread and pastry. Morse used ‘soy-bean meal’ and ‘soy-bean flour’ interchangeably in the Yearbook article.

“1926 Soy glue industry founded by I. F. Laucks (Soybean Digest, May 1942). Yearbook dropped reference to fertilizer use. Stated food use ‘has been very limited.’ Implied livestock feed was chief use.

“1933 Research had established soy protein has good amino acid balance. Meal used in feed for hogs, sheep, dogs, rabbits as well as cattle; oil content satisfactory for hogs. ‘Considerable quantities’ of meal going into glue for veneer, plywood, insulating materials, water paint, bakelite substitute. Meal used in ‘flour’; diabetic, health, and breakfast foods; malted milk.

“1935 Commercial isolation of protein for paper coatings.

“1938-47 Soy protein plastics, basic and applied studies at Urbana Soybean Lab. and Northern Lab., Peoria. Items that follow are USDA utilization research developments if not otherwise identified.

“1939-41 Protein precipitation from water-alkaline dispersions, basic to commercial development of protein isolation.

“1940-41 Plastics, fibers by Robert A. Boyer, Ford Motor Co.

“1942 Heat denatured protein in meal.

“1942-44 Soy protein adhesives for wood, paper.


“1946 Water-soluble protein by Borden Co.

“1948 Edible isolates by Central Soya.


“1950 Swift & Co. launches research leading to improvement patents on vegetable protein in food, films. Cold-setting glue.


“1952-61 Defatted, full-fat soy flours in bread.

“1954 Protein adhesives. Flash desolventizing minimizes protein denaturation.

1955-58 Toxicity of trichloroethylene-extracted meal.
1956-57 Gelsoy in sausages.
1959 Whey proteins.
1959-61 Amino acids of meal, protein, hull.
1961 Soy sodium proteinate whips and gels.
1963 Purified soy protein.
1964-66 Studies on growth inhibitors, saponins. 70% protein concentrate by Central Soya.
1965 Soy protein glue for southern pine plywood.
1969 General Mills wins 20th Kirkpatrick Chemical Engineering Achievement Award for soy protein meat analogs.
1970 Soy protein isolate replaces milk solids in Central Soya’s frozen all-vegetable dessert. Industrial research increases.”
Photos show, from left: (1) Soy protein adhesives in shotgun shells, A.K. Smith and Glen Babcock, Northern Lab.
(2) 1966 General Mills launches research leading to meat analogs. (3) Typical entrees made from textured vegetable protein. Photos (2) and (3) courtesy General Mills. (4) 1944 Isolated soy protein produced in Northern Lab pilot plant by alcohol extraction. Address: Peoria, Illinois.

• Summary: One of the best articles seen summarizing Henry Ford’s work with soybeans.

“... 30 years ago Ford unveiled the first car with a complete plastic body, thereby paving the way for 100 to 110 pounds of plastics to be built into today’s autos.

“Ford’s research into plastics was tied in with his promotion of farm chemurgy—an emerging agricultural concept which strove to put chemistry and allied sciences to work for agriculture—which in turn was keyed to his life-long efforts to improve the lot of the farmer...

“Ford planted 300 varieties of the soybeans on some 8,000 acres of his Michigan farms in 1932 and 1933. He also urged neighboring farmers to plant the beans with the assurance that his company would provide a market for them. By 1933, the industrialist’s experimentation, at a cost of $1,250,000, had been rewarded with the discovery of soybean oil which made a superior enamel for painting automobiles and for oiling casting molds and a soybean meal which was molded into the horn button...

“Two years later a bushel of soybeans went into the paint, horn button, gear-shift knob, inside window riser knobs, accelerator pedal, and timing gears of every Ford car...

“By late 1937, Ford’s research laboratory—under the direction of youthful, self-trained Robert Boyer—had developed a curved plastic sheet which Ford hoped would replace steel in automobile bodies.” Ford unveiled his handmade car with complete plastic body on August 13, 1941, at the climax of Dearborn’s annual community festival.

Early in World War II, Ford tried unsuccessfully to interest the armed forces in making uniforms out of soybean fabric. He finally sold his fabrication process and machinery to The Drackett Company of Cincinnati in November 1943. “Neither Drackett nor any other firm has been commercially successful in producing textile fibers from soybean protein.

“Ford’s efforts to develop palatable foods and popularize recipes based on soybeans were no more successful than his experiments with fabrics. To develop the nutritional possibilities of the bean, Ford set to work his boyhood friend, Dr. Edsel Ruddiman, ex-dean of the School of Pharmacy at Vanderbilt University. Dr. Ruddiman prepared a soybean biscuit, described by one of Ford’s secretaries as ‘the most
vile thing ever put into human mouths’ (but which white rats liked and the auto king professed to like) and a variety of other recipes.”

“... few of Ford’s achievements pleased him more than to help prove that there was industrial magic in a beanstalk.”

“During 1939, Ford Motor Company imports of wool were close to 250,000,000 pounds—approximately 35% of the total used— with the bulk of shipments coming from Argentina and Australia. Fearful of losing trade with Australia because of Pacific conditions, Ford stepped up production of soybean fibers.”

Photos (from the Ford archives) show: (1) A tractor in a field of soybeans. (2) Henry Ford and Robert Boyer mixing ingredients. (3) Ford Soy Bean Processing plant, located in the River Rouge complex. (4) Cartoons about car bodies made from soybeans.

(5) A huge French Oil Mill hydraulic press in Ford’s River Rouge Tool & Die Shop stamps out a short run of soybean plastic trunk lids for experimental work in 1940. Henry Ford installed one on his personal car in 1941. (6) Henry Ford, dressed in coat and hat, swinging an ax at his 1941 trunk lid made of plastic for the press to prove that the lid was ax resistant. The plastic was made from several common crops, including soybeans, wheat, hemp, flax, and ramie. (7) Film star James Cagney examines a souvenir gear shift knob made of a soybean compound during a visit to the Ford Building at the 1935 California Pacific International Exposition, held in San Diego, California. The illustrated knobs were sold to visitors for a nickel each and are much prized by collectors today. (8) Henry Ford’s plastic car (white, with “Dearborn” written on the black license plate). At the wheel is Lowell Overly, the project engineer who designed the plastic body. The car was first unveiled to the public on 13 August 1941 at the climax of Dearborn’s annual community festival.

(9) Inside the Ford Exposition Building at the 1939 World’s Fair in New York. A turntable (called “the Ford Cycle of Production”) 100 feet in diameter is topped by a circular platform on which is displayed a new Ford, Mercury, and Lincoln-Zephyr. Soybeans were a prominent part of the display. (10) A male worker assembling a soybean plastic distributor rotor on a 1937 Ford V-8 engine. Soybean meal was converted into a resin and mixed with wood flour, stearic acid, and coloring, then shaped in high-pressure molds. (11) A lady worker doing final assembly on a Ford V-8 distributor coil, on 14 July 1937 at the Rouge River Plant. (12) Illustrations (line drawings) of a distributor coil, rotor, and distributor cap.

(13) Biscuits of soybean extract are being molded in 1937 into the upper and lower coil housing. (14) A workman spraying a 1938 Lincoln Zephyr with the very durable soybean enamel paint, which had been introduced in 1933. (15) A workman in about 1939 with a machine that makes soybean fiber for automobile upholstery. The process for making the fiber is described. (16) Interior parts for Ford cars cast from soybean plastic were used on the Zephyr, Mercury, Ford Deluxe (1940), and Ford Standard. These included door escutcheons (1938), gear shift lever balls (1939), etc. (17) Henry Ford and George Washington Carver, old friends, at Carver’s laboratory at Tuskegee Institute in 1938. Carver smiles as he enjoys one of the grass tidbits they developed. (18) Dishes made from soybeans, developed after 1934, published in the March, 1939 issue of Ford News. Soy bean recipes are included for: Nut bread (using 1 cup soy bean flour); waffles (using 1 1/4 cups soy bean flour); soy loaf (using 2 cups of soy cheese); croquettes (using 2 cups soy bean cheese); and salad (using 1 1/2 cups of boiled soy beans). (19) Henry Ford with his top executives at one of the daily roundtable luncheons at the wood-paneled Dearborn Engineering Laboratory. Dishes containing soy were often served at these meals. Address: Prof. of business history, Univ. Michigan, Ann Arbor, Michigan.


• Summary: This is a brief biography of Robert Boyer [mistakenly called “Robert Boyd” throughout], age 64. He predicts that within five years housewives will buy shrimp, ham, and filet mignon made from soybean protein. More than 40 years ago, during the Great Depression, he was hired by Henry Ford to find industrial uses for farm crops. World War I interrupted the experiments. Boyer resumed work at a laboratory in Cincinnati, Ohio [Drackett Co.]. and in 1949 he applied for his patent, which was issued in 1951.

Today Boyer is a part-time consultant to the Marshall division of Miles Laboratories (Worthington, Ohio); his patent for making edible protein fibers from soybeans expired in 1971. Yet he has done well. He is semi-retired, has a 57-foot cruiser, and condominiums in Florida and Columbus, Ohio.

Miles’ first products have been targeted at the vegetarian and health foods markets. One of Miles’ latest products is Morningstar Farms sausage, a frozen product made of soy protein, egg albumen, and wheat gluten. “The egg is a binder and the wheat makes it chewy.”


• Summary: Francis Earle Calvert was born in 1912 in Cambridge, Massachusetts. He was selected by Henry Ford to be part of a special group attending Ford’s Wayside Technical School in Sudbury, Massachusetts. There was no tuition— a Godsend during the Great Depression. Then he attended Ford’s Edison Institute at Dearborn, Michigan. Calvert’s introduction to the soybean came directly from Ford himself—in the early 1930s. One day the great
entrepreneur dropped in lugging a 100-pound sack of soybeans, saying that there must be something valuable in them since Orientals had been using them for 4,000 years. He challenged the young students to find out how to use them.

He and his young co-workers at the Greenfield Village laboratory had developed a destructive distillation process. It decomposed the soybeans using heat in a closed container. Later Calvert helped to design a new solvent extractor for soybean built like an Archimedes screw; it removed soybean oil using a counter-current solvent. Soon Calvert, and colleague Robert Boyer, were making spun protein fibers for upholstery in Ford cars, as well as plastic car parts.

Because soybeans were hard to get, the young men had to grow their own. They planted several thousand acres of soybeans, then had to develop mechanical equipment to harvest them. Now they set out to adapt them to human consumption. In 1936 the lab delivered fortified soymilk to Dearborn families, made a soy sherbet that was sold in the Ford employee cafeteria, and canned green soybeans for use as a vegetable.

Why do soybeans have a bitter taste? Its a survival mechanism.

The Drackett Corporation hired Calvert, and shortly thereafter they purchased the Ford Textile Fiber Division. They put Calvert in charge of basic protein research. In 1949 he was appointed research director at Drackett. In 1962 Calvert joined Ralston Purina Co. in special soy products research. He retired in Aug. 1973. Address: Product Mgr., Food Protein Div., Ralston Purina Co.


**Summary:** "Shortly after the turn of this century, there appeared on the American scene one of the first examples of a food product based on a processed plant protein. Dr. John Harvey Kellogg, in an effort to add more vegetable protein to the menu of his famed Battle Creek Sanitarium [in Michigan], developed a method for producing wheat gluten from ground wheat and converting it into an attractive entree resembling a cut of meat."

Yet long before, people of the Orient have obtained a major portion of their protein from bean curd or tofu. There follows a good history of modern soy protein development from 1930 to the present. In the “late 1950s, the first edible soy protein plant went on stream in Chicago [Illinois, where Central Soya made Promise]. This was followed a few years later at another edible plant in Louisville, Kentucky [owned by Ralston Purina Co.]. Soon products began appearing on the marketplace listing ‘soy protein’ or ‘vegetable protein’ in their ingredient lists... This triggered a rapid growth in the plant protein industry starting in the mid-1960s... To summarize, it can be said that the first 65 years were the hardest for this new industry, but after that the progress was irresistible. Nothing is as powerful as an idea whose time has come."

A portrait photo shows Boyer, who “attended the Edison Institute of Technology before serving as Manager of the Soybean and Chemurgic Laboratory, Ford Motor Co. from 1931 to 1943. He spent the next six years as Director of Research for Drackett Co. Boyer worked as a Protein Consultant for the next 13 years with such companies as Swift and Co., Unilever Ltd., Worthington Foods Inc., Nabisco, General Mills and Ralston Purina. In 1962 he joined Ralston Purina as Protein Scientist. He served in this capacity until his retirement in 1971, at which time he assumed his present position.” Address: Protein Consultant, Miles Laboratories, Inc., Elkhart, Indiana, 46514.


**Summary:** When Robert Boyer was 14 and Henry Ford was about 60, they met ice skating in the winter on the frozen pond behind the Wayside Inn in Sudbury, Massachusetts. Ford owned the Inn and Boyer’s father was the manager. Skating and talking over 3 winters, they became friends. As Boyer’s high school graduation approached, Ford asked the young man about his plans. Boyer said he was going to Dartmouth college but didn’t know what he was going to study. As Boyer recalls, Ford then said: “Tell you what, Bob. Why don’t you come out to the (Michigan) plant, spend some time in each of our divisions until you decide what you want to do and then go to college.”

“Boyer leapt at Ford’s offer to return to Michigan where Boyer’s father had been office manager at Henry Ford Hospital, Detroit, before moving to Sudbury. Boyer’s return to Michigan was the start of a partnership that would produce the most publicized of the early efforts in solvent extraction of soybeans.”

