Processing Peanuts and Cottonseed

E.J. GARCIA M., Production Manager, Grasas y Aceites, S.A., Chinandega, Nicaragua

ABSTRACT

Two cases are presented to show how the elimination of bad operational habits and the use of controlling equipment can improve the efficiency of an oil mill. The cleaning of peanuts (farmer's stock) is presented as an example of the need to use proper equipment for a given operation. A supply of good quality seed, together with the use of modern equipment, has improved the yields of oil and protein to the present values of 91% and 96% recovery, respectively. A growing fats and oils market in the Central American area and a limited supply of cottonseed are forcing the mills of Nicaragua to look for new oilseeds.

INTRODUCTION

It is well known that the overall efficiency of an oil mill is based on close attention to each and every one of its steps of operation.

I also believe that in each of these steps—for example, storage, delinting, dehulling, extraction, etc.—there is always room for improvement. The search for the optimum conditions of the present methods and the development of new ones that will lead to higher yields, better products, and lower costs is a never ending task.

At this Conference we are witnessing a worldwide effort toward these goals.

Today, as a modest contribution to this effort, I will talk to you about some processing techniques that have improved our operations. They are really our solutions to problems that we have had.

We operate a 300-ton-a-day mill using direct solvent extraction and miscella refining for cottonseed and prepress/solvent extraction for peanuts. We also have a finishing plant for our final fat products, cooking oil and shortening.

COTTONSEED

For cottonseed we have the standard American equipment for unloading, storage, cleaning, delinting, and dehulling.

We receive cottonseed from 11 independent gins. The quality of our seed is described in Table I. Besides the average figures of the 1975 season, the extreme values of each item are shown in the columns marked "minimum" and "maximum." These variations are mostly due to differences in the seed from different gins.

Some time ago, to avoid extra handling of the seed, we fed the mill directly from the unloading station. The receipts above our crushing needs were sent to the seed house.

Here we experienced our first problem. We could not obtain a steady operation in the linter room. If we wanted to maintain a given residual lint on black seed, the tonnage would vary tremendously. The variation of the linter content of the seed from one truckload to the next made adjustment in the lint room almost impossible.

Once the ginning season was over and we started processing the seed from the seed house, the troubles in the lint room were also over and we could maintain a steady rate and uniform residual lint. No doubt the seed house was doing a good blending job. Neeedless to say, we now work only from the seed house.

This simple and obvious technique is used, I am sure, by many, if not all, oil mills. I mention it here because for us it was the starting point of a more general operational policy for the entire mill.

We noticed that, when feeding from the seed house, things were better not only in the lint room but all the way along the mill up to the miscella refining operation. Looking for explanations for this improved situation, we found that, together with a uniform raw material and a steady rate, all the important operational settings of the mill—such as percent cut, holding times, temperatures, moisture levels, hexane bath, caustic treatment, etc.—could be held constant. Since that time, "steady rate and constant operational conditions" has been the golden rule of our mill.

In our effort to maintain this rule, we have found that, in a mill, some devices designed to help maintain a steady process sometimes work against that very end. Take, for instance, the surge bins and tanks used in a mill to separate one department from another. In our mill, we have one day bin for white seed and one for black seed, a 4-hr meats bin, and two 4-hr miscella tanks between the extractor and the miscella refining. These bins and tanks are necessary for accidental shutdowns and load fluctuations; unfortunately, they also give leeway to careless and untidy work. The operators of the lint room, dehulling station, extractor, etc., all know that at the end of their own line is a buffer tank and that if they keep material in that tank, no matter whether full or almost empty, probably nobody will howl at the mill. Slack work 1 min and hasty the next can very easily occur.

To avoid these upsetting conditions, there is an order in our mill to keep all our surge bins and tanks half-full. If for any reason we lose this balance, we adjust the rate of the department affected very slowly in order not to disturb the other settings of the plant.

We have also found that the use of controlling equipment not only helps to keep a steady flow but in some cases also improves the quality of our products. A good example of this is the operation of our first evaporator (Fig. 1). Here we concentrate the 24% oil full miscella from the extractor to a 47% oil miscella. We use a temperature controller to keep the concentration of the outlet miscella within a range of ±2%. With a vacuum of 20 in. of mercury in the condenser, we produce the 47% oil miscella at 42 C. This miscella is cooled to 31 C and sent to two surge tanks of 7,300 gallons each. These are the feed tanks of our refinery, and they hold enough miscella for 8 hrs' work.

Two things hurt the oil while in the crude miscella stage:

TABLE I

Content of Nicaraguan Cottonseed in 1975 (%)

	Average	Minimum	Maximum
Impurities	0.90	0.40	1.70
Moisture	7.48	7.10	8.60
Free fatty acid	0.60	0.50	0.80
Oil	18.36	17.60	19.30
Protein	20.56	19.53	22.36
Linter	12.81	11.60	13.90

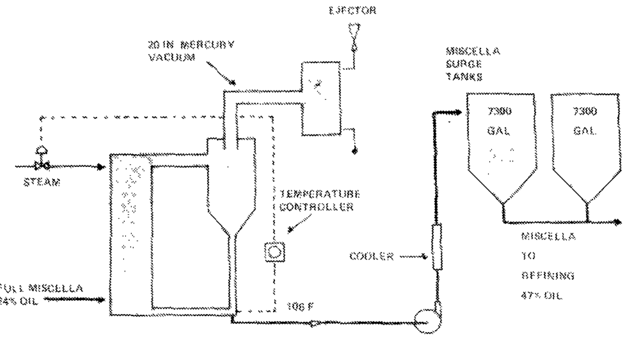

FIG. 1. Grasas y Aceites's first evaporator.

