A New Stationary Basket Extractor

R. P. HUTCHINS, The French Oil Mill Machinery Company, Piqua, Ohio

THE DESIGN of basket or percolation type of extractors was originated in Germany in the early 1930's. The first units were tall, vertical arrangements of baskets, which had a processing simplicity in that gravity determined the flow from basket to basket. This arrangement also resulted in the filtration of miscella through successive filter beds. The French Oil Mill Machinery Company began to manufacture the vertical basket extractor in connection with complete solvent-extraction systems when World War II made it impossible to import them from Germany. Subsequently the horizontal and rectangular basket extractors were developed as modifications to obtain certain advantages concerned with plant layout and operational details.

Existing extractor designs for many years have resulted in nearly complete oil recovery. Consequently the search for an improved extractor does not attempt to improve on extraction efficiency, which is already about at the ultimate in existing designs. Rather the aim is to simplify mechanical features and reduce costs (1,2,3).

The first figure shows a new extractor design which, we believe, has a mechanical simplicity that will result in lower initial cost and lower maintenance cost and yet retain the high processing efficiency of existing extractors. It is a percolation type of unit and is much like the horizontal basket extractor in processing flow, using miscella recirculating pumps.

It has the unique and distinctive feature of keeping the solids, which are being extracted, completely stationary throughout the extraction cycle. In order to make this new concept of solvent extraction work it was necessary to solve a number of difficult problems in charging and discharging the stationary compartments or baskets and to apply the solvent and successively stronger concentrations of miscella in the proper sequence. These difficult and intricate problems had to be solved in very simple mechanical ways to achieve a practical machine.

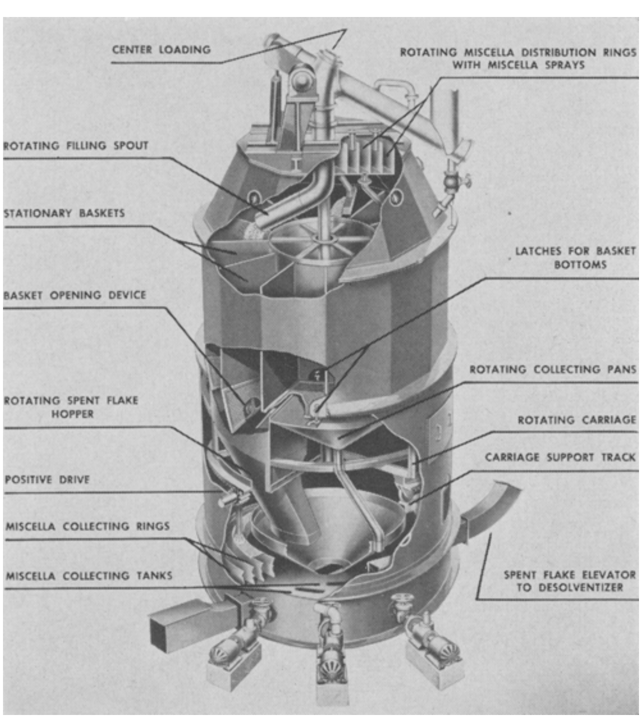

FIG. 1. Cut-away view of the French Stationary Basket Extractor.

The extractor is filled through the well-known continuous filling system, using a feed screw conveyor with plug seal and an inclined slurry conveyor (4).

THE artist's cut-away view of the extractor reveals the internal mechanism. The flakes are slurried in miscella, and the various compartments are filled by a rotating spout which is slightly larger in diameter than the stationary spout, which is welded into the top of the extractor. On the same rotating carriage are circular troughs which carry the solvent and miscella of various concentrations to the rotating solvent and miscella sprays. This rotating assembly also carries a discharge hopper and rotating miscella-collecting pan, all of which are attached to one integrated, revolving carriage. The carriage itself is held and revolved on rollers supported by a stationary circular track. No thrust bearing is required since the weight of the carriage is carried on the track.

The rotating miscella-collection pans receive the miscella of varying concentrations and discharge to stationary, circular troughs which drain into miscella-collection tanks. Stage pumps recirculate this miscella back to the top of the extractor, where it is distributed in proper concentration.

The basket bottoms are hinged and held closed with latches so that there is no weight of material carried by the rotating assembly. When the rotating discharge hopper approaches a compartment, a track engages a center roller on the hinged bottom of the compartment and lifts it a fraction of an inch to take the weight off the latches, which are then released. After the basket bottoms are unlatched, the center roller rolls down an inclined track to allow the bottom to open gradually. The flakes dump down the revolving spout through a center opening into a mass-flow type of elevator and conveyor leading to the desolventizer. The picker shaft is driven from the same motor which drives the extractor. There is no separate spent-flake conveyor drive required in this extractor.

After a compartment has dumped, the center roller engages another inclined track that causes the basket bottom to close. All of these operations are in a straight circular movement with trailing rollers which eliminate the possibility of interference or hanging up. As the basket bottom is closed, it is raised by the action of the track on the center roller so that the latches can be re-engaged with no pressure being necessary. Rotating guides attached to the hopper latch and unlatch the basket bottoms by action on trailing rollers. As soon as the latches are back in place, the track drops slightly so that the weight of the basket bottom is transferred to the latches.

The comparatively light rotating carriage is driven through the extractor shell by a pinion, which engages a ring gear the full diameter of the extractor.