In 1929, a few years after Boyer’s return to Michigan, Ford founded the Edison institute, as a “school for inventors.” Ford and Edison both believed that invention was 99% perspiration and 1% inspiration. Ford asked Boyer, then age 21, to be director of the institute. “The automotive giant told him, ‘We’ll bring the best and brightest of the (River) Rouge Trade School students over here and give you problems to get you in over your head,’ Boyer recalls. If you run into something where you think you need help, we’ll call down to Ann Arbor and get some professors up here as consultants.’

‘“We should call this the “Place for Damned Fool Experiments,”’ Ford said. ‘We don’t want you to look at anything smaller than an elephant.”’

When the Great Depression struck, Ford wanted to do something to aid farmers, who were among the hardest hit. “If we expect farmers to be our customers, then we (industrialists) must become the farmer’s customers,” Ford was quoted as saying at the time.”

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Surrounding farmland was planted to various crops and each day when the young men arrived at the three-story wooden building housing the institute they would find a truckload or two of some crop (such as tomatoes, potatoes, or soybeans) for them to analyze. Before long, “soybeans emerged as the best farm crop candidate for industrial use.”

“By 1933, Ford had 8,000 acres planted in soybeans; by 1936 it would rise to almost 60,000 acres, the largest soybean barony in the world at the time (as the New York Times described it).”

Henry Ford wanted a Model T type extractor. “One which an individual farmer could operate so that in the summer he could work on his farm and in the winter could run the extractor. Ford’s production-line outlook was seeking a way for the farmer to use profitably all his time. The Ford extractor—which could be run by one man—was the result. The horn-angle flaker, for which Ford and Boyer received the patent, may yet be used commercially, Boyer says. The extractor could process six tons of [soy] beans a day.

“Was the experiment profitable for the automotive firm? ‘The enamel base paint paid for all the research all by itself,’ Boyer says. ‘Before that, all finishes [body paints] were lacquer requiring several coats with hand polishing. It was a costly and time-consuming process.’”

“The Edison Institute continued its work into 1943 when war production requirements led Ford to shut it down. At its peak, the institute had 100 persons on the staff with perhaps 20 key staffers, Boyer estimates. The soybean research section was purchased by The Drackett Co. in Cincinnati [Ohio]. Boyer stayed with Drackett until heirs of the owner decided to disband the research unit.

“Ford’s efforts, however, had commanded nationwide publicity, even international through World’s Fairs. The continuous solvent extraction process was among the first in the United States for commercial purposes, even if it was on a limited scale by today’s standards.”


• Summary: The Henry Ford Trade School was not the same as the Edison Institute of Technology. Boyer attended the Trade School.

In the mid- to late-1930s Henry Ford held several luncheons where the press and other famous or influential people were invited. He served a complete meal from soup to nuts. Out of these events came a 19-page booklet published in about 1936 by the Edison Institute and titled “Recipes for Soy Bean Foods.” The purpose of these meals was to popularize soybeans and thereby to help farmers. But Ford was most interested in finding industrial uses for farm crops. He was deeply interested in the fact that soy had been used in the Orient for so long by millions of people as a key source of protein in the diet. But he had been interested in health before he got interested in soybeans. Still, he was very involved personally with soybeans as foods; he used them a lot in his own diet.

Ford grew his own soybeans on over 10,000 acres he bought in southern Michigan. The idea was not to help farmers by buying their beans but to encourage farmers to grow soybeans then process them in small-scale solvent extractors on their own farms. Eventually this village industry concept proved to be uneconomical so it was abandoned.

In about 1932 Ford set up his first solvent extractor near the River Rouge plant. About a year later he set up a plant to make soy protein isolates from the meal produced by the solvent extractor. In about the mid-1930s Ford built a soymilk plant in Greenfield Village. It was just a demonstration plant that made several hundred gallons of soymilk a day. The plant was part of the larger research effort; none of the milk was sold commercially. With the arrival of World War II, the process was taken by Bob Smith, one of the fellows who developed it, and used as the basis for a private plant [Delsoy Products] in Dearborn where he sold a lot of soymilk for use in whipped toppings, baked goods and frostings. It was quite successful. A big bakery in Detroit used a lot of the topping. As a result of that, the Rich Products Co. in Buffalo, New York, started making the same type of product and became very big. One of Bob Smith’s workers [Holton “Rex” Diamond] went to Rich Products and made a big success of it. Rich is very well known; they also make coffee creamers.

Henry Ford was not a vegetarian. He ate like most Americans at the time, and he ate many steaks—even though he knew meat was not the best thing for you. Mrs. Ford suffered from arthritis and he sought diets to help her.

World War II killed the idea of the plastic car. The company would have needed to spend lots on dies to make it commercial. Also each plastic body took too long to produce; it had to cure for 3 minutes in the die. Young Henry Ford II threw out everything [not directly related to automobiles] that his grandfather was interested in. General Motors was actually the first company to make a commercial car with a plastic body–the Corvette, whose body was made of fiberglass.

Edsel Ruddiman was the man who got Ford interested in the food side of soybeans. Ruddiman was quite old. He had his own lab (which he got in about 1930-31) and was a very good scientist. He and Boyer worked closely together since their labs were nearby.

Ford grew 10,000 acres of soybeans in southern Michigan. Ford set up his first solvent extraction plant in about 1932 and his soy protein isolate plant a year later. Ford was personally very involved with soyfoods. He used them a lot in his own diet. He built a soymilk plant in Greenfield Village in the mid-1930s as part of his research efforts. He made several hundred gallons a day. The milk was not sold
commercially. After the start of World War II the process was taken over by Bob Smith, one of the fellows working on it. Smith built a private plant in Dearborn where he made the milk into frostings for use in baked goods. It was quite successful. A big bakery in Detroit used a lot of it. As a result of that, Rich Product Corp. in Buffalo, New York, got interested and eventually became very successful. One of Bob Smith’s workers, Rex Diamond, went to work for Rich. They also made non-dairy coffee creamers and milk.

Boyer was director of research for The Drackett Co. from 1943-1949.

Ralston Purina’s edible soy isolate plant was in Louisville, Kentucky. It was hard at the beginning to get people to use isolates. Mead Johnson started using an isolate in their infant formula. Address: 632 Edgewater Dr., Apt. 731, Dunedin, Florida 33528. Phone: 813-734-2415.


• Summary: Floyd Radford was head of Ford’s soy farms. At the Chicago World’s Fair the Ford exposition was producing soybean oil by solvent extraction of soybeans. The soybean oil was the sole fuel used to power a diesel engine, which ran an electric generator, which produced all of the electricity for the exhibit. It was very neat.

Boyer developed the first plant protein fiber in about 1938. That year the Ford Motor Co. had a machine to spin soy protein fibers at the World’s Fair in New York. He was aware of work in Italy spinning casein into fibers from reading technical journals prior to 1936. He used the term “spinning” because the textile industry uses that term to describe how rayon is produced. In both cases, a more correct term would be “extruding,” since the dope is extruded through spinnerettes.

Ford’s soybean fiber spinning pilot plant had a capacity of 1,000 pounds of fiber a day, but they probably produced less than that. They would send the fiber to the mill, where 1 part of soy fiber would be blended with 3 parts wool to make sidewall (not seat) upholstery, which got less wear and wouldn’t mark like cotton.

When making soy protein isolates, the fiber (insoluble cellulose) is removed during clarification by centrifugation; no one had ever been successful in removing it by filtration, which would be better. After dissolving the soybean meal in alkali, it is clarified by centrifugation, then precipitated. Practically the same process is still used to make soy protein isolates.

Just a few plastic trunk lids were ever made, and they were used only on demonstration or experimental cars; they were never part of commercial Ford vehicles.

When Boyer left Ford Motor Co. he went to work for The Drackett Co., which bought Ford’s soy protein operations. Mr. Drackett sold [actually shut down] his soy fiber spinning operation in 1949. Drackett later sold all its soybean operations to ADM. After Boyer left Drackett in 1949 he filed for his first edible soy fiber spinning patent the same year; it may have been granted in 1951. He applied for a new, expanded patent, with much broader claims to a food product manufactured form man-made protein fibers, in 1951; it was granted in 1954.

In Aug. or Sept. 1949 Boyer paid his first visit to Worthington Foods. Worthington was the first company to whom he disclosed what he was doing, and showed a sample of a prototype product (pork chops) made from spun soy protein fiber. He did not go to Swift initially because he had been advised to keep away from meat companies, which might buy then bury his patents. If Worthington hadn’t been interested in his spinning process when he first visited them, he might have just given up then. He wasn’t sure if it was a screwball idea or not. Moreover, he had been out on his own for almost a year and was running out of money. Worthington was excited with Boyer’s idea but they needed a source of fiber.

So Boyer went to the Virginia Carolina Chemical Co. (VCCC) in Taftville, Connecticut. They were spinning fibers for cloth and they allowed him to use their spinning pilot plant in 1949 to produce the first edible spun soy protein fibers for research purposes and prototypes; he was not employed by them. VCCC was interested enough to call in Corn Products Corp. (CPC), which was interested–but they said they wanted to use corn gluten instead of soy protein. Boyer said “Fine.” After the first successful run, using the VCCC pilot plant, CPC got very interested. Fibers were spun from casein, corn gluten, and soy. CPC bought the first license to his soy fiber spinning process for food use in 1949. They took an exclusive option on the license for 9 months. The first sale of edible protein fiber was made by CPC to Worthington Foods; the fiber was made of corn gluten. After working for a year with CPC, everyone in the project realized that the flavor of corn gluten was so horrible that it would never work in foods. So CPC converted to a non-exclusive license. Boyer, now a bit desperate and against the advice he had been given, decided to approached a meat company. He chose Swift & Co., which took an option immediately; they were the second company to license his patent and from 1950 to 1954 they retained exclusive rights to his patent. In about 1955 Swift converted to a non-exclusive, and Boyer immediately went back to Worthington to see if they were interested in a license yet. They were.

So after having waited 7 years, Worthington finally purchased a spinning license in 1956. At that time, Boyer began to spend 50% of his time at Worthington for a year after they took the license. Initially Worthington did not spin their own soy fibers since it was too expensive for them and they did not have much money at the time. Ralston Purina was well equipped to make these fibers for them. It was not until the mid-1960s that Worthington started to spin their
own fibers.


The original Bac*O’s were made from spun soy protein fibers. Today he thinks they are made from textured extruded soy flour. General Mills took a license from Boyer. They got 25% of his consulting time, Ralston Purina got 25% and Worthington got 50%. Bac*O’s came on the market in about 1965 and were a real sensation. It was the biggest thing that had happened with Boyer’s idea to date.

Loma Linda is now spinning soy protein fibers, as is some company in Japan—at least they used to be.

How big is the market for foods made from spun soy protein fibers? Boyer would guess at least $30 million a year. Worthington’s total sales was $20 million including gluten. Miles got Worthington a new plant shortly after they bought Worthington. Now Bayer owns Miles and Worthington. The Morningstar Farms line is not making the profits they would like it to make.

Note: This is the earliest English-language document seen (Oct. 2015) that uses the term “spin soy protein fibers.”

Address: 632 Edgewater Dr., Apt. 731, Dunedin, Florida 33528. Phone: 813-734-2415.


• Summary: www.soynfocenter.com/HSS/henry_ford_and_employees.php

A comprehensive history of the subject. Contents:


• Summary: The largest ADM crushing plant at Decatur has a capacity of 4,000 tons of soybeans a day. ADM Foods was formed in 1980. British Arkady first produced TVP in 1965, and was acquired by ADM in 1974.

Dates when ADM first started producing certain soy products: Edible soy oils, 1930; Food grade lecithin, June 1934; Full-fat soy flour, 1935 (still producing); Cereal soy blends such as CSM, WSB, 1965-66 (CSM production has been discontinued); Soy protein concentrate, 1976; Textured soy concentrate, 1977; Bacon-flavored TVP, 1970.

Midland Linseed Oil Co. was incorporated in 1902, then reincorporated as Midland Linseed Products Co. in 1912. William O. Goodrich Co., located in Milwaukee, Wisconsin, was acquired by ADM in 1928. Dr. J. Hayward began employment with ADM in Sept. 1935 and worked as Director of Nutritional Research until 1956, when the position of Director of Nutrition was created for him. He worked in this position until the late 1950s. In the early 1960s he worked as a consultant for the company. On 1 July 1957 ADM acquired a soy protein isolate plant from The Drackett Co. Note: That plant, located in Evendale [near Cincinnati] Ohio, made only industrial (not edible) soy protein isolates. Address: Decatur, Illinois.


• Summary: This history is compiled from 5 interviews conducted with Robert Boyer from Oct. 1980 to Oct. 1981.

One day at the Ford plant in 1942, Boyer, while sampling fibers of his “soybean wool,” realized that these same soy protein fibers, if made tender by omitting the protein denaturation, hardening, and insolubilization, could be used as a basic ingredient in making meatlike textured...
soy protein foods. Already he had developed an analog for the protein fibers that grow on the outside of a sheep (wool), why not develop an analog for those on the inside, a meatless meat or meat analog?

Throughout the years of World War II, the idea of using spun soy protein fibers as the basic of human foods, in the form of meat analogs, returned to Boyer again and again. In late 1943 The Drackett Co. in Cincinnati, Ohio (which had a fairly large soybean crushing operation and also made consumer household cleaning products such as Drano and Windex), purchased the Ford Motor Company’s soy protein and protein spinning operations. Boyer went with the equipment and processes to Cincinnati. Boyer, now Drackett’s director of research, told the company of his interest in producing foods from soy proteins, but Drackett was only interested in industrial products at the time. In early 1949 H.R. Drackett died; the company shut down its plant that was spinning Soybean Azlon fibers, and closed part of its protein R&D laboratories. Boyer left Drackett to work on his own.

