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Anderson International's line of Expanders is the oilseed extraction requirement. Our thrust case designs are a prime example. These allow true alignment and use quality seals and bearings for long life. In addition these provide unmatched flexibility in speed changes for multi-oilseed applications.
Henry Sundström, plant manager, prepressing and extraction plant, the Raisio Group, Raisio, Finland.
Finnish shoppers don’t know it, but Henry Sundström is directly responsible for nearly half of the vegetable oil they consume. As plant manager at Finland’s Raisio Group, he closely monitors product quality and yields.

According to Henry, the PX60 separator from Tetra Laval Food was a natural choice for optimizing yield levels and thus profitability. “We saw a dramatic increase in stability,” he says. “Separation efficiency is better than it’s ever been.”

Optimal yield can now be obtained in seconds with the help of an adjustable CENTRIZOOM™ paring disc. Another plus, he says, is the “open” design, which eliminates the need for seals in the outlet and lowers pressures.

The PX60, with a capacity range of 50 to 150 tons per day, is the smallest capacity separator in the new PX Series (50-700 tpd). For further information about PX separators, contact your local dealer.
Cargill Technical Services Limited has relocated to the Cargill Europe head office in Knowle Hill Park, Fairmile Lane, Cobham, Surrey, KT11 2PD, United Kingdom. The move is effective September 5.

The International Oil Mill Superintendents Association welcomes a membership application from Wm. Blake Hendrix, general manager of engineering, Tetra Laval Food Fats & Oils, Inc., Johnson-Loft Engineering Division, Novato, California.

The assets and name of Oliseeds International Ltd., San Francisco, California, has been purchased by Itcho, a large oil trading organization based in Japan. George Kopas, Jim Easler and Joe Smith of the former Oliseeds Int'l. staff will continue as consultants for the firm. John Gyulai has been named president and Keith Nakayama as vice president. Oliseeds Int'l. has focused on safflower and sunflower seed oil markets, representing Itcho specifically.

The president of the Brazilian Association of Oilseed Crushers has predicted that Brazil's soybean production could grow to 35 million metric tons over the next several years. They are expected to produce about 24.5 tons in 1994 (Brazil's harvest comes in spring months). Many factors have prohibited major expansion of Brazil's soybean harvests namely high taxes, high interest charges, inflation and transportation problems. Recently, according to the Germany-based newsletter Oil World, Brazilian officials have given in to farmer demands with a three per cent increase in funds available for financing 1994/1995 oilseed crops. Oil World predicts next season's soybean harvests namely high taxes, high interest charges, inflation and transportation problems. Recently, according to the German-based newsletter Oil World, Brazilian officials have given in to farmer demands with a three per cent increase in funds available for financing 1994/1995 oilseed crops. Oil World predicts next season's soybean harvests...
Nick Underwood, crop production coordinator for the Canola Council of Canada, is concerned about the impact of the recent hot, dry weather in Canada on canola seed color. "At temperatures of 30°C, canola can go from ten to 15 percent seed color change in just four to five days," said Mr. Underwood. He notes that the cooler summers in past years may catch canola growers off guard for this year's hotter weather and they miss the optimum time for swathing if they are not monitoring crops closely; heavy yield losses could result. He notes the best time to swath is when 30-40 percent of the seed on the stem has changed color. Moisture levels are also a critical factor in deciding when to swath.

NACE International, a not-for-profit organization dedicated to enhancing materials performance and protection, will host the eighth annual international symposium on solving corrosion problems in air pollution control equipment to be held November 15-17 in Berlin, Germany. Co-sponsors include the Air and Waste Management Association, Creusot-Loire Industrie, Electric Power Research Institute, Informationssieh Edelstahl Rostfrei, Institute of Clean Air Companies, and Krupp-VDM. The meeting will offer timely information for businesses concerned with selection, design, manufacture, use and maintenance of air pollution control equipment. For details contact NACE at 713-492-0535 or fax 713-579-6694.

IOMSA Celebrating 100 Years...1894-1994

GAZETTEER EXCERPTS

Oil From Cottonseed? Ridiculous.

Cottonseed oil seems to have been mentioned so long ago as 1783 when it was pointed out to the Society of Arts in England that oil might be extracted from cottonseed. To encourage the manufacture of this oil the Society offered a prize, but as no application was made for it, although the offer was repeated for six years no award was made. It was not expressed commercially until several years later.

- July, 1930

U.S. Soybeans Began As A Carmaker’s Dream

By Researcher Lloyd Dinkins

The non-edible variety of soybean, now a major American crop, was brought to the United States by Henry Ford I. He had dreams of combining farm products into raw material for industry. Beans were used to make a tough plastic from which car bodies could be made. One body was for the Model A Ford; cost $80,000 and the project was dropped.

In 1939, soybeans were the twelfth most important crop in the United States and by 1959 it was ranked fourth. The United States produced 58 percent of the world’s soybeans in 1958.

- June, 1960

From Gazetteer Readers - Revisiting the Past

Recently we received the Anniversary issue of the IOMSA and the June issue of the Oil Mill Gazetteer and thank you so much—our girls, too, enjoy them as they moved from Atlanta, Memphis, Dallas and Fresno with us and were family with Carver.

While returning from Florida last summer (1993), we decided to go by Savannah and Garden City, Georgia to see the new Carver facilities—daddy was excited to see all of the new machinery.

Several of the men took him on a tour and he enjoyed it. Though I’m 88 years old, I, too, enjoy reliving the good times we had in the past.

Sincerely,
Mrs. C. L. (Eloise) Printup

Charles Printup died in October, 1993 at the age of 89. He worked several decades at the Carver Cotton Gin Company.


A large group attended the eighteenth annual West Coast Divisional Meeting held in San Diego, California in 1965. Sidney Switzer, superintendent of Ranchers Cotton Oil, Shafter, California, served as chairman at the meeting. The West Coast Division disbanded and joined the IOMSA shortly after 1973.
POS Pilot Plant Completes Tests, Revisions, On Fat Content Of Edible Oils, Fats

Nutritionists, dietitians and consumers now have current information available on the fat composition of the major edible oils and fats thanks to an analysis of ten vegetable oils and three animal fats completed by POS Pilot Plant Corporation in Saskatoon, Saskatchewan. Products for analysis were sourced from a variety of manufacturers and food processors in Canada and the United States. The last time such an analysis was done was in 1979 by the USDA.

"With the amount of breeding work that goes on in these crops, there was bound to be some changes in fat composition in that time so we wanted to bring the analysis up-to-date," said Bill Riley, research coordinator, Canola Council of Canada.

"But the real impetus was that the United States, under its new food labeling regulations, now counts all saturated fatty acids including the long chain ones. We have always included those in Canada but the original, widely-used fat composition chart developed by USDA did not include the long chain fatty acids."

The updated chart now shows canola oil at seven per cent (up from six per cent) saturated fat because of the inclusion of the longer chain fatty acids.

Canola oil remains the only edible oil with a single digit rating for saturated fat. The vegetable oil next lowest in saturated fat content is safflower oil at ten per cent, and this is 43 per cent higher than canola oil.

Dairy Researchers Ask About Cottonseed Products

The National Cottonseed Products Association found dairy scientists at the American Dairy Scientist Association meeting to be most interested in this season’s cotton production and seed cost as well as a demand for updated nutritional information on meal and hulls.

Sources for cottonseed products such as pelleted hulls were also of interest as was searching for potential methods to raise milk protein content.

The NCPA’s R & E staff held a Feed Products exhibit during the convention which attracted over 3,100 participants.

Whole Cottonseed Meets Mixed Review During Dairy Science Annual Convention

Utilization of whole cottonseed which has undergone various processing treatments has met with mixed results, according to the National Cottonseed Products Association. Several presentations on the topic were given at a meeting in July of the American Dairy Science Association and the American Society of Animal Science.

In research presented by Pires, Eastridge and Firkins of Ohio State University, whole, ground, whole roasted and ground roasted cottonseed were fed to lactating dairy cows; grinding increased dry matter intake and slightly increased four per cent fat corrected milk and milk protein percentage and roasting showed an increase in milk protein while depressing organic matter digestibility. Grinding also increased overall ration digestibility compared to unground seed.

DhimerandSatter, USDA Forage Research Center in Madison, Wisconsin, reporting on the effects of feeding heat treated (roasted) whole cottonseed to dairy cattle, saw an increase in milk fat and a depression of milk protein percentage when cows were fed either whole cottonseed or roasted whole cottonseed.

However, these diets were using over 12 pounds of whole cottonseed per day. In both of these studies no indication as to cost of processing was given and no recommendation for utilizing these methods was provided by the presenters, reports the NCPA.

The question of whether any increase in production will offset the cost of roasting was not answered.

Whole cottonseed research continues with not only dairy but both sheep and beef cattle use being tested. Research conducted at North Carolina State showed sheep respond to seven per cent whole cottonseed in the ration but gains were depressed when 14 or 21 per cent whole cottonseed was fed to replace corn and soybean meal in the diet.
Plant Oil Uses

Neem Seed Oil Natural Fungicide

Oil extracted from neem seeds covers plant leaves like a raincoat, stopping fungi that cause diseases such as powdery mildew and rust from infecting plants.

