tinuous processes. Depending on the refining process used, reductions in the refining loss of 32 to 55% have been obtained.

The organic compounds used as additives contained NH_2 and OH groups. Sucrose or blackstrap molasses appears to be the most practical material to use. However ethanolamines and various glycols and alcohols may also be employed.

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[Received May 2, 1955]

The Recovery of Phosphatides from Direct Extracted Cottonseed and Reincorporation into the Meal[1]

W. C. WHITTECAR, Plains Cooperative Oil Mill, Lubbock, Texas

THE PLAINS COOPERATIVE OIL MILL in 1952 purchased a French continuous solvent-extraction plant with the plan in mind of direct extraction of cottonseed. On April 6 the first trial run was made on prepress cake from eight French expellers. This operation was continued for 10 days. Then operations were changed to direct extraction without cooking, giving us a highly soluble protein meal. Although considerable trouble was encountered in processing during the first six months of operation, this process is in operation at the present time.

We, like other solvent operators, have experienced considerable resistance to acceptance of solvent meal by feeders and feed manufacturers. Their complaints about solvent meals were that the meals contained less fat, were dusty, and would not mix well (that is, would separate from other ingredients and grains in a balanced ration); livestock, in general, would not eat them because of unpalatability. Pellets made from straight solvent meal have never been satisfactory unless some other additive was used to soften the pellets.

A year ago we were seriously considering the installing of a complete refinery, using soap stock for the improvement of our meal and products. We are cottonseed crushers, and this would have put us into a new field about which we knew nothing. We still prefer to sell our crude cottonseed oil to the people who make refining their business.

We sincerely believe that the process we now have is not only going to help meal problems in solvent operations, but we are going to be able to deliver to refineries a much improved crude oil.

After considerable investigation the final decision was to water-wash and degum our crude cottonseed oil, thus producing a commercial cottonseed lecithin. This product would not only solve the problems regarding solvent meal, which I have mentioned before, but would give us what we believe to be a feed ingredient high in nutritive value to reincorporate into our meal. This process has proven to be very satisfactory from the first day of operation, both on meal and pellets. It has also made possible an increase in tonnage through all equipment connected with the operations. It has enabled us to move the product into districts where screw press and hydraulic meals have been the dominating products. The new product is hard to distinguish from either screw press or hydraulic meals in texture, color, fat content, and mixing qualities.

BUT IN doing these things a problem developed in regard to the oil. A very fine oil was produced, low in refining loss, low in color, and low in bleach; but its color and acidity increased in transit to delivery points.

In carrying out the degumming operations, the following method is used:

Crude cottonseed oil at normal temperature (80° to 90°F.) is pumped into a surge tank in the degumming plant. This oil is then pumped into a base vertical, high-speed mixer, where 2% warm water is injected. The mixture of water and oil flows up through the mixer forming a semi-emulsion. Upon leaving the mixer, the oil goes to a thermostatically controlled heating coil where temperature is raised to 130° to 140°F. It is then discharged into two VO 194 DeLaval Hermetic Sealed Centrifuges, turning 7,500 r.p.m. and operating under a back pressure of 60 p.s.i. Here the phosphatides are separated from the crude oil. The gums as they emerge from the centrifuge contain 35% to 45% water and from 85% to 95% acetone-insolubles.

The gums are pumped immediately into the second ring of the desolventizer toaster, where the hexane, which is present, is used to distribute the gums uniformly in the flakes. The vaporization of hexane from the flakes results in a complete adsorption of gums into the flakes. As stated previously, when the gums are incorporated into the flakes, a product results which increases the efficiency of the equipment and increases the speed of pelleting 125%. It also cuts down the wear on dies.

After the gums are separated from the oil, the oil leaves the centrifuge with .4% to .8% moisture. It goes into a heating coil where the temperature is increased to 150° to 160°F. before going to a vacuum drier where the moisture is removed. The oil is then taken from the drier and immediately cooled to 85° to 90°F. prior to storage.

As indicated before, considerable trouble was experienced in drying the oil and in maintaining color

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[1] Presented at annual meeting, American Oil Chemists' Society, April 18–20, 1955, New Orleans, La.

and FFA stability. We feel now that these difficulties have been overcome by using a very weak solution of soda ash as a stabilizer, which is injected with the water and oil at the base of the high-speed mixer. In most cases the refining loss is lower and color has a slight rise, but the bleach goes down in transit. It is not readily apparent why this weak solution of soda ash has been so effective. It improved not only operation of the dryer but of all equipment in the degumming plant. The amount of soda ash used does not affect the free fatty acids of our crude oil and is used only as a stabilizing agent.

