CPM Crown's
Model III Solvent Extractor

DESIGNED TO MEET YOUR PRODUCTION REQUIREMENTS

Crown's Model III Continuous Loop Shallow Bed Extractor offers the benefits of low power requirements, excellent component life, ease of operation and the capability of high operating capacities. The Crown design is the most efficient of several methods of extracting vegetable oils from oil-bearing seeds. This design maximizes extraction efficiency while at the same time minimizing steam consumption.

Points to Remember

- More than 1,000 operating years worldwide with a cumulative capacity of more than 300,000 TPD.
- Proven design since introduction in 1980, backed by a company established in 1878.
- Capacities of up to 8,000 rated tons per day of flaked soybeans; more when operating with expanders.
- Available in small capacities (pilot size) or for processing specialty products.
- Design operates on a wide variety of products including the direct extraction of soybeans and cottonseed, and prepress extraction of rapeseed, peanuts, sunflower, copra and various other special products.

Features of the Crown Extractor

- Pre-assembly in workshop ensures that all components fit together properly in the field.
- Shallow bed design works with all types of materials over a wide range of conditions.
- Self-cleaning V-bar screens maximize drainage without the need for screen cleaning mechanisms.
- Maximum surface area of any extractor type with a minimum required floor space.
- Expanders not required for efficient operation even when processing delicate or poor draining materials.
- Two methods of increasing capacity: add expanders for 20-25% increased capacity, and extend the extractor for another 20-25% increase.
- Low solvent carry-over reduces both steam and hexane consumption in the DT.
- Automatic extractor feeding assures 100% filling without operator control or intervention.
- Continuous, non-mechanized discharge to the spent flake conveyor for trouble-free operation.
- Surging of DT eliminated resulting in improved overall plant operation.
- Bed turned over in the middle of the extraction process insuring even extraction top to bottom.
- No closed cells and a minimum of "side wall" effect means there is no channeling of the solvent along internal vertical surfaces.
- Extractor proportions ideal for maximum percolation rate with a typical width to depth ratio of 3:1 to 4:1.
- No tuning, balancing or adjusting of operating parameters required.
- Installation can be accomplished without welding or other "hot" work.
- Significantly reduced installation time of a Crown extractor in a new or existing plant.
- High resale value of a used extractor, due to unique bolted construction.
- Robust design and slow internal speeds result in long component life.
- Easy and infrequent chain adjustments for reduced downtime due to extractor maintenance.
- Reduced power requirement of drive due to downflow of material in tail section.
- Smooth, mechanical operation with all products.
- No "dump tanks" required due to low volumes of miscella present in the meal.

Solvent Extraction Basics

Every extraction system must satisfy four fundamental requirements to effectively remove oil in the solvent extraction process:

- The product must be properly prepared so as to rupture the oil cells, minimize the distance required for the solvent to displace the oil, and maximize the percolation rate of the solvent.
- Adequate solvent must be introduced into the process to keep the miscella relatively low in oil content. This permits the dissolving and displacement of more oil at each stage of the extraction process.
- The combination of sufficient residence time of the product in the extractor and adequate percolation rate of miscella through the product bed must be maintained to obtain maximum extraction efficiency.

- Sufficient number of extraction stages must be present in the extractor in order to ensure that the miscella concentration in the final washing stage is low enough to remove the remaining oil present in the material.

Of the three basic types of extractors used in the industry today (shallow bed, medium bed and deep bed), only the Crown shallow bed design ensures that all of these requirements will be satisfied regardless of the material being processed or the operation of the preparation process.