Neem, or margosa, trees are native to India and Burma and are related to mahogany. They require a frost-free climate, and will grow in West Africa, the Caribbean, Australia, southern Florida, several southwestern states, and Hawaii.

Almost all parts of the versatile plant contain extractable compounds that have been used for centuries in India in personal hygiene products like soap and toothpaste. Seed extract has been used to treat skin diseases, sores, and rheumatism.

Fungal spores are spread by wind and splashing raindrops. "If the spores can not adhere to a leaf, germinate, and penetrate the leaf cells, they can not cause disease," says Jim Locke, a USDA/ARS research plant pathologist.

Mr. Locke says that in numerous tests, a spray of one-per cent neem oil in water "stopped 95 to 100 per cent of the powdery mildew on hydrangeas, lilacs, and phlox." A single spray application was sufficient to protect these ornamentals from infection. Repeated applications at seven to 14-day intervals as the plants grew provided disease protection without any plant damage.

On plants where mildew had begun to develop, "it was arrested," Mr. Locke says, "providing control comparable to each of three chemical fungicides."

Powdery mildew, which also attacks crepe myrtles and roses, causes leaves to turn white. Preliminary results indicate the oil will arrest and control the fungus that plagues these popular ornamentals, especially in humid areas.

Mr. Locke says the oil is the first botanical product to exhibit fungicidal properties. He has been field-testing it for the past four years on several greenhouse and nursery crops.

"We are working now to discover how the neem oil protects the plant from infection," says Mr. Locke. Two of the possibilities are that the spores fail to germinate or are unable to penetrate the leaf.

One study involves numerous laboratory tests of roses by Mr. Locke's group in the Floral and Nursery Plants Research Unit at the agency's U.S. National Arboretum, Washington, D.C. He says the oil "seems to delay infection by black spot—the number-one disease of roses. As a result, rose bushes lose fewer leaves compared to untreated, diseased plants."

He says this research, begun in cooperation with former ARS entomologist Hiram Larew, also demonstrated that neem oil can reduce damage caused by various pests, including spider mites. "In preliminary tests, a two-per cent spray of neem seed oil applied directly to spider mite eggs resulted in an 87 per cent mortality," comments Mr. Locke.

Research at USDA on plant-derived natural pesticides, such as nicotine, dates back to the 1920s. Beginning in 1975, extraction products from neem seeds were evaluated for their insect-killing properties.

Under a cooperative research and development agreement with W. R. Grace and Company, Colombia, Maryland, Mr. Locke is testing the oil as a fungicide that may be available commercially later this year.

They're Finally Here

Additional copies of the 100th Anniversary Issue of the International Oil Mill Superintendents Association are available for sale.

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Oilseed Output Update

Move Aggressively Ahead Of Last Year

The United States is expected to produce bumper crops of soybeans and cottonseed in 1994/1995 if Mother Nature cooperates. The USDA crop reduction report for cotton is at about 19 million bales compared to the final output in 1993/1994 of 16 million bales. Some industry experts estimate the baleage closer to 18.5 because of uncertain weather conditions in West Texas. Soybean production for 1994/1995 ranges from 2.2 billion bushels (by the USDA) and 2.4 billion bushels (from private sources). This compares to USDA estimated output for 1993/1994 of 1.8 billion bushels (49 million tons), forecasting a 19 per cent increase for this season.

Oilseed production forecasts for the United States for the major crops are at 68.9 million tons; soybeans- 58.7, cottonseed- 6.4, peanut- 1.6, sunflower seed- 1.9; and rapeseed (canola)- .19. World oilseed production is estimated by the USDA and most private sources at 242 million tons, a record output if it materializes for 1994/1995. Downward revisions in soybean production forecasts for Brazil and China and in cottonseed are holding global forecasts below potential. Weather is the causative factor in most instances.

CANADA

Canada’s oilseed production during crop year 1994 are forecast to reach an all-time high. Record planted area is forecast for rapeseed and soybeans this year (the two largest oilseed crops), which when combined with average yields, will likely result in a record output. Increased soybean plantings (vis-a-vis 1993) in Ontario are being forecast as farmers there react to relatively strong prices vis-a-vis corn prices. Sunflower seed production is also forecast to increase somewhat from 1993 levels.

Canada’s oilseed exports during the 1994/1995 marketing year are forecast to continue to be dominated by sales to Japan and the United States. Canada’s rapeseed exports to Japan continue to rank as the most important oilseed export. Rapeseed exports to Mexico are on the upswing, but will continue to be minor when compared with exports to Japan. Japan’s tariff on imported vegetable oil, along with Canada’s Western Grains Transportation Act, continue to be the driving forces for Canada’s exports of rapeseed seed.

Soybean and sunflower seed trade will continue to be dominated by trade with the United States. Meal production, which has trended upwards over the last 20 years, will continue to increase during the 1994/1995 marketing year, forecasts the USDA.

Canada’s crushing facilities are operating at full capacity for cottonseed and soybeans, but some rapeseed crushers are upgrading facilities to improve crush capacity. Crush capacity will likely continue to increase as demand for rapeseed oil increases in the U.S. marketplace.

Oilseed meal utilization in Canada is expected to remain fairly stable during the 1994/1995 marketing year. Canada is still building its livestock herds and increasing the numbers of cattle on feed because of the continued strength of the U.S. red meat market. Increased domestic use of rapeseed meal will likely tend to displace soybean meal imports from the United States.

Canada’s exports of vegetable oils during the 1994/1995 marketing year are forecast to increase to one of the highest levels on record, reports the USDA. The bulk of the increase will likely come from improved rapeseed oil exports.

LATIN AMERICA

Total oilseed production in Latin America is forecast by the USDA to expand by more than one per cent next year, following a ten per cent increase this year.

Argentina’s oilseed production in 1995 is forecast at a record 16.8 million tons, up two per cent from this year’s level. Soybeans make up most of the increase. Argentina’s soybean harvest in 1995 is estimated at 12.2 million tons.

Argentina’s exports of oilseeds are forecast to expand, with almost all the increase being soybean exports. Vegetable oil exports in 1995/1996 are forecast at 2.5 million tons, up two per cent over this year. Sunflower seed oil and soybean oil exports are forecast at 960,000 tons and 1.4 million tons, respectively. Sunflower seed oil accounts for nearly 70 per cent of total vegetable oil consumption in Argentina with soybean oil a distant second.

Brazil’s production of oilseeds in 1995 is projected to be 25.2 million tons, reduced slightly from the 1994 level. Although soybean production is forecast down 200,000 tons at 24.3 million tons, cottonseed is forecast to increase 9 per cent next year, following a 16 per cent increase this year. Sunflower seed oil and soybean oil exports are forecast at 800,000 tons and 1.1 million tons, respectively. Brazil will continue to be the third largest exporter of soybean oil following Argentinean and the European Union.

FRANCE

Following a decline in oilseed production in 1993, total oilseed area in France is forecast by the USDA to increase 16 per cent in 1994. A large part of this increase is due to increased production of rapeseed for industrial use, mostly biofuel, on set-aside land.

Rapeseed yields are forecast to be nine per cent lower in 1994 due to the impact of the phoma fungus, but should increase in the near future with the introduction of new hybrids. Total oilseed crush in France, which increased three per cent in 1993/1994, is projected to rise nine per cent in 1994/1995, due to increased demand for rapeseed oil for fuel.

France’s soybean imports from the United States were sharply down in 1993/1994, relative to the previous year, due to reduced demand for crush and increased competition from Brazil, and are forecast to further decline in 1994/1995, due to part to a larger domestic soybean crop.

ITALY

Italy’s oilseed production in 1993 dropped dramatically by 36 per cent, as a result of implementation of CAP reform in both the grain and oilseed sectors. Soybean double cropping practically disappeared last year, since the new CAP no longer provides any subsidy for such crops.
Both soybean, and to a lesser extent, sunflower seed area were cut substantially last year due to competition with other crops (corn for soybeans in northern Italy and durum wheat for sunflower seed in the central regions).

This year, however, the situation has changed again. Preliminary estimates of planted area indicate a sharp increase (+37 per cent for total oilseeds), as a result of: 1) a new, partial switch in the Po Valley from corn to soybeans, resulting from profitable net incomes granted to the grower from the soybean crop, as well as the concern in exceeding the corn guaranteed acreage; 2) a substantial growth of sunflower seed area, both for food use and non-food use, the latter planted on set-aside land.

Domestic oilseed crushing, after the ten per cent decline expected in 1993/1994, is expected to rebound in 1994/1995, increasing seven per cent from a year earlier, but still below the record level set in 1992/1993. Reduced crushing margins as well as other problems within the crushing industry are the primary reasons which presently keep the domestic crush on the low side.

