28. Solvent Evaporator for Mixed Oil Extraction

1. Working Principle

The solvent evaporator for mixed oil extraction is a key piece of equipment in the oil extraction process, primarily used to evaporate and separate the solvent from the mixed oil (a mixture of oil and solvent) produced during the extraction process, thereby obtaining high-concentration oil. Its working principle is as follows:

1. **Pre-treatment of mixed oil**: The mixed oil pumped out from the extraction unit is first filtered or subjected to centrifugal sedimentation to remove solid meal residues and gel-like substances, resulting in relatively clean mixed oil.
2. **Evaporation Process**: The treated mixed oil is pumped into the evaporator, where heating causes the solvent to vaporize. The evaporator typically uses a long-tube evaporator (rising film evaporator), where the mixed oil rapidly boils inside the heating tubes, and the vaporized solvent is separated from the oil.
3. **Multi-stage evaporation**: The mixed oil first passes through the first evaporator, with the outlet temperature controlled at 60–70°C and the concentration reaching approximately 60%; it then enters the second evaporator, with the outlet temperature at 90–120°C and the concentration increased to 90%–95%.
4. **Stripping process**: The mixed oil, after evaporation and concentration, enters the stripping tower, where residual solvents are further removed through steam distillation. Direct steam is introduced into the stripping tower at a certain pressure, while indirect steam is introduced into the jacket for heating, causing the solvent to vaporize and be extracted by the vacuum system.

II. Technical Features

1. **High-efficiency evaporation**: A long-tube evaporator is used, where the mixed oil forms a thin film inside the heating tubes, resulting in high heat transfer efficiency and rapid evaporation rates.
2. **Multi-stage separation**: Through multi-stage evaporation and stripping, the oil concentration is gradually increased while reducing solvent residue.
3. **Vacuum Operation**: A vacuum system is employed during evaporation and stripping to lower the solvent boiling point, reduce energy consumption, and enhance evaporation efficiency.
4. **Solvent Recovery**: Solvent vapor generated during evaporation and stripping is condensed and recovered via a condenser, enabling solvent recycling.

III. Applications

Solvent evaporators for mixed oil extraction are widely used in the oil processing industry to treat various oilseeds (such as soybeans, rapeseed, sunflower seeds, etc.) for mixed oil extraction, producing high-purity oils. Additionally, this equipment can be applied in other industrial fields requiring the separation of solvents and liquids.

IV. Advantages

1. **Improved oil quality**: Through efficient evaporation and stripping processes, high-quality oils with low solvent residue are obtained.
2. **Energy-saving and cost-effective**: Vacuum operation and multi-stage evaporation design reduce energy consumption.
3. **Environmental protection**: The solvent recovery system reduces solvent emissions, meeting environmental protection requirements.
4. **Stable operation**: The equipment has a rational structure, operates stably, and has low maintenance costs.