high temperature and long holding time. To avoid the high temperature, we keep the vacuum of the condenser as high as possible, to a maximum of 20 in. of mercury. This vacuum is very important. Should it drop, for instance, to 15 in., the temperature of the 47% miscella would jump to 44 C. At a given vacuum, the concentration is directly proportional to the temperature. Before installing the temperature controller, which is really a concentration controller, the operator of the extractor was supposed to keep the concentration at a given value by manually controlling the steam valve. He could do a good job, but he also had those big tanks to hide any unsteady or careless work. He could maintain a given concentration in these tanks no matter if at one moment he was producing a 30% miscella and a 60% the next, with the corresponding high temperature. By installing the temperature controller, we can maintain a constant concentration at the outlet of the evaporator. Consequently, we do not have to use our big tanks to adjust concentration. We now hold only a 30 min supply in these tanks.

Working fresh miscella has been one of the most rewarding changes we have made in our refinery.

PEANUTS

When we decided to crush peanuts in our mill—a mill designed to process only cottonseed by direct extraction—we thought that all we had to do was add a press room to the plant. And that was what we did! The cleaning and dehulling of the farmer's stock would be done with the cottonseed equipment with the proper changes of the screen opening.

We had no problem shelling peanuts in our hulling station, but cleaning was a different story. One of the problems was the small stones. The cleaners could not deal with stones equal to peanuts in size and density. Worse yet, the uncleaned farmer's stock was literally destroying our conveying equipment. The screw conveyors and screw lifts were also shelling the stock, and we were losing good kernels into the loose shelled kernel (LSK) stream. There was no doubt about the need for using cleaners specially designed to clean peanuts and also the proper conveying equipment.

A block diagram of the complete cleaning station for peanuts which we now operate is shown in Figure 2. The peanuts are conveyed by a special bucket elevator to a sand screen and then by gravity to a three-deck shaker. The top tray removes the large stones and sticks; the good stock rides the second tray, letting LSK drop to the third tray, where more sand is removed from the LSK stream.

The peanuts are again elevated—to the Concentrator. This machine is a gravity table where, by a combination of air flotation and shaking action, the material is separated into three layers. The top layer carries light trash and some peanuts. These peanuts are recovered on a second gravity table. The bottom layer carries peanuts and stones. The stones are removed in a third gravity table. The peanuts from these two small tables go to the main stream of

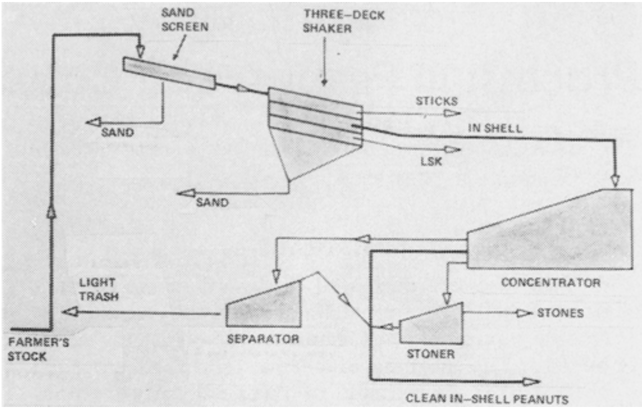

FIG. 2. Complete peanut cleaning station now in operation at Grasas y Aceites. LSK = loose shelled kernels.

cleaned in-shell peanuts coming from the center layer of the Concentrator.

All the horizontal conveying in this station is done by sliding belts.

With sound, clean, in-shell peanuts going to the dehulling station, we can produce meals of 55% protein and oils which filter well.

The use of *proper equipment*, as in the cleaning of peanuts, the use of *controlling equipment*, as in the operation of our first evaporator, and the *elimination of bad operational habits*, as in the case of the surge bins, are only three of the good operational features we have obtained from the solution of particular problems.

In our mill, we have the advantage that every year we clean house. At the end of every season, we have precise figures about our yield, costs, etc.

Every year we evaluate our work; we try to correct our weak points and take full advantage of the good ones. With cottonseed, we now recover 91% of the oil in seed as refined oil and 96% of the protein. We know we can improve these figures.

I don't want to close without mentioning what is, at present, our biggest worry: a future shortage of raw material. We have a growing fat and oil market. The oil mills of Nicaragua have the crushing and refining capacities to meet this future demand. What is not certain is the adequate future supply of raw material.

Our present cotton crop of half a million bales, which supplies 200,000 tons of cottonseed per year, is using all the good cotton land available in the country. Exceptionally good cotton prices may bring, in the future, some marginal land into production, adding about 40,000 tons of seed a year. On the other hand, with low prices, cotton production may decline in favor of increased acreages of sugar cane and bananas—two crops fighting for land in Chinandega.

Foreseeing this problem, 4 years ago we went into the peanuts business. Using that marginal land already mentioned, we have been very successful both from the agricultural and the industrial points of view—as a matter of fact, so successful that we may end up not having peanuts for oil, all our farmer's stock going to the peanut butter and salted peanut trade.

Peanuts could be a case similar to sesame seed, a crushing seed that was lost from the oil mills a long time ago with the introduction of an efficient dehulling plant. All sesame seed now goes as such to the edible trade.

There is definitely a need for a new oilseed in the Central American area. The new African palm plantations of Honduras and Costa Rica will add some oil to the area, but I don't think it will be enough. Soybean would be an ideal crop, and we are working hard to find the right variety for our climate.

When soybeans arrive, we will be ready to crush them!