On 28 September 1949 Boyer filed for his first patent on edible protein fiber (application serial no. 118,445). It was issued in 1951, then rewritten that year in a much broader format and issued in final form in 1954 (No. 2,682,466). According to this patent (which expired in 1971 and has come to be regarded as a classic), no one can use a man-made protein fiber in a food without violating the basic claim. The patent called for the use of various proteins (including soy, casein, and peanut protein) to make edible protein fibers that could be transformed into meat analogs or extenders that are low in saturated fats and virtually free of cholesterol.

In September 1949 Boyer took his patent idea to his first company, Worthington Foods, Inc., a small company in Worthington, Ohio, operated by a group of businessmen and doctors, that produced meat analogs and vegetarian foods primarily for Seventh-day Adventists and Adventist institutions. Boyer had now been on his own for over eight months and was almost out of money. He still wasn’t sure of whether the whole idea was a screwball one or not. He later commented that if Worthington had shown no interest, he probably would have just given up then and done something else. Advised to keep away from the large meat companies, who might buy up the patent and “bury” it, he went to Worthington and disclosed his concept and a pork chop prototype. Mr. Hagle, president of Worthington, was immediately very excited with the idea, but the company was reluctant to take a license until there was a source of soy protein fiber. Harrison Evans, a top Worthington employee, later recalled: “I’ll never forget the day Bob Boyer came by. They brought him down with this textured protein wrapped in a piece of aluminum foil and all it looked like was rope. Just unattractive, white... It certainly did not look like real meat.”

Worthington waited, so Boyer went to Virginia Carolina Chemical Company (VCCC) in Taftville, Connecticut; they were spinning fibers for textiles and Boyer hoped they would be able to produce soy fibers for Worthington. VCCC allowed Boyer to use their protein spinning pilot plant for research; he provided his own materials. Here he made the world’s first edible protein fibers, which were used to make meat analog prototypes. Incorporating egg albumen binder plus vegetable fats and flavorings into the spun fibers, he fabricated the first man-made meatless pork chops and then made hams from soy protein. After the first successful run, nearby Corn Products Company (CPC) got very interested and ended up buying the first license on Boyer’s patent (an exclusive option), which gave Boyer his first income from the project. Boyer then consulted for CPC for 9 months. The first sale of commercial edible protein fiber (produced from corn gluten) was made by CPC to Worthington. Eventually, however, it was realized that corn gluten would not work well in foods because of its unpleasant and dominant flavor. The project was dropped. Continued. Address: 632 Edgewater Dr., Apt. 731, Dunedin, Florida 33528. Phone: 813-734-2415.

• Summary: William T. Atkinson, the inventor of TVP, retired in 1976 as “senior research chemist for the Decatur-based Archer Daniels Midland Co. At age 72, he is a consultant to ADM. In 1970, he patented the TVP process... He later assigned the patent to ADM. Many companies, including A.E. Staley Mfg. Co., Cargill and Ralston-Purina, have purchased rights to use the process. The first products using the TVP process were sold in the early 1960s. They did not become common in grocery stores until the 1970s... Since about 1950, Atkinson had been researching ways to convert soybeans into food for human consumption...

“In 1935, the Detroit native went to work for Henry Ford. He and other researchers in Ford’s Greenfield Village developed a soybean-based fiber which was used for such products as automobile upholstery, clothing and, during World War II, felt... The soybean operation, and Atkinson’s services along with it, were sold in 1943 to The Drackett Co. and moved to that company’s Cincinnati, Ohio, facility. Atkinson began working for ADM in 1957 when it purchased Drackett’s agricultural division. He moved to Decatur in 1969. Drackett shifted its soybean research efforts to food applications in about 1950. This was because of the development of new synthetic fibers which were superior to soybean-based fiber in making clothing and other non-food products. As a result, Atkinson’s research effort shifted.” A photo shows Atkinson. Address: 852 Karen Dr., Decatur, Illinois 62526. Phone: 217-877-9048.

soybeans and soyfoods, and the invention of TVP
(Interview). Conducted by William Shurtleff of Soyfoods
Center, Nov. 26. 6 p. transcript.

• Summary: In 1935 he began to work on soybeans with
Robert Boyer under Henry Ford. He isolated proteins
from the soybean and attempted to manufacture Azlon, an
artificial wool, from spun soy protein fibers. Atkinson did
the developmental work and spun the original soy protein fibers.
Boyer’s work was to maintain the research lab and staff for
Henry Ford, who made his office in the building. Henry
Ford at that time was chairman of the board and had a lot of
time to devote to agricultural research. His son, Edsel, was
president of the company.

From 1935 to 1949 he worked with soy protein fibers
to make fabrics, and developed molded industrial plastics.
In 1949 he made a major switch to developing foods made
from soy protein. Starting in 1949 he developed a food
grade isolated soy protein in powdered form at Drackett.
He thought it was an excellent product with potential
applications in products such as Gerber’s Baby Food,
malted milks, etc. This was the original food-grade isolated
soy protein. After a lot of market research they found that
nobody was interested in a food grade soy protein, even if it
tasted good, and was the right color and price.

Atkinson began to work at ADM in 1957 when ADM
purchased Drackett’s Agricultural Division. In 1958-59
ADM started selling this soy isolate to Consolidated Foods
in Texas; it was quite satisfactory and practical. In about
1959 ADM made the mistake of selling about 25 pounds
of it to some company that was working with Pillsbury to
incorporate soy protein isolate granules into a chili product
for Pillsbury. One year later they received notification from
Swift and Ralston Purina that the product could no longer be
patented because a year had elapsed since it was first sold.
Discouraged, they began research on other ways of making
foods from defatted soy flaks.

In 1961 he started extruding his isolated soy protein into
plexilamellar material. Initially he used a rubber extruder,
then changed to a plastics extruder. But ADM failed to patent
the extruded isolates since they were basically a commodities
company with little knowledge in this patent area. No patent
attorney or department was connected with the research
group until about 1963.

Work on extrusion of defatted soy flaks started in about
1961.

Note: As of May 1991 William Atkinson was still alive
but he had Alzheimer’s disease and was unable to talk.
Address: 852 Karen Dr., Decatur, Illinois 62526. Phone: 217-
877-9048.

on soybeans (Interview). Conducted by William Shurtleff of
Soyfoods Center, Feb. 19. 3 p. transcript.

• Summary: Francis (Frank) Calvert was first introduced
to soybeans after he went to Detroit. In about 1931, Ford
arrived at the Chemical Plant in Greenfield Village (also a
lab and a pilot plant), with a 20 pound sack of soybeans. He
threw them on the workbench and said, “More people eat
these than anything else. There must be something awfully
good about them. Why don’t you fellows find out what it is.”
They were already doing research on agricultural wastes and
chemurgy, on almost every crop you could think of.

Their first problem was getting soybeans. There were
none available. Within the next year or two they planted
thousands of acres themselves. Ford plowed up a big field
and planted quarter acre plots with different varieties. It was
an enormous quantity. Even though they didn’t know what
to do with them, it was Ford’s style. He did nothing small.
They raised hundreds of quarter acre plots, testing different
varieties.

Dr. Edsel Ruddiman, after whom Edsel Ford was
named, was a nutritionist and pharmacologist. He ran the
food laboratory and made lots of the foods served in the
Ford cafeteria to Ford employees. They were first sold as
samples, but didn’t sell well because of the flavor. From
about 1932-33, the products included soy milk, soy cheeses,
and soy ice cream and sherbets. Soynuts were also made in a
counter-current fryer in rectangular buckets on a chain. The
employees ate most of the products and tourists consumed
some. Food was also served from the kitchen at the Wayside
Inn in the village. Products were provided as a snack, but
most were given as samples, and a few were sold.

Both Atkinson and Calvert, research chemists, reported to
Boyer. Calvert left Ford in 1938 and went to Drackett.
Boyer and Atkinson left later to do work on soy-based
plastics.

ADM bought The Drackett soybean crushing plant in
about 1957. Calvert went with ADM for about 5 years, until
1960-61. From 1962-74, he worked for Ralston Purina. In
December 1958 Ralston purchased Procter & Gamble’s
plant in Louisville, Kentucky, and were already somewhat
involved with isolates; they began working with foods after
1962.

Ralston went into dietary products and infant formulas
in about 1963-64, supplying soy protein isolates to most of
the infant formula manufacturers such as Miles and Wyeth
Labs. Ralston, Loma Linda and Worthington were the
biggest suppliers of infant formula from 1962-74.

Don Walker, Vice President of Ralston Purina, took a
strong interest in soy protein. Ralston took the lead primarily
because of the strong interest and leadership of Hal Dean,
then Chairman of the Board and CEO. Dean was the key
motivating force from the early 1960s. He firmly believed in
and supported soy protein development.

Ford was the father of the soybean industry in the U.S.
He had an impact just through his interest in soybeans. He
planted soybeans and promoted and merchandised them in
the same way he promoted the industrial barn at the World’s
Fair in Chicago. Ford set up an extraction plant and actually extracted oil and molded gearshift balls at the Industrial Barn at the Fair. People couldn’t believe their eyes! Ford was the single largest soybean grower in the U.S. at that time.

Note: Frank Calvert passed away in about 1986.

Address: 1513 Northlin, Kirkwood, Missouri 63122. Phone: 314-822-3187.


• **Summary:** This interesting history, containing many photos, was written for in-house use to update the company’s history and to commemorate the company’s 75th anniversary in 1985. Its pages are unnumbered.

“Washing Windows: In 1934 Roger Drackett, son of Harry who was then President of the Company, joined the family business. Roger immediately began working on the New York test market of a new product: Windex. Developed in the Drackett laboratories, the glass cleaner met a growing consumer need. New technology made glass production easier, and the use of glass in commercial buildings, homes and automobiles increased. Though glass was better, bigger, cheaper and clearer, it still required cleaning. Drivers needed a clear view of the road, office workers wanted more sunlight, and housewives regarded clean window panes as essential to a well kept home.

“Knowledge gained from marketing Drano benefited the sale of Drackett’s second cleaning product. Within three years Windex was in national distribution, and its success showed the quality of the product and the talent of Drackett salesmanship.”

“Another new venture begun in the 1930’s was soybean extraction. The Company’s goal was to provide raw materials from which other products could be developed. At the pilot plant, built in 1937, research led to the development of industrial proteins [probably Alysol] which could be used for manufacturing paints, adhesives, emulsifiers, and shoe polish. Scientists in the Nutrition Laboratory experimented with soybean products as animal feed.

“In 1940, Drackett completed building a soybean extraction plant and storage silos in Sharonville, several miles north of the Spring Grove Avenue headquarters. A year later the plant was operating round the clock producing soybean oil, and soybean meal for cattle feed. By 1945 Drackett was one of the largest soybean processors in the Midwest.

“In 1946 Drackett began using soybean products to make molding powder and plastic preforms for the molding industry. During this time Drackett research also developed a textile fabric, Drackett Soybean Azlon, which could be blended with rayon and either wool or cotton.

“Another soybean product Drackett marketed was Charge Dog Candy [Charge Candy for Dogs, launched in about 1949 and first mentioned in the 1949 annual report]. Its ingredients included soybeans and bone meal, and the product was to be used as a reward for training, as a special treat, and as a supplement to a dog’s regular diet [Apparently dog’s dated it].

“As in other industries, World War II strongly affected Drackett. The business suffered from limited raw materials, manpower, and equipment... The Company did supply soybean fats, oils, and protein food materials to the Department of Agriculture... Once the war was over, the company quickly grew. It nearly doubled in size—from 225 employees in 1942 to 522 in 1945. More growth resulted from public financing in 1944, which provided funds for additional equipment and research.”

“Although soybean extraction had helped the Company through World War II, post war conditions began to make the operation less profitable. In 1957 management decided to sell the Sharonville plant in order to concentrate Company efforts on researching, manufacturing, and marketing household cleaning products.”

A page of photos shows: (1) The Sharonville soybean processing plant with its new silos. “By 1945 Drackett was the largest soybean processor in Ohio.” (2) A sack of Ortho Protein, which had many industrial uses, including as a component for manufacturing shoe polish, paint, and adhesives. (3) A case of Charge Dessert for Dogs. (3) During World War II there was a shortage of cloth. Roger Drackett (left), his father Harry, Robert Boyer, and one other employee are shown “examining socks and a blanket made with Drackett Soybean Azlon. After World War II, the development of other synthetics made it less profitable to use soybean fibers for manufacturing cloth.”

In 1948 Roger Drackett became president and an era of expansion began. In 1948 The Drackett Company of Canada, Ltd. was established as a subsidiary to produce and sell Drano and Windex in Canada. In 1957 and 1958 Drackett made its first bid for the night time television audience with sponsorship of two of America’s favorite programs, “Wagon Train” and “Maverick.” By 1963 Drackett also had branches in West Germany, England, and Australia. In 1964 Drackett stock, which had been public since 1944, was first listed on the New York Stock Exchange. In that year sales were $58,476,246 and net profits were $5,053,679.

In 1965 Bristol-Myers acquired Drackett, marking the start of a new era. In 1968 marketing for Metrecal and Nutrament was transferred to Drackett from another Bristol-Myers division.

In 1972 Roger Drackett retired. His capacity for leadership and innovation was a powerful force in the history of the Company that his grandfather founded, and his father directed for 24 years. Roger charted the course of Company progress during the post war boom and through the transition as part of Bristol-Myers Corporation. Nicholas Evans, appointed President in 1969, now heads the Company as its Chief Executive Officer.
The History Of Drackett
Drackett products of the '80's
As of 1984, Drackett products that are first in their category include: Windex glass cleaner, Drano drain cleaner, Vanish bowl cleaners, Renuzit air fresheners, O-Cedar mops and brooms, Endust dust and cleaning aid, Nutrament fitness and energy food, and Twinkle, a paste cleaner for silver or copper-clad kitchen utensils. Address: Director, Public Relations, The Drackett Co., 201 East Fourth St., Cincinnati, Ohio 45202-4178. Phone: 513-632-1500.