Olive oil production in 1993/1994 is now estimated at 450,000 tons, or only slightly over the 1992/1993 level, despite previous expectations, based on the cyclical fluctuations of this crop, which suggested a larger crop.

**SPAIN**

Forecast oilseed planted area in 1994 calls for 1,220,000 hectares planted to sunflower seed and 58,000 hectares planted to rapeseed. As in 1993, Spain’s cotton crop will be severely reduced due to lack of irrigation.

Since 1991, domestic consumption of vegetable oils, including palm and other lauric oils, in Spain has risen to about 1.2 million tons, up 22 per cent from 1990. The liberalization of Spain’s oil market in 1991, which ended restrictions on sales of soybean oil and led to lower seed oil prices, is behind the increase in consumption.

Although consumption of olive oil and sunflower seed oil initially increased following the liberalization of Spain’s oil markets, more recently consumption of olive oil has declined moderately while sunflower seed oil consumption has remained flat.

In contrast, soybean oil consumption has doubled since 1990 to 196,000 tons in 1992/1993, and is forecast to further increase to nearly 200,000 tons in 1994/1995. In general terms, the increase in soybean oil consumption is due to more competitive
prices for soybean oil, and the growing propensity for industrial
users to substitute vegetable oils in place of animal fats in food
processing.

Declining soybean crushing margins have resulted in increased
imports of soybean meal to the detriment of soybean imports in
the 1983/1994 marketing year. However, soybean imports are
expected to rebound from a 1983/1994 low of two million tons
to about 2.3 million tons in 1994/1995.

OTHER WESTERN EUROPE

Oilsseed production in 1994 is forecast by the USDA at
942,000 tons, up 11 per cent from last year and nearly 43 per
cent above the quantity produced in 1991. Much of the gain in
production this year occurred in Austria and Sweden where an
added incentive exists to maximize plantings prior to entry into
the European Union in 1995.

Under the current agreement, the base acreage for oilsseed
area will be determined as the average planted oilsseed area for
the three years prior to entry into the EU.

In Norway, there was no crushing of soybeans in 1993 due
to the October 1992 fire at the only crushing plant Denofa.
However, Denofa resumed full production as of April 15, 1994;
1994 may see a crush of about 200,000 tons. This level is
forecast to be maintained in 1996.

CHINA

China’s oilsseed production in 1993 had two record harvests
(soybeans and peanuts) and significant declines in cottonseed
and rapeseed. However, total oilsseed production rose by nearly
16 per cent over 1992 production. Producer prices for peanuts
and rapeseed remain strong, which will lead to expanded acreage
in 1994.

Demand for oilsseeds and oilsseed products is continuing to
expand rapidly in China. The most important factor has been the
dramatic growth of the animal feed sector. This industry has
been supplying the fast growing meat, poultry and aquaculture
sectors, which have sprung to life as a result of increasing
incomes and China’s fast growing economy.

Demand for oil continues to be strong, and consumer
preferences are shifting to higher quality refined cooking oils. In
addition, consumers are also developing preferences for specific
types of oil, favoring soybean oil at this time.

China will remain an important market for some oilsseeds, and
oils, while continuing to be a major supplier of certain meats and
peanuts. Trade levels will most likely remain constant for 1994,
but over the next three to five years are likely to exceed current
levels.

China’s fast growing economy will allow consumers to spend
more of their income on meat, poultry and processed foods,
which together drive the demand for meats and oils.

PHILIPPINES

Philippine copra production within the next three to five years
is expected to remain above two million tons despite the
apparent trend towards reduced area and bearing tree population,
comments the USDA. This is in anticipation of improved yields
resulting from positive initial effects of the World Bank-financed
Coconut Industry Rehabilitation Scheme (CIRS). The industry
has a very ambitious target of 3.0-3.5 million tons by the year
2000.

Soybean cultivation, at less than one per cent of total oilsseeds
produced, will remain relatively small and insignificant even
though it continues to slowly expand.

An improvement in local oil processing efficiency and
continued expansion of soybean oil sales to industrial end-users
should translate to modestly increasing soybean crush in the
coming years. Soybean consumption for food use is expected to
remain stable at 25,000 tons per year.

Soybean extrusion into full-fat soybean meal, which
insignificant at present, is expected to gradually increase in the
near to medium term. Consequently, the outlook for soybean
imports in the next five years is very positive.

Domestic consumption of all meals posted only modest
growth in calendar year 1993. Power outages severely affected
the swine and poultry industries, which suffered form production-
related constraints and weak meat demand due to unreliable
frozen storage and reduced purchasing power. In the next two
to three years, general economic recovery and improving
consumer purchasing power should stimulate growth in overall
meat demand. Coupled with the 2.4 per cent annual population
growth rate, prospects for Philippine meal consumption are
very positive and are projected to register about eight per cent
growth per year.

The largest segment of domestic oil consumption is for food
use. Food-use consumption of total oils declined in 1993 due to
a power crisis effect on the economy, although a dramatic
recovery is seen beginning in 1994 with improved power availability
and significant economic and population growth.

Industrial use is the second largest segment of domestic oils
consumption, and is projected to continue to expand in the
medium to long term. The domestic coconut oil-based
oleochemical industry is becoming established.

Officials see the possibility of lesser coconut oil exports in the
longer term which more supplies are diverted to the domestic
oleochemical industry for processing into downstream value-added
products.

INDIA

India’s 1993/1994 oilsseed production was a record 23.8
million tons, reports the USDA. Soybean area and production
continues to increase due to excellent returns to growers,
expaniding processing capacity, expanding export markets for
meals and improved cultivation practices. Peanut production,
the largest source of vegetable oil in india, continues to vary year
to year due to large part to variations in rainfall. Rapeseed
production rebounded in 1994, but failed to match the record
1991 production.

Exports of edible peanuts, the only major oilsseed exported
from India, has grown significantly since 1991/1992 as Indonesia
emerged as a major market.

Domestic vegetable oil production continues to expand,
but at a slower rate than domestic demand. This caused
vegetable oil prices to move up significantly during the first
quarter of 1994, prompting a government decision to allow palm
oil imports.

Private traders are now permitted to import palm olein subject
(continued on page 16)
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to an import duty of 65 per cent compared with a 20 per cent duty applied to imports by the government's State Trading Corporation.

Vegetable oil imports during 1993/1994 are likely to reach around 264,000 tons including commercial imports of 200,000 tons of palm olein. Assuming imports by the private trade will be allowed during 1994/1995, total imports are forecast to reach 350,000 tons.

**BANGLADESH**

Bangladesh continues to be a major importer of edible oil, as local production only meets one-sixth of the annual consumption of over 500,000 tons, according to USDA numbers.

Imports over the past three years have shifted from soybean to palm oil due to the rapid development of crude palm oil processing facilities, a pro-palm revision in the tariff structure, freight advantages from palm oil producing countries and recent firm international soybean oil prices.

Soybean oil imports are expected to gain slightly in 1994/1995 with the return of PL-489 Title III funding and forecast lower (assumed) international soybean oil prices. Palm oil imports in 1994/1995 are expected to remain near current year record levels given recent changes in policy which favor palm oil imports.

**PAKISTAN**

Cottonseed production, which was reduced following extensive disease and pest infestations in 1993, is forecast, by USDA personnel, to rebound in 1994 to 3.2 million tons. This will bring cottonseed production to the highest level since 1991 when production reached 4.4 million tons.

Production of other oilseeds, particularly rapeseed, peanuts, and sunflower seed should remain at, or slightly above the level of a year earlier. However, these commodities account for roughly 12 per cent of total oilseed production in Pakistan.

India’s soybean meal dominates the import market to the detriment of U.S. soybean meal which is at a price disadvantage. Soybean meal from India has the advantage due to its lower price and availability.

Consumption of edible oils is expected to continue increasing at an annual rate of four per cent in 1994/1995.

The market share of palm oil is now approaching 68 per cent and is largely due to the widening price gap between soybean and palm oils. Pakistan is a price conscious market and as such there is little demand for the most costly oils.

**MALAYSIA**

With the recent addition of a new soybean crushing facility, soybean imports should grow by 100,000 tons during 1993/1994 to 630,000 tons. Imports are forecast to reach 665,000 tons in 1994/1995. Malaysia's soybean crushing capacity should be sufficient to handle the country’s crushing needs for at least the next three years assuming that soybean meal imports continue at approximately the current level, and soybean meal demand continues to grow at around five to eight per cent per year, in line with growth in livestock feed production.

Soybean meal imports are expected to reach 310,000 tons in 1993/1994 and are dominate the soybean meal import market. The price is competitive and quality has reportedly improved over recent years.

In the palm oil sector, Malaysia is expected to set new production records over the next two years as yields are reaching their cyclical highs and the mature hectare equivalent area continues to rise. Exports of palm oil should also reach new highs assuming that world demand remains strong and palm oil prices are competitive.
Cotton Council President Testifies Before U.S. Government For Strong Farm Programs

National Cotton President Bruce Brumfield told a House Agriculture Subcommittee recently that U.S. agriculture needs the continuation of strong, market-oriented farm programs in 1995 farm law.