Any constructive criticisms or suggestions will be greatly appreciated.

[Received April 22, 1955]

Meal Recycling—Method of Solvent-Extracting Oilseeds of High Fat Content: Application to Filtration-Extraction of Peanuts[1]

JOSEPH POMINSKI, H. L. E. VIX, and E. F. POLLARD, Southern Regional Research Laboratory,[2] New Orleans, Louisiana

PRESENT-DAY PRACTICE of solvent-extracting vegetable oilseeds requires many preparatory steps prior to extraction. Included in this category are cracking, flaking, moisture adjustment, cooking, drying, cooling, prepressing, and reforming (2, 3, 4, 7, 8). These steps are costly, and they involve special machinery, extra labor and power, especially when applied to high fat content oilseeds such as peanuts, sesame, castor, etc. Improper conditioning during preparation has adverse effects on the properties of unsaturated oil from seed such as flax and tung (9) and on protein which is readily susceptible to heat damage (1).

To simplify preparation there is need for a solvent-extraction process that eliminates costly machinery used in cooking or prepressing, reduces operating expenses, and efficiently extracts raw flakes or grit-like material. Such a process should be versatile enough to be applicable to many oilseeds without affecting the yields and properties of the oil and extracted meal products. These advantages are reported for a new process in which filtration rates are increased by the addition of solvent-extracted and dried oilseed meal.

In the filtration-extraction of raw flakes prepared from oilseeds of high oil content, *i.e.*, peanuts, the flakes consolidate, forming a solid mass, impervious to the flow of solvent. By mixing back with the unextracted raw flakes portions of the materials which have been solvent-extracted and completely desolventized by drying, the extraction rate is substantially increased and the effect of excessive fines is minimized. The coarseness and firmness of all extracted materials can be controlled in part by temperature and moisture control in the dryers. The use of such a process eliminates prepressing, cooking, resizing, and reforming. This method was applied to the filtration-extraction of raw peanuts, and the data show that adding extracted and dried material back to raw peanut flakes increased the mass velocity during filtration from an impractical 112 to a highly practical 2,860 lb. per square foot per hour (a 25-fold increase), yielding an extracted meal containing less than 1% residual lipids.

Experimental Method and Equipment

Filtration-extraction tests were conducted, using the bench-scale test unit consisting of a metal funnel with a removable filter (5). The raw peanut flakes were mixed with dried solvent extracted meal prior to slurrying with commercial hexane.

Materials. The materials used were U. S. No. 1 shelled Spanish peanuts and solvent-extracted peanut meal obtained from a commercial solvent extraction plant. The Spanish peanuts were cracked and flaked to 0.010 in. in thickness. The solvent-extracted meal had been prepared from peanuts by a) cracking, b) heating mildly to about 140°F. with steam to a moisture of 7–8%, c) flaking, d) extracting with hexane, and e) heating the extracted flakes to about 200°F. This meal had an analysis of 8.89% water and 1.9% lipids and yielded a filtration mass velocity of 5,810 lb. per square foot per hour. Table I shows wet screen analyses of the peanut flakes containing 6.5% moisture and of the commercial solvent extracted meal.

TABLE I

Wet Screen Analyses of Peanut Materials

Sample	Commercial Solvent Extracted Meal, %	Raw Flakes, %
Screen Mesh		
5	2.2	2.5
8	5.0	6.1
16	26.2	26.5
20	22.2	10.6
40	24.8	13.5
60	11.7	11.3
80	2.2	4.0
120	1.8	4.5
170	1.1	4.6
200	0.2	2.0
300	0.5	1.0
Thru 300	2.1	13.5
Total	100.0	100.0

Results

Processing Variables in Filtration-Extraction. Table II shows the effects of the following variables on the filtration-extraction of raw peanut flakes mixed with extracted peanut meals: a) types of extracted meal, b) amount of extracted and dried meal, and c) temperature of extraction. The addition of solvent-extracted marc (solvent-wet-extracted meal) did not materially increase the mass velocity over that obtained for raw flakes. Changing the ratio of raw peanut flakes (with 6.5% moisture) to solvent-extracted and dried peanut meal from 1/0 to 4/3 increased the mass velocity during filtration-extraction at 82°F. from 112 to 2,860 lb. per square foot per hour (a 25-fold increase). Extraction of the 4/3 ratio

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[1] Presented at 29th annual fall meeting, American Oil Chemists' Society, Philadelphia, Oct. 10–12, 1955.

[2] One of the laboratories of the Southern Utilization Research Branch, Agricultural Research Service, U. S. Department of Agriculture.