• Summary: This is the transcript of an interview conducted by Dave Crippen of the Henry Ford Museum on 7 Feb. 1985 at Mr. Boyer’s home in Dunedin, Florida. It covers all aspects of Boyer’s work with soybeans at the Ford Motor Co., including: Growing up in Royal Oak, Michigan; his father worked in the accounting department of the Ford Motor Co. at Highland Park, Michigan (p. 1). Boyer’s first meeting with Frank Campsall (p. 2). Growing up at the Wayside Inn (the oldest hotel in America, in South Sudbury, Massachusetts, p. 1-6). Attending high school in Framingham, Massachusetts (p. 6). First meeting with Henry Ford when the two ice skated together on the mill pond behind the Wayside Inn (p. 7). Moving to Dearborn in Sept. 1927 to attend Ford’s Trade School (p. 7-11). Early work at the chemical plant (quarter-size model of Iron Mountain plant) in Greenfield Village (p. 12-13). Ford’s trip to Germany [Peace Ship to Europe, in 1915 during World War I?] crystallized a lot of his thinking. The Great Depression and the origins of his chemurgic thinking. In 1934 the first National Chemurgic Conference was held at Dearborn Inn; Boyer was in charge of the program. Mr. Irenée DuPont attended and Mr. Ford spent a lot of time with him. Before that, the DuPonts and the big banks did not trust Ford. (p. 14). Opening of Greenfield Village in late 1929 on the 50th anniversary of Edison’s birth. (p. 15). Chemical experiments on truckloads of farm crops using a retort; Frank Calvert (p. 16-19).

Experiments starting in about 1933 using hexane as a solvent to extract the oil from soybeans; the Ford Extractor (p. 20-23). Boyer’s group wanted to get pure protein from soybeans. So “in the lab we developed our own process for extracting the oil... We used hexane solvent, like dry cleaning. We’d flake the beans and run them through a pipe that was full of hexane on an angle with a screw in it.” Hexane solvent is “distilled out of petroleum. It has a very narrow boiling point–66° centigrade. The Ford extractor... got quite a lot of attention. We built it across the street from the chemical plant. It was about 150 feet away. Mounted it all by itself because everybody was afraid of fire.” A roof was built over it but no walls. It was probably built in about 1933.

In 1933 at the World’s Fair [sic, the Ford Exposition of Progress] in New York City, Boyer’s group had a glass model (on a table) of this extractor that used hexane solvent.

Note: Ford boycotted Chicago’s A Century of Progress Exposition which opened in 1933, in part to call attention to the company’s 30th anniversary; he held his own “industrial fair,” first in Detroit and then in New York, in late 1933. Business Week described it as “the greatest industrial show ever held.” Some 2.3 million people attended the two-week show in New York.

A working model of the Ford extractor, using hexane solvent, was at the Chicago World’s Fair, starting in mid-1934, in the Ford Industrial Barn. “They would never let you do that today. Too dangerous.”

Research on purified soy protein and soy plastics with formaldehyde; Bakelite (p. 24-25). Use of soy oil for foundry core binders for casting the Ford V-8 engine block; thus, the soy experiments are now commercialized. Building a 50 ton/day extractor (p. 26-27). Spinning soy protein fiber like rayon, based on spinning milk protein in Italy. Using the fibers to make wrinkle resistant synthetic wool, a suit of clothes for Henry Ford and others, overcoats, neckties, felt hats. “We also found that these fibers blended in very well with rabbit fur for making men’s felt hats. So the Hat Corporation of America took all the fiber we could make. It wasn’t very much and they would blend it in with rabbit fur. And they actually had them [the men’s felt hats] on the market.” Rabbit fur is very expensive (p. 29-36). Ford’s suit of clothes contained 65% wool and 35% soy fiber. Boyer leaves Ford Motor Co. in 1943. Problem with fiber was tensile strength, especially wet strength. Ford’s interest in this fiber work, and his fitness at age 75 (p. 37-38). Ford “was not a true vegetarian but he was pretty close” (p. 38). Edsel Ruddiman’s work with foods (p. 39-47). Boyer and Ruddiman attend American Soybean Assoc. soybean conference in Washington, DC [in Sept. 1932] where they saw “leather-like products that the Chinese make” [yuba]. Boyer tried unsuccessfully to use the idea to make “synthetic leather.” USDA’s experimental farm in Holgate, Ohio, where many soybeans sent back by W.J. Morse were tested (p. 40-42). Work with soybean milk (p. 43-46). The executive dining room in the Engineering Laboratory. Henry Ford invited Boyer to lunch there about 6 times (p. 45). Development of soy ice cream; lipoxidase enzyme inactivation (p. 45-46).

Visits to Battle Creek, Michigan and Dr. John Harvey Kellogg (p. 47). Boyer’s work was with industrial products; the plastic car and structural plastics with hemp, flax, and phenol formaldehyde (soya protein Bakelite resin) (p. 47-64, 70). Making trunk lids using a hydraulic press (p. 50). Ford’s famous axe demonstration on a trunk lid (p. 50-52). Lowell Overly and Joe Stewart (p. 53-56, 61, 78-79). Boyer drives the plastic car home (p. 63). Ford’s aim with the plastic car: to provide industrial markets for farmers (p. 65). World War
II stops plastic car development (p. 65-66). Contract to build an airplane wing of plastic (p. 66-70). The plastic lid and car contain little or no soy (p. 70). Fiberglass and the Chevrolet Corvette (p. 71). Plexiglas and the B-24 bomber made at Willow Run (p. 72). Edsel Ford’s death of stomach cancer in the spring of 1943 and its effect on his father, Henry (p. 73-74). Ending work with soy fiber (p. 74).

Boyer leaves Ford in 1943 and goes to work for Drackett Co. in Cincinnati, Ohio. Wife needs to leave Detroit. After 1943 Boyer’s career really takes off. Dr. Gangloff (p. 75-77). Use of soy fiber by Drackett in felt hats. “We sold them a lot of fiber and we decided to build a bigger plant.” Building a protein plant and a fiber plant in Cincinnati big enough to supply the hat company’s demands and larger “than we needed just to supply our fiber operation.” They also had a big operation in Cincinnati for high-impact (not structural) plastic (p. 78-80). Drackett’s marketing people knew how to market Windex and Drano “but they had no feeling for the soybean operation. So when Mr. Drackett died, they sold the whole soybean plant to Archer-Daniels-Midland (ADM, p. 81-83). Before Mr. Drackett died, Boyer’s division had developed commercial soy products, and Drackett was making money on the plastic (phenol formaldehyde plus hemp) and the fiber (p. 81). Use of soy protein as a paper coating (p. 83). ADM finally closes the old Drackett protein plant and sells it to Central Soya, which used the million bushel elevator capacity for storage (p. 83-84).

Shortly after Mr. Drackett died, Boyer left Drackett to work on his edible soy fiber, where he owned patents. “If we can make a fiber from soy protein that resembles the outside of a sheep, why not make a fiber that will resemble the inside (p. 84-86). Idea of building an edible soy protein plant is in Cincinnati, with Mr. Drackett’s approval (p. 87). Boyer tries to find companies to license rights to his landmark patent: Virginia Carolina Chemical (Taftville, Connecticut, p. 88); Swift & Co. (p. 89-92); Unilever, which was interested in peanut protein in Africa and at Port Royal near Liverpool (p. 92-94, 112-13); General Foods and Nabisco (Fairmont, New Jersey research lab) (p. 94, 99). Unilever and Swift pay licensing fees of $20,000 a year plus consulting fees. General Mills and Ralston Purina (p. 94-95). Why Swift dropped its interest (p. 95-96). General Mills and Bacos (p. 96). Patent expires in 1971 after 17 years (p. 96). Worthington Foods (p. 97). Ralston Purina was getting into protein. In about 1956-58 they “had bought Procter & Gamble’s protein plant in Louisville [Kentucky], which was making industrial protein for paper coating” (p. 98). Worthington Foods was too small to make their own soy protein fibers, so Ralston Purina made it for them (p. 78-80). Ralston Purina’s great success with edible soy protein and their small conflict: pet food vs. human food (p. 100-01). From 1961 to 1971 Boyer was receiving licensing fees / patent royalties from Ralston Purina, Worthington, and General Mills (p. 102). General Mills and Bacos (p. 103-04). Ralston Purina’s patent lawsuit against Far-Mar-Co. Ralston won $8 million. Boyer testified as an expert witness (p. 104-05).

Boyer remarries and retires in 1971 (p. 102, 105, 107). Subsequent work with Miles and Worthington; the Morningstar Farms line (p. 105-08). Companies now spinning soy protein fiber (two in the Netherlands, one in Japan, one in Australia). Ford Foundation was not interested in his work with soy protein for Third World nations (p. 110). Central Soya bought the ADM plant that was located in Chicago (p. 113-14). Kellogg’s Corn Soya breakfast cereal (p. 114-15). Worthington’s Soyloin Steaks; all early Kellogg and Worthington vegetarian products based on wheat gluten (p. 119). When Worthington bought Battle Creek they got their lady research director; she worked at Worthington until she was quite elderly. Boyer visited her in her lab at Battle Creek several times (p. 119-20. Note: Josephine F. Williams was in charge of the lab and product development at Battle Creek, where she worked closely with Dr. John H. Kellogg. She kept similar positions at Worthington Foods, according to Ron McDermott). Henry Ford as a soybean pioneer and visionary. The soybean is now America’s No. 2 cash crop and also our second largest earner of foreign exchange. “That really started from Ford. When we first started in 1931, hardly anybody ever heard of the soybean, and Henry Ford’s penchant for publicity publicized the soybean... He certainly made it popular and made people become aware of it. Today it’s darned important.” He should be remembered as the “Father of the Soybean.” “I always thought it would be nice if they would rebuild the [Soybean] laboratory [in Greenfield Village] or restore it like it was when we were doing the soybean work and give it the real credit that it deserves...” (p. 120). After Henry Ford died in 1947 his family wanted no part of any of his pet projects. They completely eradicated the old Ford company (p. 121). Henry Ford was deeply interested in the welfare of American farmers. His tractors and Model T were of great use to them (p. 121). Origins of Ford’s interest in chemurgy; William Halle and Dow Chemical Co. in Midland, Michigan; the first three chemurgic conferences in Dearborn, Michigan, in May 1935, 1936, and 1937 (p. 122-27). Ford and Ruddiman establish a complete canning line for good-tasting green soybeans on the outskirts of the Ford estate. The equipment was quite expensive. When World War II threatened, Ford gave it to Michigan State University to teach canning to students. (p. 129-30). Boyer’s personal impressions of Henry Ford (p. 128-30). Address: 632 Edgewater Dr. #731, Dunedin, Florida 33528.

• **Summary:** This history starts in the 1920s and focuses on the USA, with several mentions of Japan. Discusses: Henry Ford (whose soybean suit woven of soy fibers cost an estimated $39,000), soy fiber production in Japan (in 1939 the Japanese produced 900,000 to 1,200,000 lb of it), soybean plastics, Azlon made of soy protein fiber [by The Drackett Co., Cincinnati, Ohio], the Northern Regional Laboratory (at Peoria, Illinois), soy flour adhesives for plywood, soy adhesives used in fiberboard boxes and shotgun shells, soy oil as a drying agent in paints (especially alkyd paints) and linoleum, soy protein paper coating, soy oil in fire fighting foams, as a rubber substitute (Norepol), as an anti-foaming agent, in fuels, printing inks, as a carrier for agricultural chemicals (with probable environmental advantages over petroleum-based carriers), and for control of explosive grain dust (at reasonably cool temperatures, it doesn’t readily go rancid).

One of the first major thrusts of the U.S. Regional Soybean Industrial Products Laboratory, established in 1936, was development of soybean plastics. “Isolated soybean plastic was first attempted, then abandoned. The Laboratory had difficulties increasing its water resistance. But the intractable problem was that the protein isolate plastic didn’t flow well enough to allow molding in injection dies.

“So they tried plastic made from soy meal instead. But it was even less water resistant than the protein isolate plastics, and had to be expensively treated to remove sugars and salts as well as heat-treated to denature the protein...

Today over 100 million lb of epoxodized soy oil is used as a plasticizer and stabilizer for vinyl plastics. “Soy oil is an anti-foaming agent in the aerated fermentation of penicillin, streptomycin and tetracyclines. An added plus is that soy oil provides nutrients to markedly increase the yield of antibiotic... Soy oil is not nearly so good a fuel as it is an anti-foaming agent. For one thing, it is too viscous for good fuel injection. It must be converted to simple alkyl esters.” But these form varnish deposits on cylinder walls and fuel inlets.

“Soy oil is coming into its own as a printing ink, relatively cheaper than the soy protein dispersions that proved too expensive in the 1940s. Soybean oil is clear so that pigment shows through better than in petroleum based inks, and soy oil ink doesn’t smudge onto your fingers like regular newsprint.

“And the use of soy ink in rural newspapers, and soy oil in agricultural chemicals and grain elevators brings an immeasurable public relations benefit to people who do business with farmers. This public relations benefit frequently offsets any additional cost of using soy oil. For instance, over 1,000 newspapers now print with slightly more expensive soy oil.

“Possibly the major factor in charting the soybean’s course was the discovery of vitamin B-12 not long after World War II. No longer was animal protein needed in poultry and swine rations. It could simply be inserted into formulations of only corn and soybean meal. Demand for soybean meal skyrocketed, and became the chief soybean product.”