Mr. Brumfield noted that under the more market-oriented farm laws of 1985 and 1990, "net cash income and net farm income have generally trended upward. Real value in farm assets has stabilized after a sharp and persistent decline during the 1980s, profitability has improved and farm foreclosures are far less common."

He urged members to oppose in 1995 farm legislation: damaging increases in non-payment acres, efforts to require the idling of more land as a condition of program participation and efforts to further restrict eligibility for program benefits. He asked that every effort be made to retain well-funded market development and export credit programs and to extend Conservation Reserve Program contracts.

Mr. Brumfield said the Council's foremost priority is opposition to any further limits on benefits which might be imposed by means-testing or any other measures to restrict benefits based on size, management organization or income.

In providing the General Farm Commodities Subcommittee an assessment of the nation's agricultural situation, the Mississippi producer testified that "we (agriculture) will maintain our trade surplus, along with the jobs it creates, only if we keep sensible farm programs that are keyed to the nature of our competition."

The council also opposes an increase in unpaid flex acres, cross- and offsetting compliance; supports the continuation of the 50-85 program option and non-market disruption alternative use of idled acres under the annual acreage reduction program; and is interested in a targeted option program that would allow individual farms to make cropping decisions.

Mr. Brumfield also reminded members that farm program spending was reduced two-thirds between 1986 and 1992 while total federal spending continued to soar during that period. "Cotton's program costs have fallen while the industry has expanded dramatically — especially relevant given cotton's status as the number one generator of revenue and jobs among U.S. agricultural commodities," he testified.

Mr. Brumfield said the cotton industry expects the current, successful farm program will face many challenges in the months ahead — from interests as divergent as the General Agreement on Tariffs and Trade, budget pressures, environmental concerns and simple political expediency.

GATT, for example, will not reduce the need for U.S. agricultural programs, according to his report. "Unless we keep effective farm programs in place, few of the North American Free Trade Agreement benefits may be realized and GATT will be damaging to U.S. agriculture," he said.

"We think it would be devastating to American agriculture for our government to make substantial, unilateral reductions in agricultural spending just when global competition reaches a new apex under GATT," Mr. Brumfield said. He praised the panel for its opposition to calls for cuts in agricultural spending as a way to offset lost tariff revenues from GATT's implementation.

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Southern States May Increase Soybean Acreage; New Seed Breeds Improve Profits

In Florida, only 8,000 acres of soybeans were planted in 1949; by 1965, 76,000 acres were planted. Florida acreage peaked at about 600,000 acres in 1980/1981 and many of those acres were soybeans developed by Kuell Hinson and other USDA/ARS scientists. But production in Florida has plummeted since that early 1980’s peak to about 50,000 acres today, primarily because of competition from Brazil and Argentina.

Other southern states have also seen their soybean acreage drop sharply. But economic factors—such as last year’s weather conditions—could prompt increases in southern soybean plantings, Mr. Hinson says.

Southern growers now have a much narrower window for planting their crop—only 35 to 40 days from about May 10 to mid-June in the Gainesville, Florida area, where Mr. Hinson worked for ARS and is now completing the soybean breeding work at the University of Florida. If farmers try to plant outside that narrow window, yields drop off because the plant’s normal flowering is disrupted and seed production declines.

When the days are long, the soybean plant channels its energy into making leaves, stalks and other vegetative growth. When the days shorten, the plant senses the reduction.

Because of their day-length sensitivity, soybeans are divided into different maturity groups ranging from group 000 to X, with 000 suited to the northern-most planting areas and group X to tropical growing areas closest to the equator. Mr. Hinson says he has incorporated a long-juvenile trait into germplasm in groups V through VIII, making them of most benefit to growers from mid-Tennessee to north Florida.

Mr. Hinson began working with the juvenile trait in 1978. ARS soybean breeder Edgar Hartwig and colleagues had identified the trait in soybean germplasm that originated in the Orient but came to the United States by way of Peru. In the mid-1980s, Mr. Hinson discovered that the trait was controlled by one gene.

Later varieties also incorporated resistance to the soybean cyst nematode, which also damages soybean plant roots.

"If economic conditions improve and soybeans are in greater demand, we want to make sure our southern growers have the best soybeans available to them," he adds. "I think these long-juvenile soybeans will provide them with the flexibility to produce a profitable crop."

### National Safety Council Offers Training Course

In 1992, 62 per cent of workplace illnesses were reported as cumulative trauma disorders (CTDs), according to the Bureau of Labor Statistics. In response to the continued increase in repetitive trauma injuries, the National Safety Council has introduced an ergonomics training program, Ergonomics: Awareness and Application, which can help reduce CTDs in the workplace.

The program is designed to increase CTD risk awareness among employees at all company levels. The program provides an overview of ergonomics and teaches how to identify risk factors and job hazards.

The CSA is expected to propose a new ergonomics standard later this year which will affect both industrial and office workplaces. Conditions associated with CTDs include carpal tunnel syndrome, noise-induced hearing loss and epicondylitis (tennis elbow).

The modular, 16-hour training package includes a 300-page instructor’s manual with color overhead transparencies and a participant workbook with pre- and post-tests to gauge program effectiveness. Also included, and available separately, is a three VHS-video set that provides: an ergonomics overview, CTD definition and information; and, elements of a successful ergonomics program.

For Ergonomics: Awareness and Application ordering information, call the National Safety Council at 1-800-621-7619. The National Safety Council is a not-for-profit, nongovernmental, international public service organization dedicated to the reduction of accidental deaths and injuries.
Cottonseed Crusher Representative Selected To Cotton Leadership Class By Cotton Council

Members of the 1994/1995 Cotton Leadership Class were named by the National Cotton Council’s industrywide selection committee. Four producers and one representative from each of the six other industry segments, including the processing area, will participate in the program sponsored by a Cotton Foundation grant from DuPont Agricultural Products. The group, the twelfth to be selected in this program, will begin training in mid-September during the council’s fall meeting in Memphis, Tennessee.

Class members by industry segment are: cotton producers - Steven G. Tate, Meridianville, Alabama; Thomas M. Pitts, Indianola, Mississippi; Randall R. Williams, Altus, Oklahoma; and Steven E. Bales, Jr., Buckeye, Arizona; ginner - S. Randolph Kennedy, Shallowater, Texas; warehouseman - H. H. Lindemann, III, Waco, Texas; merchant - Richard L. Clarke, III, Memphis, Tennessee; crusher - Dennis Lard, Chandler, Arizona; cooperative - Shane Stephens, Greenwood, Mississippi; and manufacturer - Frank T. Buie, Laurinburg, North Carolina.

The class will study industry organizations and their policy-making procedures, observe cotton research and marketing development and view cotton production and processing during 30 days of activities across the Cotton Belt. Participants also will receive training in communications techniques and get a closeup look at governmental and political affairs during a visit to the council’s Washington office.

"Through its sponsorship of the Cotton Leadership Program, DuPont has made a contribution to the future of the council and the foundation," said Mark A. Wolters, Cotton Market Manager for DuPont Agricultural Products. "We at DuPont now feel like true stakeholders in the foundation and the council."

Canola Meal Fattens Pigs Comparable To Soybean Meal At Significant $ Savings

Data collected from feeding trials across Western Canada show that pigs fed canola meal rations will grow and finish as well as those fed soybean meal - but at a lower cost. The trials showed that $1 to $2 could be saved per market hog in feeding costs when pigs are fed canola meal supplemented rations. In a typical 300 sow farrow-to-finish operation that represents a saving of $6,000 to $12,000 per year.

"The trials found that there was essentially no difference in pig performance between rations using canola meal or soybean meal as the protein source. Pigs fed canola meal had the same dressing percentage, feed conversion and average daily gain as pigs fed solely soybean-based rations," said Dr. Hickling, director of feed technology for the Canadian International Grains Institute and coordinator of the trials for the Canola Council of Canada.

Based on earlier feeding trials, an assumption had been made by many hog producers that they could not get their pigs to market as quickly on diets containing canola meal. This new information disproves that perception. "In past feeding trials, researchers did not balance rations to take into account the fact that canola meal was lower in digestible lysine that soybean meal," explained Dr. Hickling.

"Formulating rations to digestible amino acids is a relatively
new concept. In order to make a canola meal ration nutritionally equivalent to soybean meal with respect to dietary protein, additional lysine must be added to the ration. When that is done, and the rations are balanced to produce the same energy levels, pigs fed canola meal perform just as well as those fed soybean meal - at both the grower and finisher stage - and the feed cost is lower.

The feeding trials were conducted at independently-run Canadian research facilities in Alberta, Saskatchewan and Manitoba. By running the same feeding trial in each of the three provinces, differences in environment, barn conditions, ingredient quality and pig genetics could be factored into the study.