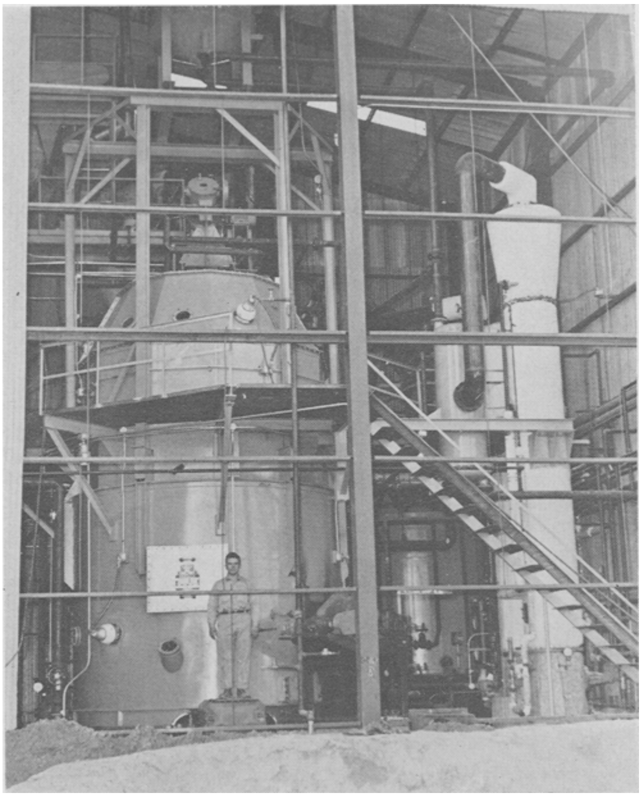

FIG. 2. Extraction equipment installation for Southern Soya Inc., Estill, S.C.

FIGURE 2 shows the plant view of the first Stationary Basket Extractor installation at Southern Soya Corporation in Estill, S.C. The extractor with the distillation equipment is shown at the right. The Desolventizer-Toaster is immediately behind the extractor. An external plant view is shown in Figure 3.

The operating results and mechanical performance of the first full plant-operation at Estill have been very satisfactory. The processing advantage of a stationary bed of flakes free from vibration is shown by a clear miscella.

Earlier in this article the French Stationary Basket Extractor was compared to the original vertical basket extractors. It is possible to compare it to a still older extraction system, the pot-plant system, which was also developed in Germany in the early 1900's. The pot plant was a series of stationary tanks with screened false bottoms that were charged in turn with solids. Solvent and ever more concentrated miscella were pumped through the pots in series, countercurrently to the charging sequence. Although this system, by modern standards, was costly in labor, it still retains merits of versatility that permit extraction of very difficult materials unsuited to current continuous extractors. The Stationary Basket Extractor can be visualized as a method of combining a group of such extraction pots into a single housing with continuous automatic charging devices for solids and liquids.

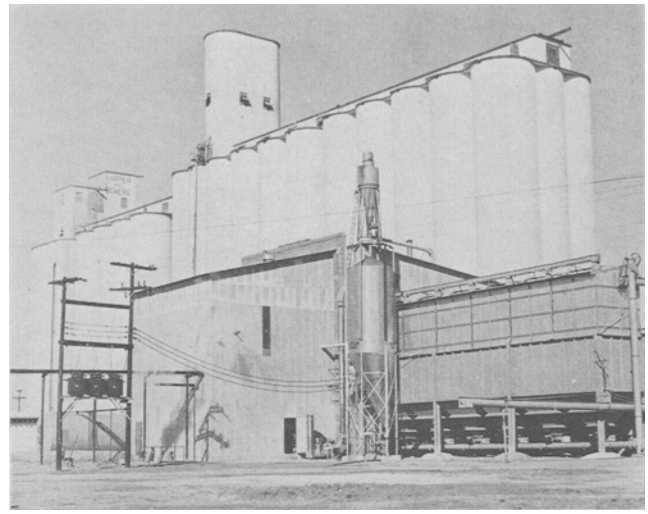

FIG. 3. Plant view, Southern Soya Inc., Estill, S.C.

REFERENCES

1. Hutchins, R. P., "The Practice of Solvent Extraction," American Oil Chemists' Society Short Course, 1948.
2. Karnofsky, George, "The Mechanics of Solvent Extraction," American Oil Chemists' Society Short Course, 1949.
3. Lectures, 1953 Short Course, J. Am. Oil Chemists' Soc., *30*, 535–539 (1953).
4. Hutchins, R. P., "Some Improvements in Design of Solvent-Extraction Plants," *ibid.*, *32*, 698–699 (1955).

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Cuphea llavea Seed Oil, A Good Source of Capric Acid

T. L. WILSON, T. K. MIWA, and C. R. SMITH JR., Northern Regional Research Laboratory,[1] Peoria, Illinois

FATTY ACIDS in the seed oil of *Cuphea llavea* var. *miniata,* commonly called Cinnabar Cuphea and closely related to the familiar cigar-flower, are reported to be 83% capric acid (1). This shrubby, erect perennial of Loosestrife (Lythraceae) family is native to the foothills and mountains of Sonora and Chihuahua to Oaxaca, Mexico. Because of its showy vermilion flowers it has become a popular ornamental in the southern areas of the United States. Recently preliminary agronomic evaluations indicate that this species has the potential of becoming an economic source of capric acid; consequently confirmation of the gas chromatographic analysis (1) was sought. Chemical characterization has now established that the major acid is capric. At least 72% of the capric acid present may be isolated in 97% purity by steam distillation of the mixed fatty acids.

[1] This is a laboratory of the Northern Utilization Research and Development Division, Agricultural Research Service, U. S. Department of Agriculture.

Experimental

Extraction of the Oil. Coarsely ground seeds of *Cuphea llavea* were extracted over-night in a Soxhlet apparatus with 30–60° petroleum ether. The bulk