Address: American Soybean Assoc., St. Louis, Missouri. Phone: 314-432-1600.


• **Summary:** Much of this interesting presentation are taken from the author’s original and very authoritative book, *The Public Image of Henry Ford* (1976, see p. 282-85). “Henry Ford mostly is remembered for his Model T, mass production methods and the five-dollar day which doubled his workers’ pay. But he should be equally remembered for his extensive soybean experimentation and research into plastics, his last great achievement and the work that delighted him more than any other.

“Ford grew up on a farm near Detroit, and had a lifelong interest in improving the lot of the farmer. As early as 1907 he experimented with a motorized tractor which he called an “automobile plow.” During the ‘teens and ‘twenties he designed and built the Fordson tractor.

“In early 1928, Ford became interested in a new agricultural concept, farm chemurgy; that is, putting chemistry and allied sciences to work for agriculture. The auto king was chiefly interested in finding new industrial uses for farm crops, although he also hoped to find new ways to use crops for food.

“In 1929 Ford established a laboratory in Dearborn and began experiments to determine which plants or legumes offered the most promise. After extensive research, he decided in 1931—exactly 60 years ago—to focus attention on the soybean.”

The author then presents an interesting and carefully documented discussion of Henry Ford’s work growing soybeans and testing soybean varieties in Michigan, soybean plastics and the “plastic car,” contemporary media comments on this car (see record for 1941), development of soybean fiber Ford’s suit and tie made from soybeans (by 1938), Ford’s unsuccessful attempts early in World War II to interest the U.S. armed forces in making uniforms out of soybean fabric, sale for the fiber fabrication process and machinery to The Drackett Company, of Cincinnati [Ohio], in Nov. 1943, work of Ford and Edsel Ruddiman with soyfoods.”Ford also advanced his ideas about the soybean and chemurgy with exhibits and a film. In 1934, he planted a small plot of soybeans and exhibited soybean processing machinery in his company’s exhibit area at the Chicago World’s Fair. Similar exhibits were shown at various state, regional, and world’s fairs during the 1930s. In 1935 the Ford Company produced and distributed *Farm of the Future*, a sound-slide film which illustrated Henry Ford’s views on the importance.
of chemurgy.

“Ford’s frequent declaration, ‘soybeans will make millions of dollars of added income for farmers... and provide industry with materials to make needed things nobody even knows about now’ was proved correct by the passage of time.”

Today soybeans are still grown on Henry Ford’s former Dearborn estate, Fair Lane. In fact, about 400 of the 2,300 Ford-owned acres surrounding Ford World Headquarters, located adjacent to the Ford estate, are devoted to soybean cultivation, a fact which amazes foreign visitors.

“Soybean cultivation does seem remarkable on property valued at hundreds of thousands of dollars per acre. But growing soybeans serves a practical purpose, according to George Anderson, manager of corporate real estate for Ford Motor Land Development Corporation. ‘It creates an economic value and saves us from weed control,’ he says.

“Anderson, who monitors 255 million square feet of Ford office and factory space around the world, has a sentimental attachment to the soybean fields remaining in Dearborn.

“You watch the wind gently blowing the fields, and it’s like an ocean,” he says. ‘When you see a soybean field, it’s a thing of beauty...’

“As for Henry Ford, through his experimentation, and the publicity he gave it, he made a substantial contribution to the increased utilization of the soybean. His work in this field, started when he was in his late sixties and carried forward until he was 80 years of age, is the outstanding achievement of his declining years. Even at 80, Ford found boyish delight in helping to prove that there was industrial and culinary magic in a beanstalk.

“All North Americans are beneficiaries of that magic, most of all soybean growers and those allied with them. If you and your Marketing Board ever designate a patron saint, or wish to memorialize a Champion of the Soybean, may I respectfully suggest that you consider Henry Ford for the honor. Were he alive, I’m sure that no other recognition would please him more. I’m also sure that he’d come to your ceremony in a soybean-derived car, wearing a soybean suit—and expect every dish in our luncheon to be based entirely on soybeans.”

Note: Prof. Lewis is now (Dec. 1992) finishing a new book on the history of the Ford Motor Co. from 1956 to the present. It is sort of a continuation of the 3-volume work by Nevins and Hill (1954-1963). Address: Prof., School of Business Administration (Room B3253), Univ. of Michigan, Ann Arbor, MI 48109-1234. Phone: 313-764-9540.


• Summary: The Drackett Co. was organized in 1910; its founder and first president was Philip Drackett. The second president was Harry R. Drackett, who died in March 1948. His son, Philip, became the third president shortly after H.R.’s death. Drackett has a number of significant “firsts” to its credit. Drano was America’s first commercially successful drain opener. Windex created the glass cleaner business. Drackett commercialized the first textile fiber (named Drackett Soybean Azlon) made from plant proteins. The Azlon Research Facility was probably closed in about 1949. In the “Notes to Financial Statements” section of the 1950 Annual Report, there is confirmation that the Azlon Research Equipment was idle for a year.

The Drackett Co. still exists in Cincinnati, Ohio (as a subsidiary of S.C. Johnson Wax) at 2 locations. The original 5020 Spring Grove Ave. location is an R&D and administrative facility. Dave is located at 201 East 4th St. in downtown Cincinnati, at executive headquarters. The company was sold to Bristol-Myers in Nov. 1965. On 31 Dec. 1992 it was sold to its present owner S.C. Johnson & Son, Inc. (Racine, Wisconsin), whose products include Johnson’s Wax, Pledge furniture polish, Glade air fresheners, and Gel shaving cream. People who would know more about The Drackett Company’s work with soya are Fred Wilson (who came from the Ford Motor Co., was manufacturing vice president for many years, and is now retired in Florida), and Chuck Butke (in R&D, retired in Cincinnati).

Perkins notes that one main reason that Drackett sold its agricultural operations to ADM in 1957 is that they were making a major push to advertise their consumer products (especially Windex and Drano) on television. In 1957 they sponsored a show that became Wagon Train, then after that Maverick. Some of the funds that came from their sale to ADM were invested in this TV advertising program.

The Drackett Co. has both annual reports and a periodical titled “The Drackett Dotted Line” for the period
1936-1957 during which Drackett was involved with soybeans.

Presently S.C. Johnson & Son, Inc. is shutting down all Drackett operations in Cincinnati; before the end of the summer of 1993 there won’t be any Drackett people left in Cincinnati, but about 70 of those people will be “hired” by Johnson to move up to Racine. There haven’t been any Drackett manufacturing operations in Cincinnati since the late 1970s or early 1980s. They had plants at Urbana, Ohio and Franklin, Kentucky—both of which are also being phased out. The name Drackett will cease to exist by about the end of 1993.

Concerning Sharonville and Evendale, Evendale became a city in 1951. When Drackett originally moved into this area in the 1940s, they moved onto property in Hamilton County that was very near Sharonville—the nearest local post office. In reality, it was probably just unincorporated property that officially became the city of Evendale in 1951. Address: Director, Public Relations, 201 East Fourth St., Cincinnati, Ohio 45202-4178. Phone: 513/632-1800.


• Summary: “Dear Mr. Shurtleff:

“I certainly hope the names and phone numbers of Fred Wilson and Chuck Butke turn into beneficial contacts for you and your writing project. I’ve tried to look in old issues of our company publication, The Dotted Line and 1949 through 1949 copies of the annual reports of Drackett to gain some insight into the 1949 “event” to which you alluded. I can find no indication of any sale of soybean plant processes or assets, as you indicated.

“At any rate, I’ve enclosed a small clipping from The Dotted Line that focused on a run of record production. It may be of interest to you. In addition, should you wish to get some financial details regarding soybean production from the old annual reports, I’d be happy to provide photocopies. I may possibly be able to lend you individual copies from which old photos could be ‘copy-dotted.’

“Hope you’ll be able to send us a copy of your history of Drackett’s ‘Soybean Era.’ We are pulling together historical data for the Cincinnati Historical Society, now that our operations here are being eliminated. The soybean business was an intriguing part of the company’s history.

“Sincerely…”

Note: In a follow-up letter of April 16, Perkins sent Shurtleff (on loan) many of Drackett’s annual reports; each is cited in this book.

In a final letter of April 27 (1993) Perkins wrote:

“Dear Bill: Thanks for your help and guidance on my sidebar story on Drackett’s ‘first’ with Azlon. Your real knowledge certainly helped me stay away from a very clumsy inaccuracy.

“I’m enclosing the [1984] Drackett History for which you asked as well as the photocopy of The Dotted Line article on the December 2, 1943 opening of the Soybean Fiber Plant.

“Best regards and thanks for the historical materials. They will be part of Drackett files at The Cincinnati Historical Society.

“Sincerely... Dave.” Address: Director, Public Relations, The Drackett Company, 201 East Fourth St., Cincinnati, Ohio 45202-4178. Phone: 513/632-1800.


• Summary: When the Ford Motor Co. sold its soy protein operations to The Drackett Co. in Nov. 1943, Robert Boyer, Frank Calvert, William Atkinson, and Charles Robinette went to Drackett as part of the deal. Charles (now age 71) started working for Drackett in 1946 in the R&D lab at Cincinnati as a chemist and chemical engineer; he had never worked for the Ford Motor Co. For the first 6 months, Fred Wilson from Ford worked in the same lab with him; then Fred moved out to production. His work was to try to increase the amount of protein extracted from the defatted soybean meal.

There was a man named J.F. Johnson who was a very well educated and competent man. He was one of the first graduates of MIT [Massachusetts Institute of Technology, Cambridge, Massachusetts]. From Procter & Gamble, he came to work for Mr. H.R. Drackett, the company’s president. He designed Drackett’s original soybean crushing and protein extraction plant on Spring Grove Ave. in Cincinnati. His design and process was different from that used previously by Ford. At this plant Drackett processed soybean oil meal, oil, and Drackett Soybean Lecithin (in 55 gallon drums by 1945). Johnson designed a system whereby the oil was extracted from the soybeans using hexane solvent, and the crude soy oil was run into huge tanks and allowed to settle for 7 days. The good oil was decanted off the top and the foots on the bottom were reprocessed and yielded lecithin. Johnson’s good soy oil was good enough to use in home cooking; it was used in consumer sampling but it was never sold commercially.

When Ford’s soy protein operations went up for sale, H.R. Drackett thought that his soybean crushing operations and Ford’s technology for spinning soy proteins would make a perfect marriage.

First Drackett set up an experimental soy protein plant at Spring Grove, then they made it into a commercial plant next to their soybean extraction plant at Sharonville, Ohio, which was crushing about 55,000 bushels/day of soybeans. This plant was later said to be at Evendale (even though it never
moved) either for tax purposes or because city boundaries moved.

Charles had a spiral-bound catalog titled “Drackett Proteins” (which he sent to Bob Griffin at Drackett about 6 weeks ago in response to an enquiry related to Drackett company history) that described the three types of industrial isolated soy proteins made and sold by Drackett when he arrived in 1945–Protein 110, Protein 112, and Protein 220. The first two were low-viscosity proteins of low molecular weight used in paper coatings and sizings. The Protein 220 was used very widely in water-based paints. The names of these proteins were later changed to Ortho Protein–of which there may have been different types. A man named Sam Wise (now deceased) held one of the original patents for making water-based paints. Mr. Drackett sold that patent to a big paint company so that they could get into the water-based paint business.

Drackett made and sold Soybean Azlon (spun soy protein fibers) from about 1946 to 1949. Their main customer was the American Hat Corporation (in Connecticut), which used it in felt hats. Chuck is absolutely certain that the Azlon was sold commercially because he was in charge of approving the shipments to go out. It had very good felting properties. Drackett made about 1,000 to 1,500 lb/day of Soybean Azlon, cut the fibers into lengths of about 2½-3½ inches as desired by the hatter, tied them into loose uncovered bales with cord, and shipped them. There were also two other smaller companies that used Azlon. At the time, H.R. Drackett had suits and hats made for his sales force that contained Azlon.

Drackett also had a small operation that made plastics, and he is sure that they received 1-2 orders for these in the form of 3-foot diameter bases for large industrial fans. Not much of the plastic was sold and Butke thinks this was the only application for which it was sold commercially. He does not recall which company ordered the plastic bases.

In 1949 Drackett shut down its plant that was manufacturing Azlon, quit making isolated soy protein, and also shut down some of its soy protein research. Charles was moved out of soybean research into the laboratory doing research on soybean oil. Bob Boyer left Drackett, then rewrote the patents for making Azlon to make them suitable for production of edible soy protein fibers. When Boyer left, Frank Calvert became director of research for Drackett.

Drackett did considerable work on edible soy protein products—a fact that is not well known. Bill Atkinson’s TVP grew out of this work. It started when a group of Seventh-day Adventists from Worthington Foods of Worthington, Ohio (located just north of Columbus, Ohio) came to Drackett (in Cincinnati, Ohio) and asked if Drackett could develop an edible soy protein—because they didn’t eat meat. They even gave Drackett some seed money to work on the project. Bill Atkinson took charge of the project in about 1956; he worked with Ed Lankheit (pronounced LANG-

kite, he is now age 76 and lives in Park Hills, Kentucky) and a lady researcher. Drackett sold granules all the time. To make these granules they took the flakes from the solvent extraction plant, ran them through an alkali extraction process to extract the protein, which is ten precipitated with an acid. It is filtered and dried to make small and hard granules of isolated soy protein. They then used a hot water or steam extraction on the granules to try to get rid of their raw beany flavor—to no avail. So they mixed the granules with beans and chili sauce to mask the beany flavor. The texture of the cooked granules closely resembled that of ground meat, but the flavor was pretty poor. This product was never commercialized, but it did evolve into the TVP developed later by Atkinson at ADM.