Three different rations were used in each of the grower and finisher stages: a control diet containing soybean meal, a diet with medium levels of canola meal (six per cent in the grower and eight per cent in the finisher), and a diet with high levels of canola meal (ten per cent in the grower and 15 per cent in the finisher). The rations were balanced to be nutritionally equivalent. In the canola meal rations, a higher level of wheat was used to balance energy; a higher level of lysine to balance digestible lysine levels; and a slightly higher level of crude protein to balance digestible threonine. Ensuring that the ration is nutritionally balanced is key to achieving the type of performance shown in these trials.

What is worthy of note about the feeding trials coordinated by Dr. Hickling is that the results, when averaged across all trials, show no statistical difference and only negligible numerical difference between pig performance on canola meal or soybean meal diets.

"The bottom line is, pigs can be sent to market as quickly on canola meal as they can on soybean meal. These trial results demonstrate that," said Dr. Hickling.

Human Reluctance Slows Use of Plant Automation Process Control Technology

While technological barriers that previously restrained growth in the advanced control market are diminishing, human factors are the main aspects slowing growth in this industry, with the main problems deriving from the shortage of experienced engineering personnel and an instinctive reluctance to entrust critical processes to an advanced-control strategy, that allows control of the plant to be tuned and adapted automatically.

Throughout the process industries, increasing use is being made of advanced-control technology to regulate difficult processes and reduce production costs. The petroleum refining and chemical industries were the first to implement advanced-control schemes and their use has now spread to a much wider spectrum of process industries.

According to a new report by Frost & Sullivan, the technologies in use today have proven their ability to reduce costs, but the market is still at an early stage of development as only a small proportion of potential applications have been fulfilled.

Revenue growth rates started to decline in 1993, but with an estimated value of $77 million, the European market for advanced-control, which is increasingly becoming the one of the key driving forces in the distributed-control markets, remained very healthy overall as growth in countries with more mature markets slowed.

Growing at a compound annual growth rate of 17.6 per cent, Frost & Sullivan forecasts that the total European advanced-control market will be worth $239.9 million by the end of the study period in 2000.

In terms of product types, the software toolkit market, which is still at an early stage of development, is forecast to show the highest growth over the surveyed period, increasing from $12.4 million in 1993 to reach $53.9 million by 2000.

Advanced batch projects and consultancy, estimated to have been worth $0.7 million in 1993, is expected to increase to reach $2.7 million by 2000, as this market exhibits healthy levels of revenue growth as the technology for this type of application matures and stabilizes.

The largest 1993 national market for advanced-control was France, valued at $12.7 million and expected to reach $36.3 million by the end of the study period, reflecting the current high demand for project engineering and consultancy, the report states. The German market is predicted to show the highest growth over the study period, rising from its 1993 level of $11.4 million to reach $53.8 million in 2000.

With a 34.3 per cent market share, the petroleum refining industry was the dominating industry sector within the advanced-process-control market. Although the lowest growth will be experienced in the petroleum refining industry, it will still represent 20.5 per cent in 2000.

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September, 1994 / OIL MILL GAZETTEER
Special Invitation Extended To All TSOMSA and IOMSA Members and Spouses

I realize it's still summertime yet here I am talking about a meeting scheduled for early December- the annual TSOMSA sponsored regional meeting held the first Saturday in the Christmas month- but I am very excited about our program and what we have to offer you.

I would like to take this opportunity and time to invite all Tri-States Oil Mill Superintendent Association and International Oil Mill Superintendents Association members and their spouses to this special gathering in Memphis.

The meeting will be held Saturday, December 3, at Wilson World. Call the hotel at 901-366-6600 for directors and reservations. Rooms have been reserved for Friday and Saturday nights. If you reserve rooms now and mention you are attending the TSOMSA meeting, special room rates will be available.

Currently, the technical and social programs are not complete but much of the planning is done. Let me share what we have scheduled as of mid-August:

1. One of our five speakers will be Leroy Venne, safety and environmental coordinator for Cargill. He will address process safety management and where the industry should be today.
2. The remaining four presentations are awaiting approval.
3. Saturday evening's dinner and entertainment are arranged and it will be a semi-formal affair.
4. Saturday's Ladies Luncheon is slated to include a special speaker, Lieutenant Jim Bullard who will discuss Self-protection For Women, an important issue in the nineties. Carol Whitsett made the arrangements for this event.

If you want an enlightening education in safety and oilseed processing, a good social agenda, and some good ol' Southern Hospitality, come to Memphis December 2 and 3 and take advantage of an enjoyable meeting.  

Tom Richardson
TSOMSA MEMBERSHIP APPLICATION

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The Sparks Companies, Inc., Annual Fall Outlook Seminar will provide a comprehensive look at the shifting market conditions that most immediately impact agribusiness’ bottom line—from the changing mind-set of the U.S. food sector to the upcoming debate on the 1995 Farm Bill, global agriculture and trade policy, and the major implications of a new world trade order. The seminar will be held in Memphis, Tennessee, September 21-22 at the Adam’s Mark Hotel.

The seminar will bring together industry leaders to give their perspectives on how to remain a successful market participant as changing market conditions affect short-term and long-term business goals. In addition, attendees will hear SCR’s top economists give supply/demand analyses of the oilseeds, grains, sweeteners, livestock, and transportation industries.

The highlight of this year’s seminar is industry leaders’ discussions on how their firms succeed by using efficient consumer response and economic value added approaches to profitably managing business growth. Attendees will gain ideas on how to focus on consumers and respond quickly and efficiently to their changing interests. They also will learn new distribution techniques, how to utilize partners, ensure commitment, manage inventory, and supply higher value products at lower costs.

Attendees will hear from Ed Dudley, vice president of distribution services, Kraft General Foods, Northfield, Illinois. Mr. Dudley is a member of the Kraft’s efficient consumer response team which has responsibility for defining and developing the appropriate strategies and necessary core capabilities for its successful implementation.

An in-depth look at the United States and global economic environment will be presented by Michael Drury, chief economist at McVean Trading & Investments, Memphis, Tennessee.

SCI president Carroll Brunthaver will look at the key issues shaping the 1995 Farm Bill debate including how budget constraints will factor into the equation, whether means testing will emerge, and if the Export Enhancement Program is still alive and well. SCI senior vice president J. B. Penn will provide insights into global agriculture and trade policy—particularly the Uruguay Round GATT agreement’s impact on the United States and world economies and the major implications of a new world trade order.

SCI also has organized a special two-hour bonus session on the current and prospective economic, political and agricultural future of China. Attendees will hear of market development prospects for China’s agriculture sector as well as information on obtaining accurate and timely analyses of China’s business risks and opportunities. SCI has invited a delegation of high-ranking Chinese officials to participate in this unique session, including China’s vice minister of agriculture.

The seminar’s commodity outlook sessions will include both SCI analyses and industry perspectives on the 1994/1995 supply/demand situations for oilseeds, cotton, grains, sweeteners and livestock. In addition, SCI will present its short-term and long-term weather forecasts as well as provide SCI’s outlook for transportation.

For registration information, contact seminar director Jane Glenn at (901) 766-4478.

SCI focuses on comprehensive agriculture, the food industry, agribusiness, and commodity research, information, analysis and consulting.
The Clean Air Act of 1990 has created much anxiety within the solvent extraction industry; especially, with hexane being included among the 189 chemicals considered as some hazardous air pollutants. The Clean Air Act is purposely very broad in nature and not very specific in many ways, which is not necessarily all bad. However, this can be very frustrating for those that really try to understand how it affects their company today and in the future. Within the next few years, a maximum standard for hexane emissions will be established for all solvent extraction plants. Exactly what the standard will be is not known at this time; however, it certainly will not be easy to meet, even today, by the most efficient plants.

We have all heard the acronym, MACT, Maximum Achievable Control Technology, with reference to the Clean Air Act. To meet the MACT standard, extraction plants may be forced to install very elaborate and expensive hexane recovery equipment. Before investments of this nature are undertaken, one should not lose sight of the basic principles of solvent loss control.

In most of the plants operating today, the hexane loss is less than half what it was ten years ago. This reduction was accomplished by emphasizing the basic engineering and operating principles upon which all of the plants were originally designed and built, which are going to be just as important in meeting the MACT standard as any single new control device may prove to be.

PREVIEW
If one looks at the solvent extraction process of oilseeds, the majority of process adjustments or fluctuations will have either a positive or negative effect on the solvent recovery efficiency of the plant. The other important process parameters, such as residual oil in the meal and mill feed, meal fiber content, etc., are not affected to the same degree and frequency.
Successful solvent loss reduction programs are very similar to successful safety programs. The plants that have successful safety programs daily emphasize the importance of people working safely, working smart, and looking out for one another.

For companies to operate with a minimum of solvent loss, they will have to emphasize daily the importance of monitoring and maintaining the many process variables and conditions that can affect the hexane loss both to the environment and into finished products. This means the plants must have well trained operators and supervisors as well as good process controls and process monitoring. The successful plant must also have well maintained equipment that is properly designed and sized for the production requirements.

A good detailed analysis for quantifying a plant’s hexane loss for each source was done by Bob Henricks, Central Soya Company.  