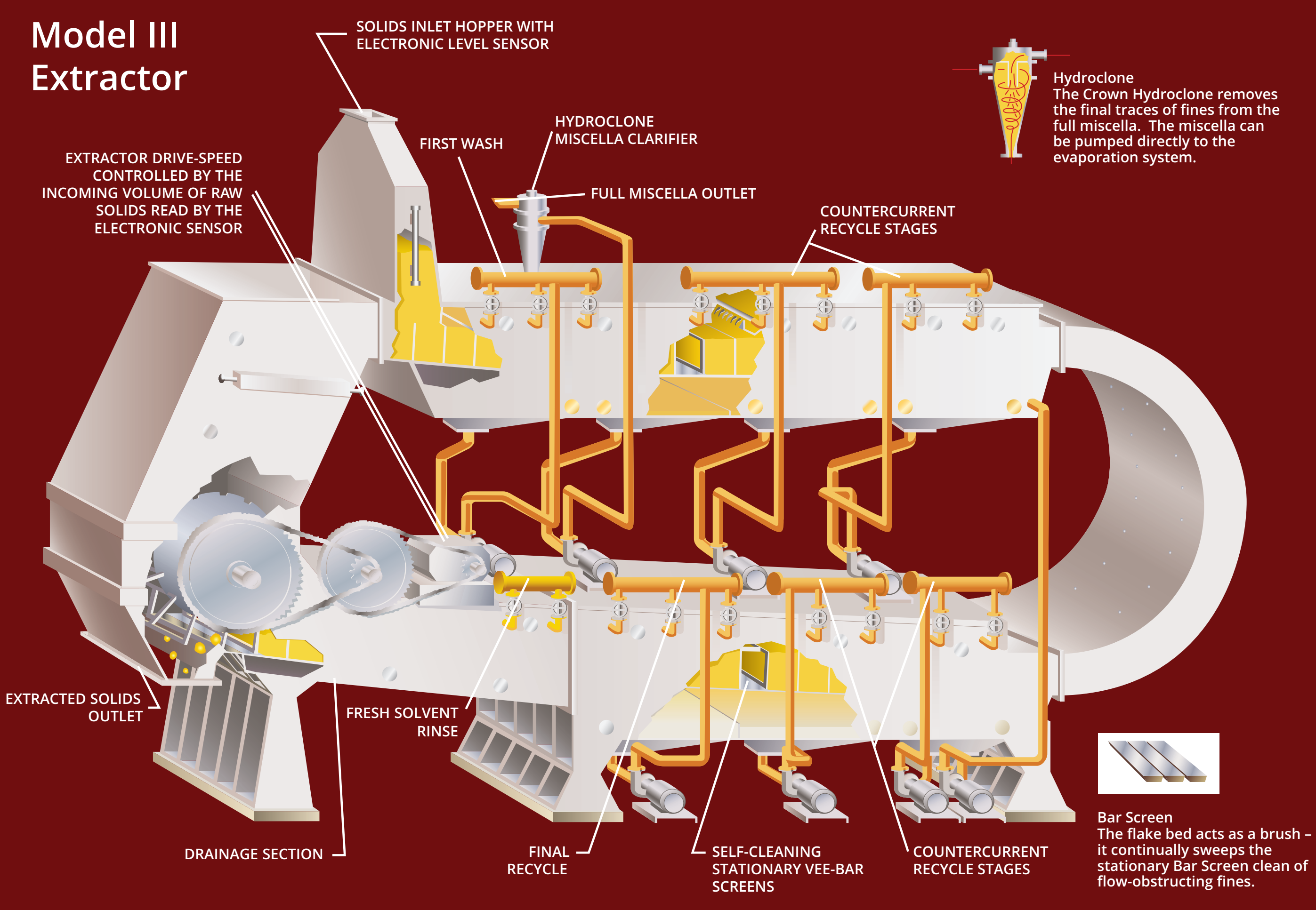
Model III Extractor Operation

Material is fed into the extractor through the inlet hopper located on the top section of the extractor. The internal chain assembly carries the material across the length of the top section. The material is supported by Crown V-bar screens, which are arranged linearly to ensure that they are continuously and automatically cleaned. The material is constantly washed by several stage pumps during this time.

