OIL & FAT INDUSTRIES

VOLUME V SEPTEMBER, 1928 NUMBER 9

European Methods of Crushing Soya Beans

BY GEOFFREY E. GOVIER

PRIOR to 1908 Soya Beans were practically unknown to the European vegetable oil industry, but soon after the first experimental shipments of beans had been received from the Orient their great value as a source of excellent oil and meal was realized and it was not long before the prominent oil mills in most European countries were importing immense quantities.

The war gave the Soya Bean oil industry great momentum and record quantities were crushed between the years 1915-1920, both in Europe and the Orient, for during that period the latter was shipping very large quantities of crude oil to most of the European markets.

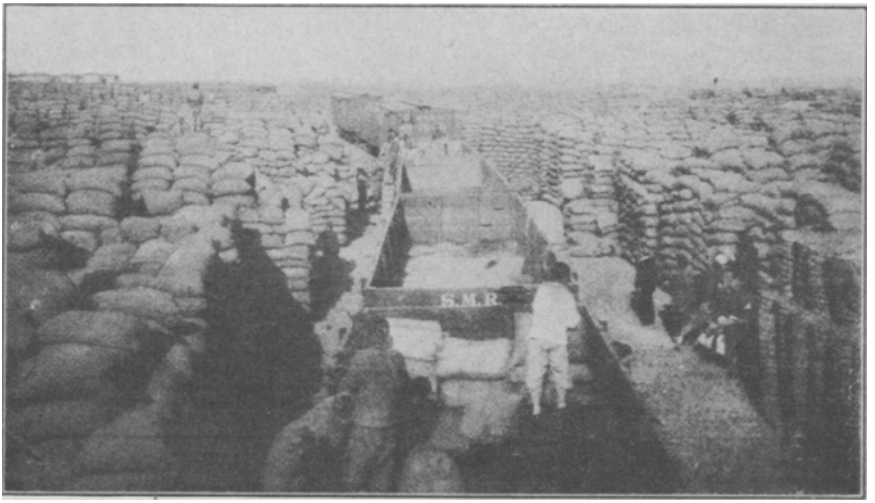
At that time the oil was not only used for technical purposes but a very considerable proportion of the output of the European mills was refined and hydrogenated and found its way into several edible products, such as margarine, lard substitute, suet substitute, etc.

Soya beans are still a very important factor in the European vegetable oil industry, and the oil is used very extensively by the soap industry; in the preparation of hard fat for candle manufacture; for "boiling" for use in paints as a substitute for linseed oil; also as a substitute for the latter in the manufacture of linoleum. During recent years a very extensive trade in edible soya bean oil has been developed in the South American countries, where the product is used both as a cooking and salad oil.

An interesting practice was adopted by one of the very prominent English oil mills during the war, when the idea was conceived of mixing the soya beans with cottonseed prior to processing. This produced an oil which was marketed as Soy-cot oil, and which, on refining produced a product of much lighter and more pleasing color than the straight soya bean oil, while it reacted very much more satisfactorily to hydrogenation. In addition to the improvement in the oil, the cake (also marketed as Soy-cot cake and meal) was much superior to neat cottonseed cake and became so popular, that Soy-cot products became one of the most important lines of this

particular mill (at that time rated as the largest plant of its kind in the world).

In the older European oil mills it was customary, when working soya beans, to grind the rolled beans under heavy edgestones before sending them to the kettles, but the modern practice is to entirely rely on rolling, which, when properly carried out gives as good results as grinding and eliminates the many objectionable features of edge stones. The thorough crushing and breaking of the oil cells is of vital importance in obtaining the best results.



Loading soya beans into cars at Dairen South Manchuria

Vertical-Pattern Rolls Popular

The writer found the vertical-pattern seed crushing rolls to be the most popular. Such rolls are made of chilled iron, which is preferred to the ordinary close-grained cast iron on account of its extreme hardness and consequent greater durability. These rollers are fitted with mild steel spindles, forced in with hydraulic pressure, the roller then being ground up true on its own spindle, and afterwards fluted if necessary. The cast iron housings have vertical slots in which the bearings of the upper rollers are free to slide. On the top of the housings is fixed a feed hopper of large capacity, fitted with a feed roller, by means of which a regular supply of beans can be fed into the crushing rollers. The quantity is regulated generally by a slide, but in some instances the writer saw special feeding devices being used.

The large rollers are driven at each end by fast and loose pulleys on the bottom roller, a more satisfactory system than driving rollers at one end only. It is said that those driven at each end run more steadily, wear more equally, and that the risk of fracture to the bottom roller driving shaft is reduced to a minimum.