**HEXANE LOSS POINTS and CONTROL PARAMETERS**

**Meal Desolventizing, Drying and Cooling**

I would agree that 45-50 per cent of the total hexane lost is in desolventizing, drying and cooling the meal. The desolventizer toaster has been improved considerably in the last 15 years; however, its performance is affected by many other variables outside of the DT. Assuming the DT is properly sized and designed, the most critical variable is the amount of solvent retained in the flakes entering the DT. The solvent retention of the flakes, ranging from 30-40 per cent, is influenced by several factors many of which can be controlled by the plant’s operator.

Solvent retention is dependent on proper drainage of the final hexane wash through the extractor bed. Drainage is reduced by: (a) excess fines generated in preparation or prepress operations, (b) water in the hexane blinding the top of the flake bed, and (c) steam entering the extractor from the DT blinding the extractor screens. Also, reduced flake moisture allows more solvent to be retained in the flakes even under good drainage conditions.

Controlling the water/hexane interface level of the solvent separation tank will usually give adequate time for good separation. Several reliable instruments are available to monitor the interface level and control the water discharge to the sewer water evaporator as well as alarm at high and low level conditions.

Steam entering the extractor is primarily due to the DT not operating under a negative pressure. The pressure on the DT can be caused by an undersized vent system, high cooling water temperatures, excess sparge steam on the DT, fouled condensers or fines carried with the DT vapors restricting the shell side of the first stage evaporator. Typically, a rotary valve or seal conveyor is installed between the extractor and DT to block the steam vapor.

DTDC’s, under the right conditions, can allow air to enter the desolventizer section from the dryer section which quickly overloads the vent system. Consequently, a rotary valve or seal is required between the first drying section and the last DT section.

The extractor size or design may not allow sufficient time for proper drainage. When the extractor is too small, expanding approximately 50 per cent of the total soybean flakes has been very beneficial for reducing both the residual solvent and oil in the flakes leaving the extractors.

Increasing the drainage time by incorporating a drainage section in the conveyor feeding the DT has had limited success due to the difficulty in keeping fines cleared from the solvent collection piping, etc.

**Vent System**

A properly sized and maintained vent system is very important in solvent recovery as well as in safe plant operations. The vent system allows the extractor, DT, solvent and miscella tanks, and conveying equipment to be maintained under a slight negative pressure which reduces solvent leaks and improves safety. However, excess hexane will be lost from the vent system if more
Air is allowed to enter the system than the mineral oil recovery is designed to handle.

Air enters the system through packing glands, sight glasses, manholes and maintenance access covers. Considerable air can enter the extractor and vent system with the flakes. However, the slurry feeding devices have significantly reduced the entrained air entering the extractor.

The hexane vapor that is not condensed in the last vent condenser is typically passed through a mineral oil absorption system. The parameters to maintain for effective solvent recovery are cool vapors from the vent condenser, 50-60 degrees Fahrenheit, if possible, adequate mineral oil flow and temperature to the absorber, 10-20 gpm, 80 degrees Fahrenheit. To ensure proper stripping of the absorbed hexane, a discharge oil temperature of 230 degrees Fahrenheit should be maintained from the oil stripper.

Frequent checks of the vent gases leaving the absorber with an explosive meter is a good way of monitoring the system. It is performing well if the meter reads below 25 per cent LEL. Installing a flowmeter on the gases entering the absorber is a good idea. About 25 per cent of the total hexane loss is through the mineral oil system, or vent system. A more in-depth discussion of recovering hexane from the vent gases was done by R. D. Good, Blaw Knox Chemical Plants.  

Water and Oil

The sparge steam from the DT is the main source of water which requires gravity separation from the hexane in the separation tank. The water leaving the separation tank should be heated to a temperature of 190-200 degrees Fahrenheit for at least ten minutes in the safety boiler, or sewer water evaporator, to recover the small amount of solvent that may be carried with the water.

Solvent loss to the sewer mainly occurs during upsets with the level control of the separation tank, which typically is associated with plant shutdowns. Again, a water/hexane interface indicator and controller with alarm can be very helpful in reducing hexane lost with the water. Also, excessive fines from the DT entering the sewer water evaporator can contain significant amounts of hexane. The DT design, configuration, and operations have the most direct effect on the amount of fines entrained with the steam and hexane vapor.

An automatic temperature control and alarm system should be a standard part of the sewer water evaporator. Hexane lost to the water is estimated to be about five per cent of the total.

Under optimum operating conditions, some hexane is chemically bound to the oil as it exits the oil stripper and dryer; the concentration is estimated to be 500-600 ppm at a flash point of 320 degrees Fahrenheit. Low vacuum and low exit oil temperatures from the stripper and dryer are usually the causes for excess losses, which can be minimized with transmitters and alarms. However, the stripper may be asked to remove more hexane than designed due to the first and second stage evaporators not functioning properly.

Low vacuum and fouled heating surfaces from fines retained in the miscella from the extractor hinders the solvent recovery of the distillation evaporators and heat exchangers. Along with proper preparation of the flakes or cake, a reduction in fines can be accomplished with a liquid cyclone on the full miscella leaving the extractor, which I would recommend for all extractor types.

Proper flow of miscella to the slurry loader and the first stages of washing on the extractors can have a significant effect on the fines leaving the extractor. Ask your extractor manufacturer for their recommendations.

Fugitive Emissions

Fugitive emissions include the hexane loss from packing glands and mechanical seals on pumps, drive shafts, valves and level indicators. Mechanical seals should be used where possible in place of packing glands. Consideration should be given to the valves that are designed to minimize fugitive emissions especially from control valves.

Fugitive emissions also include leaks from flanges of piping, spouting, equipment, maintenance access doors, etc.
manholes, sight glasses, etc. The flanged connections must be correctly designed and fabricated. The flange thickness, bolt size and spacing is usually at the discretion of the equipment designer or supplier, since there are no specific ASME standards to meet. Both the buyer and designer should not let the cost dominate the flange design criteria. Also, the number and location of sight glasses and access doors etc., should be properly addressed prior to fabrication.

The amount of fugitive emissions are directly related to the operating pressure of the equipment, which is one of the main functions of the vent system. Its ability to perform this function efficiently is dependent on the cooling water flow and temperatures, heat exchanger conditions, and flake or cake temperature entering the extractor.

Plant Shutdowns

Uneven operations contribute the most to disrupting all of the aforementioned parameters, set points and operating conditions. Plant shutdowns must be minimized to reduce solvent loss.

There are several key elements which are associated with any plant’s successful run time. It must have well trained and motivated people operating the plant. Process controls and operator interface systems have allowed the extraction plants to function with fewer people under less supervision than ever before. Consequently, the people must be well trained, which also applies to the maintenance staff who must make repairs correctly the first time on increasingly sophisticated equipment.

Following established specific shutdown and startup procedures with checklists is critical eliminating excessive solvent loss both on planned maintenance outages as well as unscheduled equipment breakdowns. This should already be included in the process safety management program developed for the plant.

It is essential for a plant’s equipment configuration to include surge tanks, oversized conveyors etc., which will allow small increases or changes in material flow without stopping the plant. Proper electrical interlocking of motors, flow and motion switches, and alarms have a significant impact on a plant’s effective run time.

CONCLUSION

Hexane loss has always been a significant cost item for operating an extraction plant. Perhaps in the past, there were times additional solvent usage was accepted as a part of having lower residual oils in the meal and mill feed or even lower energy costs in steam production. If so, those days are ending.

Also, solvent usage will dominate even more in decisions management will make in allocating capital expenditures. However, excessive expenditures for additional solvent recovery or pollution control equipment will not be necessary if a plant properly operates and maintains its existing equipment.

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National Center for Agricultural Utilization Research
ARS, USDA, Peoria, Illinois

New technology for the processing of vegetable oils continues to be developed. Our research has evaluated the applications of ultrasonic energy and supercritical fluids for improved oil purification and modification processes.

Early attempts to implement physical refining procedures for soybean oil failed due to inconsistent crude oil quality and inadequate pretreatment of the oil. Thus, soybean oil is commonly refined by the conventional caustic process. Crude oils contain gums and phospholipids which are removed during caustic refining or by a water degumming procedure.

Degumming at commercial processing plants has shown variable results in removing phospholipids (Table 1).

<table>
<thead>
<tr>
<th>Company</th>
<th>Phosphorus, ppm</th>
<th>Phosphorus Removed %</th>
<th>Mean %</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Crude 683, Degummed 67</td>
<td>77.2</td>
<td>82.8</td>
</tr>
<tr>
<td>B</td>
<td>Crude 684, Degummed 80</td>
<td>93.8</td>
<td>92.3</td>
</tr>
<tr>
<td>C</td>
<td>Crude 588, Degummed 95</td>
<td>87.5</td>
<td>84.8</td>
</tr>
<tr>
<td>D</td>
<td>Crude 615, Degummed 10</td>
<td>93.4</td>
<td>95.9</td>
</tr>
<tr>
<td>E</td>
<td>Crude 623, Degummed 12</td>
<td>83.6</td>
<td>79.7</td>
</tr>
</tbody>
</table>

*Plants located in Illinois, Iowa, Minnesota, and North Carolina. Two samples from each plant separated by at least 2 weeks.