In the tail section of the extractor, two important functions are automatically performed. First, the material is slowly turned over, ensuring that the bed is inverted when it leaves the tail section. Second, miscella added to the top section travels with the material, creating a soaking section which aids in removal of oil in the bottom section of the extractor. The downward travel of the material in the tail section reduces the power requirement of the drive. Large rollers of the internal chain travel on “guide rails,” which ensures that there is no wear on the fixed plates of the tail section.

In the bottom section, the material is washed by successively leaner stages of miscella, until the last stage where pure solvent is used to remove the last remaining oil. In the drainage section, the bed is raised up a shallow ramp, which ensures that no excess solvent can over-flow into the discharge and be carried on to the DT. In the discharge section, the extracted material falls by gravity in small increments into the spent flake conveyor, ensuring a smooth, continuous and even feed to the DT.

Model III Extractor



From the fresh solvent wash section, the miscella travels from stage to stage, counter-current along the bottom section of the extractor. At the end of the bottom section, an automatic level controller pumps or lifts the miscella to the top section of the extractor. From here the process is repeated until the final or full miscella is removed from the last washing stage on the top section.

The full miscella is pumped through one or more hydroclones mounted on the top section of the extractor. Here, any fines present in the miscella are removed and deposited on top of the meal bed. The scrubbed full miscella is then sent to distillation for removal of the solvent.

All process flow rates, including the extractor chain speed, miscella lift, and full miscella discharge are smoothly and automatically controlled without the need for operator intervention. The fresh solvent flow rate can be set to obtain maximum overall plant operating efficiency.

On smaller and medium sized extractors, the number of washing stages is seven or more. On larger extractor sizes (4000 TPD and larger) this number is at least 10 and can be as high as 13 on some models. This high number of extractor stages results in the maximum extraction efficiency for any given set of operating conditions.

The Problems with Deep Bed Extractors

All deep bed extractors can suffer from poor percolation, compression of materials, long extraction times, slow drainage and high solvent carry over.

Deep bed extractors traditionally lack uniformity in material discharge rates. They may produce materials of varying solvent content and varying bulk densities. In addition, deep bed extractors may damage fragile materials.

With roto cell extractor designs, the deep material bed is often up to three meters in height. This causes a channeling of solvent through the material bed, leading to inconsistent percolation and the formation of dry areas throughout the material.

Slow drainage is a common characteristic in deep bed extraction and results in a high solvent carry over to the DT, and greater overall plant steam consumption.

The Advantages of a Crown Shallow Bed Extractor

With the shallow bed design, solvent is evenly distributed with consistent percolation throughout the bed of material.

Due to the shallow bed design, material is not compacted and the percolation rate remains high, regardless of the quality of the prepared product.

Since there are no cells or internal vertical dividers, channeling of solvent and dry spot formation are eliminated.

A larger surface area to volume ratio ensures that the maximum washing rate can be used, resulting in the highest attainable capacity for a given size of extractor. This feature also produces an extractor which is more forgiving when operating on fine or poorly prepared material.

The main advantage of the Crown shallow bed design over the deep bed design is the significantly improved drainage of a Crown extractor. This translates directly into increased oil removal, reduced steam consumption in the DT, improved overall plant operation, reduced down time and a net increase in the profitability of the plant.

For ongoing innovation, Crown's technology and team are second to none.

CPM Crown's Global Innovation Center is a facility unlike any other. A fully functional 15,000 sq. ft. pilot plant, analytical lab and training facility, the GIC offers piloting capabilities from benchtop lab scale to multiple tons per day of continuous production, simulating real life and enabling customers to develop and testnew product concepts in a confidential, controlled environment. The GIC has capabilities in preparation, extraction, desolventizing, drying, deodorizing, refining, fat splitting, renewable diesel and specialty extraction (including Hemp CBD Oil). Crown's technical expertise, R&D and full lifecycle process provide guidance and support at every step from feasibility, trials and custom processing to commercial-sized operations and aftermarket.

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