In mid-1957 Drackett sold its soybean operations to ADM. ADM wanted Drackett’s two industrial soy protein products, Atkinson’s work with edible textured soy proteins, and the other people and expertise in the edible area. ADM also bought Drackett’s library, laboratory notebooks, etc. Roger Drackett had hired a group from Ohio State University to survey the future potential of soy proteins. They concluded that another 25 years of R&D would be needed to make the soy protein operations financially successful. Drackett took the money from the sale to ADM and invested it in TV ads for consumer products like Windex and Drano.

Charles went to ADM as part of the deal—along with about 9 other researchers, including William Atkinson. Charles worked for ADM at the plant in Evendale from 1957 to 1960. The soybean crushing and soy protein operations were continued as before except that ADM added a new Ortho Protein product—which was less expensive because it was not bleached as much with hydrogen peroxide. Bleaching was one of the most expensive steps in the process. In 1960 Charles left ADM and went back to work for Drackett at their plant in Spring Grove, where they made Windex, Drano, etc. At some point ADM moved the soybean crushing and protein equipment out of the plant in Evendale but he does not know where they took it. They sold the soybean and grain storage facilities to Central Soya, and they sold the many empty buildings to other small industries.

Address: 9541 Flick Rd., Cincinnati, Ohio 45247. Phone: 513-741-4289.


• Summary: Fred started working for Henry Ford in 1933; he was a guide in Green Village and museum, while he was in high school. In 1935 he went to work as a research chemist for Robert Boyer at the research lab. in Dearborn, Michigan. They were extracting oil on a small scale from soybeans, breaking it down into various derivatives, converting it to stearic acid, and also extracting the protein.
He also did some work in the soybean fields. He worked on the “plastic car” whose body was made from phenolic resin (made from carboxylic acid) plus some soy protein and fiber. In late 1941, Mr. Ford gave Boyer’s group part of an air-frame building (about 120 by 250 feet, located opposite the Ford airport) to use as a pilot plant, they expanded their work on spun soy protein fibers. Mr. Ford bought the group some Sacal Lowell spinning equipment (pilot plant size), carding mills and frames, felting machines, even looms so they could make carpets and upholstery, mixing the fiber with rayon (mostly) and some cotton. Then he supervised the production of the spun soy protein fibers. Bill Atkinson, an excellent chemist, worked with him, mixing the spinning solution that was run through spinnerettes. Charles Robinette handled the spinning lines. Walter Jenks was a research chemist, who later went to Drackett. But Boyer was the man most responsible for developing the spun soy protein fibers. Ford’s main use of soybeans was for oil. Much of the remaining defatted soybean meal was sold for use in feeds, mostly to the poultry industry.

The group produced about 1,000 lb/day of soy fiber and all of it was used experimentally. Fred does not recall any of this fiber ever being used in any automobiles sold by the Ford Motor Co. But the fiber was used in “service cars” owned by the Ford Motor Co. for its own use. The soy fiber was mixed with sisal (a coarse fiber), then the mixture was formed into a pad and sprayed with latex to hold the pad’s form. This material was used as padding under the seats of the service cars. Fred does not recall that this fiber was ever used in any type of upholstery for any cars. During World War II, the spun soy fiber was mixed with rabbit fur and made into experimental hats by some hat company. They did some work with Munsing, which blended the soy fiber with other materials to make underwear. Henry Ford and Bob Boyer each had some of this underwear.

In 1943 The Drackett Co. purchased all of Ford’s soy protein operations and Fred went to Drackett at that time. He started as technical supervisor in the soy protein plant at Sharonville (the correct city name; not Evendale) making Ortho Protein, whereas Chuck Butke and Robert Boyer worked at the lab in Cincinnati. The protein was coagulated, drum dried and oven dried, then ground to a fine powder and bagged in 100-lb bags. Some of the Ortho Protein was sold to Sherwin Williams for use in water-based paints. Eventually Fred became superintendent of the entire Sharonville facility (both solvent extraction and protein).

Fred does not recall any of the soy protein fiber (Azlon) ever being sold by Drackett for use in commercial products. Specifically he does not recall its ever being used in commercial felt hats by the Hat Company of America—but he admits that Chuck Butke (who is younger and has a better memory) may well be correct in his recollection that it was sold for use in hats. The problem with the fiber was that it had poor tensile strength, was brittle, and had no elasticity. A large amount of the soy oil that Drackett produced was sold to Procter & Gamble for use in margarine.

Concerning the plastic molding compound and preforms, they were made from phenolic resin with rayon cord plus some soybean fiber (a filler, left over after the soy protein was extracted from soybean meal) and some soybean hulls. The basic concept came from Ford.

When Drackett sold its soybean operations to ADM in 1957, Fred stayed with Drackett and worked on consumer products. ADM ran the soybean crushing plant and protein plant for about 5 years, then they shut it down; they sold the silos and grain storage facilities and cleaning or reconditioning equipment to Central Soya.

After Boyer left Drackett he and his wife, Betty [Elizabeth Szabo Boyer], continued to live in Cincinnati (on North College Hill St.). Then Betty died in Cincinnati [in Feb. 1963]. Fred thinks he remarried later [April 1965] to a lady [Nancy Ann Miller] who worked in a bank in St. Louis, Missouri.

For more information about Drackett, contact Jean Drackett (Mrs. Roger Drackett) in Naples, Florida, or Cincinnati, Ohio (Phone: 513-561-7418), or their daughter, Cecil (Phone: 513-561-2627). Address: Florida. Phone: 813-784-6560.


• Summary: This biographical sketch of Boyer (1909-1989), Henry Ford’s top soybean man, is well researched and full of original material. Robert Boyer was born on Sept. 30, 1909 in Toledo, Ohio. In 1916 he moved with his parents to Royal Oak, Michigan, where he attended grade school while his father worked in the accounting department of the Ford Motor Co. in nearby Highland Park. When Henry Ford bought the Wayside Inn in Massachusetts in 1923, Frank Campsall suggested to Ford that Earl Boyer would be an appropriate business manager for the Inn. So the Boyers, including young Robert and his three sisters, moved into a Ford-owned house near the Inn. Robert then attended high school at Framingham, Massachusetts, where he graduated in 1927. Robert met Henry Ford while skating at the Inn. Ford suggested that he come to Dearborn for some work experience before going to college at Dartmouth as planned. So in Sept. 1927 Robert arrived in Dearborn where he was enrolled in the Henry Ford Trade School at the Rouge plant.

“Henry Ford had taken recent trips to Europe and had been impressed with the agricultural prosperity in some of those countries. Returning to Dearborn, Ford wanted to set up an experimental agricultural chemical factory to determine what products could be obtained from plants. The experimental chemical factory became a one-quarter size model of Ford’s mammoth wood distillation plant at
Iron Mountain, Michigan. The model was constructed at Iron Mountain and moved to Greenfield Village in late 1928. About then Ford asked, ‘Bob, how would you like to supervise this model plant–to stay another year or two and live at the Sarah Jordan Boarding House in Greenfield Village.’

“Boyer had had little formal training in chemistry, but he was provided with tutors from the University of Michigan, and from 1929 to 1933 attended the Edison Institute of Technology, a school founded by Henry Ford and Thomas Edison as a school for inventors... Ford’s purpose was to find industrial uses for farm crops. A farm depression was imminent. During the depression year of 1931, Robert Boyer married Elizabeth Szabo of Detroit. During the next few years they had three children...

“In 1931, soybeans became one of the plants investigated at the Chemical Laboratory... Usually the beans were pressed to obtain the oil, and the remaining ‘cake’ was fed to animals. The Boyer group, however, developed a solvent extraction procedure whereby soy protein as well as oil could be produced...

“By this time Henry Ford was growing rather old, approaching seventy. Design of the V-8 Ford in 1931 seems to have been his last great interest in automobile mechanics. His Edison Institute Schools, Greenfield Village, and soybean research now largely occupied his time. In 1932 he began to plant hundreds of acres of soybeans on his Dearborn farm lands and began procuring thousands more acres in Southeastern Michigan. Several additional processing plants were located in outlying towns where he promised to buy even more soybeans from local farmers to use in automotive paints and plastics. Boyer was largely responsible for Ford’s advancement in soybean technology.

“Henry’s vegetarian eating habits led him to hire his old gradeschool friend, Dr. Edsel Ruddiman, an organic chemist, to devise tasty dishes containing soybean ingredients for the dining room. And Ford’s executives, including Boyer, were coaxied by Ford to try them—soybean milk, soups, bread, croquets, simulated meats, butter and ice cream. Most were not very palatable, however, because of the tendency of the soy oil to be slightly rancid.”

Boyer was in charge of the “Industrialized American Barn” demonstration at the 1934 Chicago World’s Fair. And in May 1935 when the first chemurgy conference was held at the Dearborn Inn, Boyer was in charge of arrangements. During the second chemurgy conference in Dearborn, Boyer led the groups of participants through his Soybean Laboratory at Greenfield Village. At about this time Boyer developed soy protein fibers which were blended with wool (35% soy and 65% wool) and woven into cloth. The resulting cloth was given to Ford’s own tailor, and suits of soy fiber were worn by Ford on occasion—and highly publicized.

“Boyer admits that the tensile strength of soy fiber was only 85% of wool, however, behooving the wearer to avoid strenuous movements, bending down for example very cautiously.

“Boyer’s fiber was ideal for felt hats, however. All of the fiber Boyer could produce was wanted by the Hat Corporation of America. The soy fiber blended well with rabbit fur, was less expensive and much cleaner to work with. To produce fiber in larger amounts and to develop fiber of higher tensile strength, a modern air-conditioned laboratory was built on Village Road in Dearborn. In this plant not only fiber producing equipment was installed but complete weaving equipment as well.”

Between 1939 and 1941 Boyer worked on Ford’s “plastic car” made from soybean plastic. It also drew widespread media publicity. “Boyer drove the car a few weeks before it was abandoned. (People are still wondering what became of that plastic car.) A major defect never corrected, according to Boyer, was the strong odor reminiscent of a mortuary.

“The soy protein fiber facility was operating nicely when in 1943 the U.S. Air Force demanded the air-conditioned building for precision measurement of aircraft engine parts. When his building was thus usurped, Boyer was out of a job involving soybeans. He then transferred to Ford’s Willow Run Bomber Plant at Ypsilanti, Michigan, where, because of his knowledge of plastics, he was given responsibility for protecting the plastic windshields on the B-24s during assembly of the planes.”

In 1943 Drackett Products Co. in Cincinnati, Ohio, purchased the Ford fiber processing equipment and Boyer went to work for Drackett in Cincinnati—he was never again in direct contact with Henry Ford. Boyer wanted to develop edible soy protein fibers. When H.R. Drackett died in 1949, Boyer left The Drackett Co. so he could pursue his goal of receiving a pioneer patent for texturizing vegetable (soy) protein. He was granted this patent in 1949. As many as 30 corollary patents were subsequently obtained.

“Boyer had developed methods for producing soy fiber that was thoroughly washed and tasteless. In 1951 he became a consultant to several food processors who were licensed to use his patents in their operations. These firms included Worthington Foods, Swift & Company,Ralston Purina, Unilever Company of England, National Biscuit Company [Nabisco], General Foods, and General Mills. Dozens of high-volume foods were, and still are, produced using Boyer’s procedures... Robert Boyer worked full time for Ralston Purina in St. Louis, Missouri, from 1962 until 1971.


“The Boyers did considerable traveling. But in the early
1980s Robert’s eyes began to fail, and then his chief hobby became baking, an occupation he had always enjoyed. In 1985 he dictated his oral reminiscences [8 hours on tape with David R. Crippen] as requested by the Henry Ford Archives. Boyer died in Dunedin on November 11, 1989. The body was cremated and the ashes scattered over the Gulf of Mexico.”

Photos show: A portrait of Boyer in his later years (Ford Archives photo ID No. P.0.19429). The Chemical Laboratory building at Greenfield Village at Dearborn (No. 0.6213) in 1930. Henry Ford discussing soybean work with Boyer in the Chemical Laboratory on Ford’s birthday, July 30, 1937 (No. 188.21320. Ford is seated on a stool by a lab. bench reading and Boyer has one elbow on the bench behind him.) Boyer and Ford with the “plastic car” at Dearborn in 1941 (No. 189.16352).

Talk with Ford Bryan. 1992. Nov. 12. He is now working to get Robert Boyer’s soybean research laboratory, the Chemical Plant of the Edison Institute, restored at Greenfield Village and interpreted as to its history and significance. The building is in fairly good shape; the exterior is in good shape but all the equipment has been removed from the interior. Address: 21800 Morley, Apt. 1203, Dearborn, Michigan 48124.

127. Butke, Charles. 1993. The Drackett Company’s work with ‘Alysol’ soy protein (Interview). SoyaScan Notes. May 26. Conducted by William Shurtleff of Soyfoods Center.  • Summary: Chuck went to work for Drackett in 1946 at about the time when the Sharonville plant began operations. At about that time he recalls reading in a report that a soy protein product named “Alysol” was being made by Drackett before he arrived. The Alysol was made at the Drackett plant at 5020 Spring Grove Ave. in what was then northern Cincinnati. That was the location of Drackett’s original soybean extraction plant which began operations in about 1937. At this plant the soybeans first had their hulls blow off, then they were run through cracking rolls, followed by flaking rolls. Then the flakes were put into a chamber that was very high in the air. “The flakes dribbled down through that chamber while hot hexane solvent flowed from the bottom to the top. That equipment was designed by Mr. J.F. Johnson.” The protein was extracted from the soybean meal to make Alysol. It was modified with sodium hydroxide, then neutralized and precipitated with sulfuric acid to get the isolated protein.