Nonhydratable phospholipids have been shown to develop during export shipment of soybeans (Table 2) and are difficult to remove during degumming.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Iron (ppm)</th>
<th>FFA (%)</th>
<th>Peroxide Value</th>
<th>Phosphorus Crude (ppm)</th>
<th>Phosphorus Degummed (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Origin</td>
<td>0.4</td>
<td>0.7</td>
<td>0.9</td>
<td>442</td>
<td>37</td>
</tr>
<tr>
<td>Destination</td>
<td>2.5</td>
<td>1.7</td>
<td>2.8</td>
<td>359</td>
<td>183</td>
</tr>
</tbody>
</table>

Physical refining normally is a two step process, without any wet separation; improved yields of neutral oil are obtained; soapstock is eliminated as a byproduct and environmental problems are reduced; and fatty acids recovered from the deodorizer are moisture-free and light colored, and can be marketed without further preparation. Pretreatment of crude soybean oil for physical refining includes a treatment with H$_3$PO$_4$ (85 per cent) and activated bleaching earth.

If traces of H$_3$PO$_4$ remain in the oil, darkening of the finished oil and development of a distinct off-flavor can result.

Ultrasonic Degumming

The ultrasonic degumming system developed at our laboratory is shown in Figure 1 and consists of a 750 watt continuous rating power supply (model 184v), converter, 1:0.5 booster horn, one-inch diameter titanium processing horn and a stainless steel high-pressure processing cell. Crude oil and degumming agent are combined just before entering the processing cell.

Reaction temperature of the oil-water mixture is measured immediately beneath the horn. Volume of the reaction zone beneath the horn measured 2.4 cc. At our flow rates the oil-water mixture is subjected to ultrasonic vibration for 0.8 seconds. The discharged oil-gums are then sent to a centrifuge for separation.

Continuous ultrasonic degummed and batch degummed soybean oils were bleached and deodorized. Citric acid (100 ppm) was added to all deodorized oils at 100°C during the cooling stage in the deodorizer. Finished oils...
were evaluated for flavor quality and stability by a 15-member experienced taste panel.

As shown in table 3 nearly 100 per cent phosphorus was removed from oil A by both batch degumming at 60 °C or continuous ultrasonic degumming at 33°C.

For oil B, 88 per cent phosphorus was removed by conventional batch degumming at 60°C and 96 by cont. ultrasonic degumming at 33°C. Bleaching of degummed oils from oil B removed seven per cent more phosphorus from the batch degummed oil, and two per cent more from ultrasonic degummed oil.

The bleached oils in this study, containing 38 ppm and 19 ppm P, did not darken and deodorized satisfactorily.

Flowsheets of the existing "chemical refining process" and "physical refining process" are compared with the "continuous ultrasonic degumming process" in figure 2. In the "continuous ultrasonic degumming process" phosphtides in the crude oil are hydrated with a small amount of degumming agent, without an acid pretreatment and without heating the oil. Lower oil temperature was found to increase the ultrasonic cavitation. The oil-water mixture is then centrifuged, without cooling, to separate the degummed oil from gums.
Table 3: Continuous Ultrasonic Degumming vs Batch Degumming of Crude SBO

<table>
<thead>
<tr>
<th></th>
<th>FAA %</th>
<th>P ppm</th>
<th>Fe ppm</th>
<th>Mg ppm</th>
<th>FAA %</th>
<th>P ppm</th>
<th>Fe ppm</th>
<th>Mg ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude SBO &quot;A&quot;</td>
<td>0.5</td>
<td>528</td>
<td>5.8</td>
<td>65.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Batch Citric Acid Degum, 60C</td>
<td>0.4</td>
<td>13</td>
<td>2.4</td>
<td>2.6</td>
<td>0.3</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Batch Water Degum, 60C</td>
<td>0.5</td>
<td>11</td>
<td>0.8</td>
<td>0.7</td>
<td>0.3</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Continuous Ultrasonic Water Degum, 33C</td>
<td>0.6</td>
<td>94</td>
<td>30</td>
<td>21.2</td>
<td>0.3</td>
<td>19</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Crude SBO &quot;B&quot;</td>
<td>0.8</td>
<td>800</td>
<td>1.6</td>
<td>10.8</td>
<td>0.5</td>
<td>38</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Batch Water Degum, 60C</td>
<td>0.6</td>
<td>11</td>
<td>0.8</td>
<td>0.7</td>
<td>0.3</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Continuous Ultrasonic Water Degum, 33C</td>
<td>0.5</td>
<td>35</td>
<td>2.1</td>
<td>13.8</td>
<td>0.3</td>
<td>19</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

Water-washing ultrasonic degummed oil is not required since there is no acid pretreatment of the oil. The small amount of water added to the oil for degumming essentially ends up in the gums and, therefore, drying the oil further is not necessary.

**Supercritical Fluid Degumming**

Another alternative approach for degumming soybean oil for physical refining which we have investigated involves the application of supercritical fluid for the removal of gums from crude oil. The countercurrent degumming experiments were performed using a modification of the semi-continuous pilot plant constructed in our high pressure laboratory.

The following components were used in the unit: main compressor - Haskel gas booster Model 14 AGT-125/315 Haskel Inc., Burbank, California, auxiliary compressor - Haskel gas booster AGT-62/152, back pressure relief valve adjustable from 17.2-172 MPa - Haskel Model 5700-26, in-line high pressure mass flow meter - Model D12 Micro Motion, Inc., Boulder, Colorado, high pressure parts and gauges Autoclave Engineers, Erie, Pennsylvania

**Countercurrent Degumming Vessel.** An alloy steel 4-liter vessel, rated at 207 MPa, having an internal bore 91.4 cm length and 7.6 cm width (Autoclave Engineers, Erie)
outfitted with self sealing closures was used for the countercurrent refining process. The inside of the vessel was packed with six sections of 15.2 cm x 7.6 cm type 779 Goodloe packing (Otto York Co., Inc., Parsippany, New Jersey) by inserting the sections one on top of the other in the refining vessel. High pressure carbon dioxide was fed into the packed vessel from a 0.635 cm portal located 5.08 cm above the bottom sealing closure, while the liquid soybean oil entered the vessel 5.08 cm below the top sealing closure.

Temperature control on the extraction vessel was maintained with a fiberglass-insulated heating mantle (Glas-Col, Terre Haute, Indiana), 112 cm in length, 15.2 cm inside diameter having a nominal thickness of 2.54 cm. Power to the mantle was supplied by two 1200 watt, 115 volt circuits, controlled by a Barber Coleman Model 560 controller (Carlen Automation, Inc., Rock Island, Illinois). Temperature control for the vessel was accomplished using a Durakool mercury relay (American Electronic Components, Elkhart, Indiana) and a contact thermocouple counted on the outside of the vessel.

Receiver Vessel. A 316 SS 2-liter vessel, rated at 70 MPa for 22°C used as a receiver. The vessel which was 7.6 cm i.d. X 45.7 cm in length, and incorporated O ring closures at both ends to seal the vessel. The receiver was placed downstream from the back pressure relief valve and was typically held at 17.2 MPa and 60°C to precipitate the oil from the SC-CO₂ without having to substantially recompress the CO₂.

Oil Delivery Pump. The delivery of soybean oil to the countercurrent refining vessel required the development of a modified liquid pump. A Chemtrol Simplex Model CP1.A04646 (Clark Cooper Co., Cinnaminson, New Jersey) by inserting the sections one on top of the other in the refining vessel. High pressure carbon dioxide was fed into the packed vessel from a 0.635 cm portal located 5.08 cm above the bottom sealing closure, while the liquid soybean oil entered the vessel 5.08 cm below the top sealing closure. The delivery head was accomplished by a Polysciences Model 9500 constant temperature circulator (Polysciences, Inc., Niles, Illinois).

Soybean oil was fed to the pump from two-liter graduated cylinder under nitrogen sparge. Calibration of the oil delivery pump was made against an 55 MPa, 70°C SC-CO₂ back pressure. Plots of delivery rate (3-25 ml/min) versus per cent speed control at two different stroke adjustment settings were linear. The pump output remained constant during each refining run at 55 MPa back pressure during each refining run.

Degumming Procedure. The degumming apparatus was operated as follows: 1) Valves S-1A, S2, and S-8 were opened; 2) Heating of the receiver vessel was started; 3) The auxiliary compressor was turned on; 4) The receiver was pressurized to 17.2 MPa and 60°C; 5) Valves S-8 and S-2 were closed and valves S-1B and S-3 opened; 6) The main compressor was started; 7) Heating of the extractor vessel was started; 8) The extraction vessel was pressurized to 55 MPa and 70°C; 9) Valve S-1B was closed and valves S-7 and S-8 opened; 10) BPR-2 was adjusted to give 55 MPa on the refining column; 11) With the system recycling the CO₂, the compressor air drive cycling rate was adjusted to maintain the desired CO₂ flow rate; 12) At the same time, the system was being equilibrated, the liquid pump was initiated as follows: a) Pump head was heated to 60°C, b) Valve S-6 was opened to pass crude soybean oil to the heated pump head, c) BPR-1 was adjusted to give a pressure of 70 MPa as read on gauge G-2; 13) After the refining apparatus was equilibrated as detailed above, valve S-5 was opened; 14) The mass flow meter was zeroed and; 15) Countercurrent degumming of the crude oil was initiated.