A standard set of rollers has a capacity of two thousand pounds of soya beans per hour. A standard set is a set of rollers five feet high, each roller being 16 inches in diameter and 48 inches in

length. After having been passed through the crushing rolls the beans are sent to heating kettles. These kettles are used for heating and moistening the rolled beans, and the efficiency of this treatment is of great importance in getting the best results from the ultimate pressing. Both temperature and moisture require very careful adjustment. The temperature in some cases may have to be as high as 180°F, and to attain this, ample heating area and high steam pressure in the jacket are necessary, as it often occurs that steam cannot be added to the meal. For this reason the standard practice is to construct the kettles of steel, for there is less risk of failure and bursting than with cast iron; the conductivity of the plates being higher, a greater efficiency is obtained also. It is found to be better to use kettles of large capacity, for by treating as large a quantity of meal as possible in a batch a more uniform and thorough tempering of the meal is obtained. A double kettle is generally used when more than four presses are to be served from one kettle.

Cooking Methods

Moisture is added to the beans in the form of steam, which not only penetrates the meal thoroughly, but also helps to heat it. Special steam sprays are fitted to the kettles, designed to uniformly distribute the moisture. The are controlled by regulating valves with dials indicating the extent of opening, so that the operator knows just how much steam is being added to the batch. As the amount of natural moisture in the bean varies from time to time, it is important that control of the moistening apparatus should be simple, so that the ultimate moisture content may be kept constant, ensuring uniformity of the finished cake.

The tempered meal then goes to an automatic cake moulding machine. Four heating kettles serve one automatic cake moulding machine, and one of the latter serves sixteen Anglo-American hydraulic presses. One moulding machine averages two hundred and seventy cakes in thirty-five to forty minutes. A moulding machine is very easily operated. The operator places a cake tray and wrapper on the sliding carriage and then pushes this under the mould frame. The machine does the rest, and the operator has only to withdraw the carriage again with the moulded cake on it, and fold over the loose ends of the wrapper.

Description of Presses

The operator then places these cakes in the hydraulic press. In Europe, the Hydraulic Anglo Oil Press is now almost entirely used for expressing oil from Soya Beans. Generally a pressure of about four hundred tons is used, but where it is desired to make soya cake containing a minimum percentage of oil it is now usual to use heavier type presses with a gross pressure of from six hundred to eight hundred tons.

The number of cakes that can be made in a press is limited by the height a man can reach, and sixteen to eighteen has been found to be the best number for most purposes. Some exceed this number, but only by reducing the thickness of the cakes, or by making the height so great that there is difficulty in filling the upper plates, which results in loss of time and badly made cakes. Modern practice is to make the heaviest cake possible, so that on the newer

equipment ample space is allowed between the plates, so that thick cakes can be produced. This method enables the output to be increased without adding to the labor cost.

The size of the finished cakes is usually twelve to fourteen inches in width by thirty to thirty-two inches in length. The thickness and weight varies with the adjustment of the press, but it may be said that the average weight is fourteen pounds.

Arrange Press Capacity

The capacity of a sixteen cake press working on soya beans averages four hundred and fifty pounds per hour. A standard make of press has cylinders of cast steel, bored to standard gauges for rams, and, if carrying the columns, the holes for these are bored to jigs, as are the heads also, thus insuring accurate alignment of the columns. The rams are of close grained cast iron, ground smooth to avoid undue wear of leathers. Chilled rams are sometimes used.

The tables are of cast iron turned to fit the head of the ram and with corrugations on the upper face. The columns are constructed of mild steel, turned and polished with steel nuts top and bottom that bed over their whole area on the solid head and bottom, thus giving uniform stress on the columns. This gives a much stronger construction than columns with forged collars and loose caps on the head and bottom. The heads are of cast iron of box section, bored to jigs for reception of the columns, and with corrugations on the under side. In the lighter presses the bottoms are of cast iron, with large oil dishes to prevent the expressed oil from running into the foundation tanks below the presses, these tanks being sometimes entirely dispensed with. In the heavier presses the cylinder and bottom is one steel casting, the oil dish forming part of the casting, as in the lighter presses.

The plates are made of solid forged and rolled mild steel, with the usual corrugations formed during the rolling, thus giving strength and reducing breakages. Where special brands are required for the cakes, they are made of brass and inserted into suitable machined recesses in the plates.

Some manufacturers sell their whole output of cakes in the form that they leave the presses, others break them up into meal, for sale as straight soya bean meal, or make blends with other seed residues, molasses, dried meat, locust beans, etc., and produce special trade marked concentrates. The oil yield averages ten per cent. Very few soya beans are subjected to solvent extraction for it is found that the residual meal is unsuitable for feeding purposes.

American Linseed Oil Plants Sold

IN order to retire from the linseed oil business and to devote its entire attention to the food products trade, the American Linseed Company has sold its oil plants to the Archer-Daniels-Midland Company and Spencer Kellogg & Sons for a price not disclosed. The plants involved in the sale are the ones at Staten Island, Buffalo, Boston, Chicago, St. Paul, Portland, Ore., and Richmond. The capacity of these plants is 5,000,000 bushels of seed annually, and it is understood that each of the purchasing companies will get about one-half of the total properties passing under the sale.

Rumors of financial activity regarding the American Linseed Company have been prevalent for several weeks.