1937 was the year of the big, devastating flood in Cincinnati. Water from the Ohio River backed up and flooded the entire Mill Creek Valley. The water rose to the base of the second floor of Drackett’s buildings on Spring Grove Ave. This was Drackett’s only location at the time; there they had their administrative offices, plants for making Drano and Windex, and for crushing soybeans. Drackett had 4-5 carloads of soybeans on the railroad siding by the plant. When the soybeans were soaked by the flood waters, they expanded and after the flood waters fell they heated up and basically blew the railroad cars apart. Jack Mairose (pronounced MAI-rose) wrote up this whole story, perhaps in the Drackett Dotted Line. Jack died about 18 months ago. The booklet by Dave Perkins, published in 1984 to commemorate Drackett’s 75th anniversary, mentions the development of this early soy protein.

A Chinese man named Tien Leiue (who later invented Playdough in Cincinnati for another company) ran the original nutritional labs at plant on Spring Grove Ave. He fed soy products to rats and rabbits and studied their response. He started this work prior to 1945.

Drackett’s second location was in San Leandro, California. Their third location was in Sharonville. It was only about ten years ago that Drackett moved its administrative offices to Atrium 1 at 4th and Main in downtown Cincinnati. Address: 9541 Flick Rd., Cincinnati, Ohio 45247. Phone: 513-741-4289.

128. Shurtleff, William; Aoyagi, Akiko. comps. 1993. The Drackett Company’s work with soybeans and soy proteins: Bibliography and sourcebook. Lafayette, California: Soyfoods Center. 79 p. Subject/geographical index. Author/company index. Language index. Printed June 25. 28 cm. [81 ref]  • Summary: This is the most comprehensive bibliography ever published about The Drackett Company’s work with soybeans and soy proteins. It has been compiled one record at a time over a period of 18 years, in an attempt to document the history of this subject. It is also the single most current and useful source of information on this subject available today, since 99% of all records contain a summary/abstract averaging 341 words in length.

This is one of more than 40 bibliographies on soybeans and soyfoods being compiled by William Shurtleff and Akiko Aoyagi, and published by the Soyfoods Center. It is based on historical principles, listing all known documents and commercial products in chronological order. It features: 17 different document types, both published and unpublished, every known publication on the subject, and 10 original Soyfoods Center interviews. Thus it is a powerful tool for understanding the development of Drackett’s work with soya.

The bibliographic records in this book feature (in addition to the typical author, date, title, volume and pages information) the author’s address, number of references cited, original title of all non-English publications together with an English translation, month and issue of publication, and the first author’s first name (if given).

It also includes details on 7 commercial soy products, including the product name, date of introduction, manufacturer’s name, address and phone number, and (in many cases) ingredients, weight, packaging and price,
storage requirements, nutritional composition, and a description of the label. Sources of additional information on each product (such as references to and summaries of advertisements, articles, patents, etc.) are also given.

Details on how to make best use of this book, a complete subject and geographical index, an author/company index, a language index, and a histogram by year are also included.

Brief Chronology of The Drackett Company’s Pioneering Work with Soybeans and Soy Proteins:

1910. The Drackett Co. is organized as a partnership. Its main business is distributing a line of bulk chemicals to industrial users. In 1933 the company adopted its present name.

1918-1928. Drackett is America’s leading manufacturer and seller of U.S.P. grade Epsom salts.

1923. Drackett starts production of Drano (a chemical composition used to clear clogged drains), which soon becomes its first major consumer product.

1934-36. Drackett starts production of Windex (a spray that cleans windows without water), which soon becomes its second major consumer product. Both products are made at Drackett’s plant at 5020 Spring Grove Ave. in Cincinnati, Ohio.

1935-36. Laboratory studies at Drackett lead to the design of an original pilot plant process for oil extraction by the solvent method. Laboratory research is also conducted on the extraction of soy protein from defatted soybean flakes.

1935, fall. Drackett submits samples of industrial soy protein to the Champion Coated Paper and Fiber Co. for examination as to use in paper coatings in place of milk casein.

1936. A pilot plant for making industrial soy protein begins operation at 5020 Spring Grove Ave. in Cincinnati, Ohio.

1937 Feb. A solvent extraction pilot plant begins operation on Spring Grove Ave. and continues for 3 years.

1938 April. The world’s first soy protein fiber (and the first experimental textile fiber made from a plant protein) is exhibited by Robert Boyer of the Ford Motor Co. at the Fourth Annual Conference of the Farm Chemurgic Council in Omaha, Nebraska.

1938. Drackett purchases 60-75 acres of farmland at Sharonville, Ohio (several miles north of the Spring Grove Ave. headquarters), for a solvent extraction plant. Ground is broken in Sept. 1939.

1940, first quarter. Drackett starts to work cooperatively with the Ford Motor Co. to develop a soybean protein suitable for spinning into fiber from which upholstery cloth could be made.

1941 Jan. Soybean oil extraction begins at the Sharonville plant. Drackett’s initial investment was about $1.5 million. The plant has an annual capacity of 35,000 tons of soybean meal and 15 million lb of soybean oil.

1941. Drackett’s first industrial soy protein isolate is sold commercially. 15,018 lb were produced and 7,039 lb were sold during the year. By 1942 this soy protein isolate was brand-named Alysol. Some of it was sold to the Ford Motor Co. to make experimental soy protein fibers.

1943 Nov. Drackett purchases the Ford Motor Company’s soy protein and soybean fiber spinning operations. Robert Boyer, Francis (Frank) Calvert, and William Atkinson go to Drackett from Ford as part of the deal.

1943 Dec. 2. Drackett starts commercial production of Soybean Azlon, the world’s first commercial fiber made from plant proteins. The fibers were used mainly in felt hats by the America Hat Corporation.

1944? Drackett is now making a new line of industrial soy proteins named Drackett Protein 110, 112, and 220. The first 2 are for use in paper coatings and sizings, the latter for water-based paints.

1945. The Drackett Co. is the largest soybean processor in Ohio.

1946. Drackett finishes construction of 18 new silos at Sharonville, costing $500,000, to house 1 million bushels of soybeans.

1947, mid. Drackett’s plant making industrial soy protein isolates begins operation at Sharonville. It also makes Ortho Protein and Impact Plastic Molding Compounds.

1948 March. Harry R. Drackett, the company’s second president, dies. His son, Roger Drackett, is elected president of the company.

1949 July 12. Drackett’s soybean plastics operations are discontinued completely.

1949. Robert Boyer leaves The Drackett Co. when it shuts down its Azlon fiber spinning plant. He begins research on developing the world’s first edible soy protein fibers.

1949 Sept. Drackett introduces Charge Candy for Dogs, which contains soya bean flour as a major ingredient.

1957 July 1. Drackett sells its entire isolated soy protein business to the Archer Daniels Midland Co. (ADM). William Atkinson goes to ADM as part of the deal. Address: Soyfoods Center, P.O. Box 234, Lafayette, California 94549.

Phone: 510-283-2991.

129. Shurtleff, William; Aoyagi, Akiko. comps. 1993. Henry Ford and his researchers’ work with soybeans, soyfoods, and chemurgy–Bibliography and sourcebook, 1921 to 1993: Detailed information on 439 published documents (extensively annotated bibliography), 79 unpublished archival documents, 71 original interviews (many full text) and overviews, 13 commercial soy products. Lafayette, California: Soyfoods Center. 249 p. Subject/geographical index. Author/company index. Language index. Printed May 19. 28 cm. [367 ref]

• Summary: This is the most comprehensive book ever published about the work of Henry Ford and his researchers with soybeans and soyfoods. It has been compiled, one
record at a time over a period of 18 years, in an attempt to
document the history of this subject. It is also the single
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understanding this subject from its earliest beginnings to the
present.

The bibliographic records in this book include
439 published documents and 79 unpublished archival
documents. Each contains (in addition to the typical author,
date, title, volume and pages information) the author’s
address, number of references cited, original title of all non-
English publications together with an English translation of
the title, month and issue of publication, and the first author’s
first name (if given).

The book also includes details on 13 commercial soy
products, including the product name, date of introduction,
manufacturer’s name, address and phone number, and (in
many cases) ingredients, weight, packaging and price,
storage requirements, nutritional composition, and a
description of the label. Sources of additional information
on each product (such as references to and summaries of
advertisements, articles, patents, etc.) are also given.

Details on how to make best use of this book, a
complete subject and geographical index, an author/company
index, a language index, and a bibliometric analysis of
the composition of the book (by decade, document type,
language, leading periodicals or patents, leading countries,
states, and related subjects, plus a histogram by year) are
also included. Address: Soyfoods Center, P.O. Box 234,
Lafayette, California 94549. Phone: 510-283-2991.

130. Lewis, David L. 1995. Henry Ford and the magic
• Summary: Much of this interesting presentation is taken
from a paper by the same title presented by the author on
6 Dec. 1991 to the Ontario Soybean Growers’ Marketing
Board. This, in turn, is based the author’s original and very
authoritative book, The Public Image of Henry Ford (1976,
see p. 282-85). On the first page, the author writes in a
sidebar: “Henry Ford is most remembered for the Model
T, mass production, and the five-dollar day, which doubled
his workers’ pay. But he should equally be remembered
for his extensive soybean experimentation and research
into plastics–his last great achievement and the work that
delighted him most.”

Contains 8 good photos related to Ford’s work with
soybeans. The caption accompanying the famous photo of
Ford taking an axe to the back of a black car reads: “Henry
Ford takes an axe–only a blur in this photo–to the dent-
resistant plastic trunk lid of his personal 1940 Ford. Keeping
his axe in the trunk of his car, the magnate routinely swung
on the lid to impress guests. He hit it one too many times
when showing off before Walter P. Chrysler and caused a
fracture in the lid similar to the splintering of a piece of
green wood. Unfazed, Ford praised the ability of the lid to
absorb as much impact as it had.” Address: Prof. of Business
History, Univ. of Michigan, Ann Arbor, MI 48109-1234.
Phone: 313-764-9540.

isolates for food use. Dec. 9. Compiled by William Shurtleff
of Soyfoods Center.
• Summary: 1939–The Glidden Company in Chicago,
Illinois, becomes the world’s first company to manufacture
a soy protein isolate for use in food. Named Albusoy and
called “soy albumen,” it is an enzyme-modified isolate used
as a whipping agent to replace egg whites. 1950–Gunther
Products of Galesburg, Illinois, becomes the world’s
first company to manufacture
ed soy protein isolate. By 1967 roughly 1 million lb/
year of enzyme-modified soy protein isolates were being
made in the USA.

1957–The Glidden Company in Chicago becomes
the world’s first company to start large-scale production
of today’s regular (non-enzyme modified) food grade soy
protein isolate. Their $4 million plant at Indianapolis,
Indiana, makes Promine brand isolated soy protein.

1957 July–ADM purchases The Drackett Company
(Evendale, Ohio), which makes commercial industrial soy
protein isolates and is experimenting with edible isolates.

1958–The Glidden isolate plant at Indianapolis is
purchased by Central Soya–which now enters the isolate
business.

1958-1959–ADM starts to sell small amounts edible
isolates to Consolidated Foods in Texas. William Atkinson
developed the product, which was quite satisfactory and
practical. But the patent was about to expire, so ADM turned
its attention elsewhere.

1959 Oct.–Central Soya opens a huge new plant to
produce their Promine brand of soy protein isolate. By 1966
Central Soya is making 30 million lb/year of soy protein
isolates.

1962 Oct.–Ralston Purina starts making food grade
soy protein isolates in Louisville, Kentucky, under the Edi-
Pro brand, using technology largely developed by Frank
Calvert and Robert Boyer when they worked as researchers
for Henry Ford. Anderson Clayton and Carnation started to
make soy protein isolates soon thereafter.

1964–The USDA allows the use of soy protein isolates

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in meat sausages at the 2% level by weight.

1965 Oct. Skippy Peanut Butter with Smoky Crisps introduced. The "Smoky Crisps" are bacon-like bits made by General Mills from spun soy protein fiber.

1965 Dec.–General Mills introduces Bac*O's, meatless fried bacon bits made from spun soy protein fiber in several test markets.

1966 May–General Mills introduces its Bontrae line of meat analogs based on spun soy protein fibers, including Ground Beef Analog, Diced Ham Analog, and Diced Poultry Analog.

1969 Dec.–Bac*Os, meatless bacon bits, are now available nationwide.

1970 Dec.–Bontrae spun soy protein fiber starts to be made at General Mills' new plant in Cedar Rapids, Iowa.

1973 March–Hamburger prices reach all-time highs. Hamburger extended with 25% Bontrae (spun soy protein fiber) goes on sales at Red Owl Stores in Minnesota.

1973 summer–Grain Processing Corp. of Muscatine, Iowa, starts making soy protein isolates under the Pro-Fam brand.

1974 Oct.–General Mills introduces meatless Country Cuts, made from spun soy protein fiber, in ham or chicken flavors.

1976–Ralston Purina has become the world’s leading manufacturer of edible soy protein isolates. Their flagship plant is still in Louisville. 1977 May–Dawson Foods buys (for about $10 million) the Bontrae spinning line, plus exclusive rights to General Mills’ soy isolate and patented spinning technology, equipment, and frozen spun products marketed to food processors and institutional customers. Dawson moved the equipment to Minnesota, and broke ground for a new plant in Feb. 1978.

1979 March 31–Dawson Mills’ soy protein isolate plant opens 1½ miles east of Dawson, Minnesota, on a 220-acre site.

1980 May–Dawson Mills introduces its Anaprime line of meat analogs based on spun soy protein fibers and technology purchased from General Mills; they are very similar to the Bontrae line.

