26. Horizontal (Plate Chain) Extraction Unit

1. Working Principle

The horizontal (plate chain) extraction unit is a highly efficient solid-liquid extraction device primarily used for extracting oils from oilseed crops. Its working principle is as follows:

1. **Material Conveyance and Spraying**: Oilseeds that have been rolled into flakes or expanded enter the drag chain frame of the extractor and form a certain material layer height. At this point, the solvent is sprayed onto the oilseeds through spray pipes, establishing a certain liquid level on the upper surface of the material layer.
2. **Extraction and Drainage**: The chain scraper driven by the transmission device uniformly and slowly pushes the oilseeds forward within the drag chain frame. The oil materials in each frame are isolated from one another, so they do not affect each other during the extraction process. The amount of mixing oil penetration between the first and second extractions is minimal, resulting in a large concentration gradient of the mixing oil, which enhances the mass transfer dynamics of the extraction process. The drag chain frames can move the oil materials back and forth between two horizontal grating plates, improving equipment utilization. Additionally, the oil materials are flipped once after the first extraction and then extracted a second time, enhancing the uniformity of the extracted oil materials.
3. **Mixed Oil Circulation**: When the oil is repeatedly sprayed and soaked with solvent (mixed oil), the fats within the oil are slowly dissolved and extracted, dissolving into the solvent (commonly known as mixed oil). The mixed oil is filtered through grating plates into an oil collection tank, then pumped by a mixed oil pump into a temporary storage tank, and transported to the evaporation stripping section. The lower-concentration mixed oil continues to participate in the circulation spray.
4. **Wet Cake Processing**: After approximately one hour of extraction, the oil is completely extracted from the oilseeds. The cake residue after extraction is pushed into the cake discharge port of the extractor by a chain scraper and transported to the solvent recovery unit via a wet cake scraper for solvent recovery.

II. Technical Features

The horizontal (plate-chain type) extraction unit has the following technical features:

1. **Excellent sealing performance and high solvent utilization rate**: The equipment adopts a fully enclosed design, effectively reducing solvent evaporation and improving solvent utilization efficiency.
2. **Variable frequency adjustment for optimal solvent penetration**: By adjusting the speed of the drive mechanism via a variable frequency drive, the unit can adapt to the extraction requirements of different oilseeds, optimizing solvent penetration efficiency.

3. **Adopts a feed box structure to prevent cross-flow of mixed oil in the material layer and ensure concentration consistency across spray sections**: Each feed box forms an independent extraction unit, effectively preventing cross-flow of mixed oil between levels within the material bed and maintaining concentration gradients between spray sections.
4. **Counter-current flow of material and solvent throughout the entire section, resulting in high mixed oil concentration**: The counter-current spray method is used to gradually reduce the concentration of mixed oil, thereby improving extraction efficiency.
5. **Automatic speed control device ensures low machine failure rate**: Equipped with an automatic speed control device, the equipment can adjust its operating speed according to production requirements, thereby reducing the failure rate.

III. Equipment Composition

The horizontal (plate chain-type) extraction unit primarily consists of the following components:

1. **Main drive unit**: Provides power to drive the chain scraper and feed frame movement.
2. **Tensioning device**: Maintains chain tension to ensure normal operation of the drive system.
3. **Driven Unit**: Assists the main drive unit to ensure smooth chain operation.
4. **Feed Hopper**: Used to store oilseeds awaiting extraction.
5. **Scraper Chain**: Moves oilseeds within the drag chain frame.
6. **Screen Plate Frame**: Supports oilseeds and allows mixed oil to pass through.
7. **Feed Regulation Device**: Controls the feed rate and speed of oilseeds.
8. **Spray Assembly**: Sprays solvent onto oilseeds to achieve oil extraction.
9. **Sight Glass Flushing Device**: Used to observe and flush the internal condition of the equipment.
10. **Housing**: Provides the outer shell of the equipment, protects internal components, and forms a sealed extraction environment.
11. **Drive System**: Provides power support for the equipment.
12. **Upper and Lower Oil Tanks**: Used to collect and temporarily store mixed oil.

IV. Advantages

Horizontal (plate chain-type) extractors have the following advantages:

1. **High-efficiency leaching**: The low material layer thickness allows for better solvent penetration, reducing leaching time; the material layer is loosened and reorganized as it moves from the upper to lower layers, resulting in improved leaching efficiency.
2. **Energy-saving and consumption reduction**: Optimized spraying and drainage processes reduce solvent and energy consumption.

3. **Stable Operation**: The equipment has a rational structure, operates smoothly, and has a low failure rate.
4. **Safe and Reliable**: The fully enclosed design reduces the risk of solvent leakage and enhances equipment safety.

The horizontal (plate chain-type) extractor, with its efficient, energy-saving, and stable characteristics, has become one of the mainstream pieces of equipment in the oil processing industry.