Initial pressurization of the system required 17.2 kg of CO₂. A column filled with charcoal was placed in-line after the receiver vessel to remove odoriferous components from the recycled CO₂. Degummed samples were stored under nitrogen until steam deodorization/deacidification was performed.

Use of the countercurrent degumming procedure yielded an oil having a phosphorus content below two ppm. The lecithin-rich sludge that formed in the bottom of the refining column was partially removed by
depressurizing the refining column or completely removed by solvent extraction with acetone.

Color, free fatty acid, iron, and phosphorous contents of crude, partially processed and fully processed soybean oils are shown in Table 4.

Results show that the crude hexane extracted oil used as a feedstock for the degumming studies was typical of good quality crude with respect to color, free fatty acid, phosphorous, iron, and peroxide levels. Phosphorous contents of oil obtained by SC-CO₂ degumming typically average less than five ppm, and, based on the phosphorus content of the crude oil, 99.2 per cent of the gums were removed by SC-CO₂ degumming.

Typically, conventional water degumming removes 80-95 per cent of the gums from crude oils. It is interesting to note that SC-CO₂ degumming was quite effective in removing iron to levels considered adequate for optimum flavor and oxidative stability, i.e., 0.1-0.2 ppm.

A further advantage of SC-CO₂ processing was illustrated by the color data. Caustic refining and bleaching typically reduces red color several units over the crude, with substantial amounts of red color removed by heat bleaching in the deodorizer. Invariably, virtually all the red color is removed from the SC-CO₂ degummed feed stock after deodorization at 260°C, thereby eliminating the need for treatment of the oil with absorbent clays as is normally done in both caustic refining and conventional physical refining processes.

**Ultrasonic Hydrogenation**

For 80 years vegetable oils have been hydrogenated commercially in batch converters requiring extensive heat, power and manpower. Continuous systems, either constant flow or in stages, generally have been unsuccessful because of back-mixing and low selectivity. Research at NCAUR reported the continuous hydrogenation of soybean oil using and ultrasonic processing cell with an exposed transducer within the cell. A slurry of nickel catalyst and refined/bleached soybean oil was pumped through a preheater and ultrasonic processing cell to a receiver.

Continuous ultrasonic hydrogenated test oils were prepared by varying temperature (270°C and 290°C), pressure (65 and 106 psig), catalyst concentration (40, 80, 120, 150 ppm Ni) and ultrasonic power level (100, 40, and 0 per cent of full power). Residence time in the reactor was nine seconds.

Hydrogenations at 115 psig, and 183°C with sonication

### Table 4. Characterization of Processed Oils

<table>
<thead>
<tr>
<th>Oil Type</th>
<th>FFA (%)</th>
<th>P (ppm)</th>
<th>Fe (ppm)</th>
<th>PV (meq/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude</td>
<td>0.39</td>
<td>62.0</td>
<td>157</td>
<td>0.5</td>
</tr>
<tr>
<td>Refined Bleached</td>
<td>0.13</td>
<td>0.5</td>
<td>0.023</td>
<td>1.5</td>
</tr>
<tr>
<td>Refined Bleached Deodorized</td>
<td>0.09</td>
<td>0.4</td>
<td>0.003</td>
<td>0.0</td>
</tr>
<tr>
<td>SCCO₂ Degummed</td>
<td>0.75±0.09</td>
<td>40±10</td>
<td>0.5±0.01</td>
<td>0.5±0.06</td>
</tr>
<tr>
<td>SCCO₂ Degummed Steam Refined</td>
<td>2.8±0.3Y</td>
<td>10±0.2</td>
<td>2.2±0.6</td>
<td>0.0±0.02</td>
</tr>
</tbody>
</table>

a Color by Lovibond 5 1/4  b Mean of 4 samples
proceeded in nine seconds while without sonication it took 480 seconds to obtain the same level of Iodine value.

**Supercritical Carbon Dioxide Deoiling of Bleaching Clays**

An average soybean oil refinery generates about 5000 pounds of spent bleaching clay per day. Currently, spent bleaching clays are disposed of in landfills where it is buried or treated with water to reduce the potential for spontaneous combustion. Alternatively, the clay may be treated to remove adsorbed residual oil, for example by treatment with caustic solution or extraction of oil using organic solvents.

These processes produce chemical residues which can have negative impact on the environment. Treatment of spent bleaching clays with supercritical carbon dioxide (SC-CO$_2$) offers another alternative to the above disposal methods.

Supercritical fluid extraction (SFE) using carbon dioxide provides an environmentally acceptable solution for post refinery treatment of the clay, since CO$_2$ is nonflammable, nontoxic and is a selective solvent for oils. Pilot plant extractions of spent bleaching clays were performed using our semi-continuous supercritical-fluid extraction unit.

Clay extractions were conducted in vessel at 12,000psi and 80°C using a CO$_2$ flow rate of approximately 0.5 (pounds/minute). The residual soybean oil dissolved in the SC-CO$_2$ was transported to the receiver vessel, which was operated at 2,300 psig and 40°C. The soybean oil readily precipitates from the fluid phase at these conditions.

In a comparison of oil yield by a soxhlet extraction of spent bleaching clay with hexane, the SC-CO$_2$ showed good agreement. Several physical and chemical analyses were performed on selected oil samples obtained during the SFE-extraction. Results are presented in table 5.

A visual examination of the SFE-extracted bleaching clays showed that a reduction in color was achieved; however, they still contained more pigment matter than the virgin clay. These SFE results show that quantitative recovery of residual soybean oil from spent bleaching clays is possible using CO$_2$. The extraction yields an industrial-grade oil and oil-free clay.

### New Uses of Vegetable Oils

**Soy Ink.** A new improved lithographic news ink technology has been developed, patented and is available for license and commercialization (U.S. Patent 5,122,188, "Vegetable Oil Printing Inks"). The vegetable oil printing ink satisfies the industry demands to develop a technology in which (1) the vehicle is derived totally from vegetable oil, (2) inks can be readily formulated over the complete range of viscosity for news offset, and (3) inks are cost competitive with conventional petroleum based offset news inks.

Further, inks formulated with this technology have run-off characteristics equal to those formulated and marketed as low rub inks. Using this technology, NCAUR scientists have formulated inks of all four colors satisfying specific objectives of an industrial cooperator through a recently completed Cooperative Research and Development Agreement.

Soybean oil was emphasized, but the technology has been successfully demonstrated with a wide range of representative vegetable oils.

**Biodiesel Fuel.** Vegetable oils have an enormous potential for development as alternative diesel fuels. They have energy contents that are about 90 per cent that of number two diesel fuel and have very high flash points, an important safety consideration. Such alternative fuels can reduce dependency on imports because they are renewable and may be produced from domestic oilseed crops.

Also, these fuels are more environmentally friendly because they contain no sulfur or aromatic compounds and have decreased exhaust emissions of carbon monoxide, hydrocarbons and black smoke particulates. However, testing of unmodified oils in direct-injection type diesel engines has pointed to several problems, including high viscosities (generally 10-15 times that of number two diesel), low volatilities, and incomplete combustion as evidenced by carbon buildup and contamination of the crankcase lubricant.

**Table 5: Properties of Oils from Spent Clays**

<table>
<thead>
<tr>
<th>Run</th>
<th>FFA</th>
<th>PV</th>
<th>Color</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.4</td>
<td>1.9</td>
<td>44.0Y</td>
<td>2.7R</td>
</tr>
<tr>
<td>2</td>
<td>0.48</td>
<td>1.5</td>
<td>43.0Y</td>
<td>2.7R</td>
</tr>
<tr>
<td>3</td>
<td>0.48</td>
<td>1.2</td>
<td>44.0Y</td>
<td>2.7R</td>
</tr>
<tr>
<td>4</td>
<td>0.49</td>
<td>1.1</td>
<td>50.0Y</td>
<td>3.1R</td>
</tr>
<tr>
<td>7</td>
<td>0.87</td>
<td>2.9</td>
<td>69.0Y</td>
<td>12.1R</td>
</tr>
<tr>
<td>9</td>
<td>0.39</td>
<td>3.5</td>
<td>68.0Y</td>
<td>5.3R</td>
</tr>
<tr>
<td>10</td>
<td>0.57</td>
<td>7.7</td>
<td>70.2Y</td>
<td>13.4R</td>
</tr>
</tbody>
</table>

recovery of residual soybean oil from spent bleaching clays is possible using CO$_2$. The extraction yields an industrial-grade oil and oil-free clay.
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