1980 Aug.–Central Soya sells all of its soy protein isolate operations to Archer Daniels Midland Co. With this purchase, ADM enters the edible isolate business, and Central Soya gets out. ADM names its first four edible isolates Ardex D, Ardex DHV, Ardex F, and Ardex SP-6—simply replacing Central Soya’s brand “Promine” by the brand “Ardex.”

1985–ADM moves its soy isolate plant from Chicago to Decatur, Illinois.

1986–ADM doubles the size of its soy isolate plant in Decatur.


1988 June 23–ADM buys from Grain Processing Corp. (GPC) their soy protein isolate technology, brand names (Pro-Fam), and customers—but not their equipment. ADM soon begins to produce the Pro-Fam line of isolates in Decatur, Illinois.

1988–The price of imported casein rises above the price of soy isolates—and stays there due to loss of subsidies by foreign governments.

1988–ADM starts to make industrial soy protein isolates in Decatur.

1995–ADM builds a third edible isolate plant in Decatur, adjacent to its other two plants.

1997–ADM sells its industrial isolate business in Decatur to PTI (Protein Technologies International).


Tables show: (1) Amino acid content (%) in soya bean protein compared with that of wool and silk. (2) (p. 406-12) Selected patents from various countries (China, France, Germany, Great Britain, USA) for regenerated protein fibres using soya bean protein. (3) Tensile strength of soya fibre compared with wool of the same grade (wet and dry) (1946). (4) Characteristics of soya bean fibre in comparison with other fibres (casein, wool, silk [degummed], Nylon) (1947). (5) Stain tests (1941).

Photos show: (1) Soya bean fibres made by the Ford

Note: Richard S. Blackburn is a Senior Lecturer in Textile and Colour Chemistry at the University of Leeds.

Address: Univ. of Southampton, UK.


• Summary: 1910–The Drackett Co. is organized as a partnership named P.W. Drackett and Sons. Its main business is distributing a line of bulk chemicals to industrial users. In 1933 the company adopted its present name.

1918-1928–Drackett is America’s leading manufacturer and seller of U.S.P. grade Epsom salts.

1923–Drackett starts production of Drano (a chemical composition used to clear clogged drains), which soon becomes its first major consumer product.

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1935-36–Laboratory studies at Drackett lead to the design of an original pilot for oil extraction by the solvent method. Laboratory research is also conducted on the extraction of soy protein from defatted soybean flakes.

1935, fall–Drackett submits samples of industrial soy protein to the Champion Coated Paper and Fiber Co. for examination as to use in paper coatings in place of milk casein.

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1938–Drackett purchases 60-75 acres of farmland at Sharonville, Ohio (several miles north of the Spring Grove Ave. headquarters), for a solvent extraction plant. Ground is broken in Sept. 1939.

1940, first quarter–Drackett starts to work cooperatively with The Ford Motor Co. to develop a soybean protein suitable for spinning into fiber from which upholstery cloth could be made.

1941 Jan.–Soybean oil extraction begins at the Sharonville plant. Drackett’s initial investment was about $1.5 million. The plant has an annual capacity of 35,000 tons of soybean meal and 15 million lb of soybean oil.

1941–Drackett’s first industrial soy protein isolate is sold commercially. 15,018 lb were produced and 7,039 lb were sold during the year. By 1942 this soy protein was brand-named Alysol. Some of it was sold to the Ford Motor Co. to make experimental soy protein fibers.

1941 Dec. 7–Japanese military forces attack Pearl Harbor. The United States enters World War II. Henry Ford is soon told to stop making automobiles and to build an assembly line for making bombers for the war effort.

1942 May–The Ford Motor Company produces its first B-24 Liberator bomber using a giant assembly line one mile long that it had constructed at Willow Run in Michigan. Thereafter Ford made one bomber per hour—plus engines, gliders, tanks, armored cars, jeeps, etc.

1943 Nov.–Drackett purchases the Ford Motor Company’s soy protein and soybean fiber spinning operations. Robert Boyer, Francis (Frank) Calvert, and William Atkinson go to Drackett from Ford as part of the deal.

1943 Dec. 2–Drackett starts commercial production of Soybean Azlon, the world’s first commercial fiber made from plant proteins. The fibers were used mainly in felt hats by the America Hat Corporation.

1944?–Drackett is now making a new line of industrial soy proteins named Drackett Protein 110, 112, and 220. The first 2 are for use in paper coatings and sizings, the latter for water-based paints.

1945–The Drackett Co. is the largest soybean processor in Ohio.

1946–Drackett finishes construction of 18 new concrete silos at Sharonville, costing $500,000, to house 1 million bushels of soybeans.

1947, mid–Drackett’s plant making industrial soy protein isolates begins operation at Sharonville. It also makes Ortho Protein and Impact Plastic Molding Compounds.

1948 March–Harry R. Drackett, the company’s second
president, dies. His son, Roger Drackett, is elected president of the company.

1949 July 12–Drackett's soybean plastics operations are discontinued completely.

1949–Robert Boyer leaves The Drackett Co. when it shut down its Azlon fiber spinning plant. He begins research on developing the world's first edible soy protein fibers—imitate muscle fiber in meats.

1949 Sept.–Drackett introduces Charge dessert for dogs, which contains soya bean flour as an ingredient.

1957 July 1–Drackett sells its entire isolated soy protein business to the Archer Daniels Midland Co. (ADM). William Atkinson goes to ADM as part of the deal. At ADM Atkinson invents TVP—a registered trademark that stands for textured vegetable protein.

1965–The Drackett Co. is sold to Bristol-Myers.


• Summary: Robert Boyer and Bob Smith did extensive, pioneering work on developing soy protein isolates at the Ford Motor Co. Both started research in 1938. Boyer used his isolates to make industrial products, such as spun soy protein fibers and water-based paints. The soy fibers were produced in a pilot-plant with a capacity of 1,000 pounds per day of soybean “wool” and soon a fabric containing 25% soybean wool and 75% sheep’s wool was used in the sidewall upholstery of many Ford cars. Bob Smith used his isolates to make a good-tasting soymilk, that was served in Ford cafeterias and schools, and at the Henry Ford Hospital, and was also used as the base for most of the early commercial soy-based whipped toppings—starting with Delsoy. In Nov. 1943 The Drackett Co. bought Ford’s soybean fiber spinning operations; Boyer, Francis (Frank) Calvert, and William Atkinson went to Drackett from Ford as part of the deal. Drackett made and sold their fibers, Soybean Azlon, spun from soy protein isolates, from 2 Dec. 1943 to 1949. They were used mainly in felt hats by the American Hat Corporation. Drackett also commercialized other industrial soy proteins, such as Protein 110, 112, and 220, Ortho Protein, and plastic molding compounds. Boyer left Drackett in 1949 when they shut down their Azlon fiber spinning plant; he focused all his energy on developing food uses of edible products made from spun soy isolates. In mid-1957 ADM (Archer Daniels Midland Co.) purchased Drackett’s soy protein business. Bob Boyer began to work as a full-time consultant for Ralston Purina in the field of soy proteins starting in early 1960. Since 13 June 1959 Ralston Purina had been manufacturing industrial soy protein isolates (for use in paper coatings) at a plant in Louisville, Kentucky, which they purchased from Procter & Gamble in December 1958. In 1960, after starting consultation with Boyer, Ralston Purina began its first work with edible soy proteins by establishing a research and pilot plant at company headquarters in St. Louis, Missouri. In about September 1962 Boyer was named technical director of protein products sales in the soybean division of the Ralston Purina Co.; he worked for Ralston until his retirement in 1971. Frank Calvert, Boyer’s coworker from the Ford Motor Co. was hired in November 1962 to head up Ralston Purina’s R&D work on food-grade isolated soy protein in St. Louis. In 1965 Calvert was named director of soybean research, and in 1967 director of research of the Protein Division. In 1969 Calvert was promoted to director of research, New Venture Management, and finally in 1971 vice president and research director, New Venture Management. During these years, Calvert developed new soy protein isolation processes, 70 percent soy protein concentrate products, and modified soy protein coating compositions for industrial use. Calvert is considered a visionary in soy protein research and the accomplishments of his career were honored in 1973 when the Ralston Purina plant at Memphis, Tennessee, was dedicated to him in recognition of his years of service and dedication to protein technology.

In Oct. 1962 Ralston Purina began to introduce a line of edible soy protein isolate products made at their plant in Louisville: The first three were Edi-Pro A and Edi-Pro N (spray-dried isoelectric and neutral isolated soy proteins respectively) and Textured Edi Pro (an edible spun soy protein fiber). Supro 610 was launched in October 1966. As sales of these products increased, Ralston Purina soon found itself a leader in this new field—along with the pioneer, Central Soya, which had launched Promine in Oct. 1959. Ralston Purina expanded food grade isolate capacity with new facilities at Memphis, Tennessee, beginning production on April 10, 1973; Pryor, Oklahoma, beginning production on December 1, 1976. By late 1975 the company was making about 75 million pounds per year of isolates from its three plants, and was starting to advertise its isolates in a big way, with full-page color ads. This expansion easily vaulted Ralston Purina into the position of world leader in food-grade isolated soy proteins by 1976. On 21 August 1979 the company began producing soy protein isolates at its first plant located outside the Unites States, in Ieper, Belgium. On 1 July 1987 Ralston Purina established Protein Technologies International (PTI) as a wholly owned subsidiary focused on manufacturing soy protein and fiber products. In 1993 PTI was by far the world’s leading producer of soy protein isolates, controlling about 60% of the U.S. market. PTI’s sales of consumer soy protein products rose from $221.6 million in 1989 to a record $288.1 million in 1992.

135. SoyaScan Notes. 2020. The visionary work of Henry

© Copyright Soyinfo Center 2020
Ford and his researchers with soyfoods—then and now: Pioneered textured soy flour and TVP (Overview). Compiled by William Shurtleff of Soyinfo Center.

*Summary:* The world’s most popular textured soy protein product among consumers is TVP; the name is a registered trademark of ADM, The Archer Daniels Midland Co. of Decatur, Illinois. One of the two main developers of textured soy flour was William Atkinson, a researcher at the Ford Motor Co. since 1935. After doing early work on industrial soy protein fibers, he went to The Drackett Co., then to ADM when Drackett sold their agricultural operations to ADM in 1957. “TVP Textured Vegetable Protein” was launched commercially in April 1966, and Atkinson was issued a key patent on the product in Jan. 1970 (No. 3,488,770). The product described in this patent has probably had “the greatest impact in bringing the low-cost, textured vegetable products into commercialization.” A major breakthrough came on 22 Feb. 1971 when USDA's Food and Nutrition Service authorized the use of textured vegetable proteins (which, in practice meant TVP) as an extender for meat, poultry, or fish in National School Lunch Programs and Special Food Service Programs for children. Up to 30% on a hydrated basis could be used. By 1975 some 75 to 100 million pounds were being used in these programs alone. Starting in March 1973 TVP became a popular retail item as an extender for ground beef—whose price had skyrocketed. By 1976 approximately 60% of the soy flour and grit texturizing capacity in the U.S. was licensed under this Atkinson patent. It dominated the industry from 1970 to 1976 when it, in turn, came to be dominated by the Flier patent assigned to Ralston Purina Co. Wolf (1984) estimated that in 1982 approximately 95 million lb of textured soy flour, worth about $13.8 million at the wholesale level, were produced in the USA. It continues to be widely used in foods for both people and pets.


*Summary:* One day in 1942 at the Ford plant, Robert Boyer, while sampling fibers of his “soybean wool,” realized that these same soy protein fibers, if made tender by omitting the protein denaturation, hardening, and insolubilization, could be used as a basic ingredient in making meatlike textured soy protein foods. He had already developed an analog for the protein fibers that grow on the outside of a sheep (wool), why not develop an analog for those on the inside, a meatless meat or meat analog? In 1949 Boyer left his job at The Drackett Co.

He devoted all his energy to developing food uses of edible products made from spun soy isolates. His first patent for edible soy fibers was applied for in 1949; It was rewritten and applied for in May 1952 and issued in June 1954 (No. 2,682,466). In 1956 Worthington Foods purchased a license from Boyer and began to develop the world’s first meatlike meatless products based on these soy protein fibers. In Oct. 1962 Ralston Purina Co. began to produce the world’s first food-grade spun soy protein fibers–named Textured Edi Pro—at its plant in Louisville, Kentucky. Worthington Foods purchased these fibers and used them as key ingredients in a new generation of meatlike products. The first of these were on the market by 1963, with names like Worthington Soyameat–Fried Chicken Style, Chicken Style Roll, Prosage (like pork sausage), White-Chik, Soya Meat–Beef Like; The Soyameat–Fried Chicken style was canned whereas the other products were frozen. The flavor and texture were better than any meatlike product ever made in America. Initially these products were sold in health food stores but in late 1965 they started to be sold in supermarkets. In 1966 Worthington started to spin its own soy fibers, and the next year Ralston
Purina stopped spinning.

Other companies also licensed the rights to spin soy protein fibers from Robert Boyer. In December 1965 General Mills introduced its Bontrae line of spun soy protein fiber products, starting with Bac-O*s (imitation bacon bits). By May 1966 General Mills was making analogs for ground beef, diced ham, and diced poultry—all from spun soy protein fibers. So successful were these products (they also won several prizes) that in June 1969 General Mills broke ground for a multi-million dollar state-of-the-art fiber spinning plant at Cedar Rapids, Iowa. It began making Bontrae products in later 1970. By 1975 Cortaulds in England had launched Kesp, based on spun soy protein.

Today about 15-20% of Worthington’s meat alternatives contain spun soy protein fibers. These products have a retail value of about $8.8 million. Worthington’s Morningstar Farms line of meat alternatives, some of which contain spun soy protein fibers, is sold in the frozen foods section of about 95% of all supermarkets and grocery stores in America.

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