Pope Wiped-Film Stills

Introduction and Description of Basic Technology

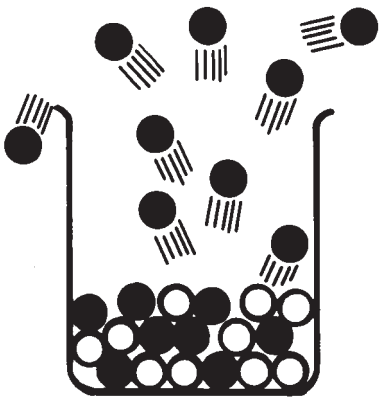
Bulletin No. 1

The Molecular Background

Wiped-Film still technology takes advantage of the fact that each chemical substance has a characteristic vapor pressure. It is this relative difference in vapor pressures which dictates how easily a complex compound can be separated into its constituent components.

Since the molecules of all matter are in constant motion in varying degrees, depending upon the chemical composition of that matter and the temperature and pressure applied to it, molecules near the surface have a tendency to escape into the surrounding atmosphere. As temperature increases and pressure decreases, this escaping tendency usually increases and the substance is said to vaporize.

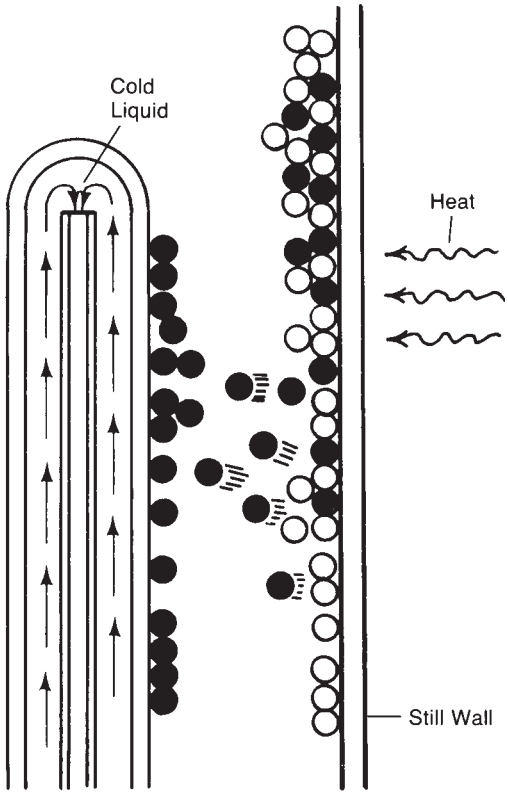
The force generated by these escaping molecules is referred to as the vapor pressure of that material at a particular temperature and pressure. It is the relative difference in vapor pressure of substances which dictates how easily a complex compound can be separated into its constituent compounds.



Molecules escaping from solution.

Brief Operating Description

The Pope Wiped-Film Still consists of a heated body into which a fluid system requiring some degree of separation is continuously fed. The fluid is spread into a thin film by a rotating wiper blade assembly driven at a predetermined speed. The film, while being forced into turbulent flow by the wiper blades, progresses down the inside body wall aided by gravity and the slots in the wiper blades.



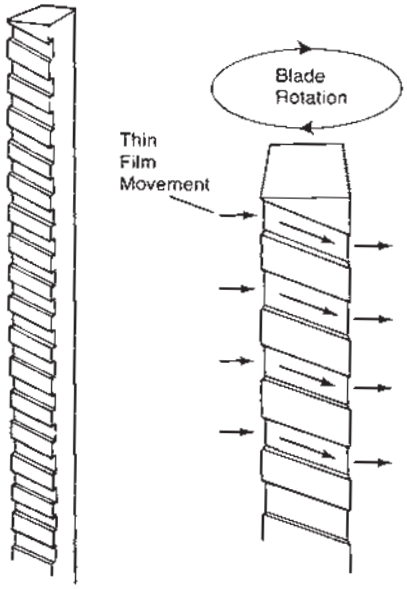
Basic evaporation and condensation.

During the course of flow through the heater system, some degree of evaporation takes place depending upon the characteristics of the feed material and the inside wall temperature, in addition to the system pressure. The nonevaporated fluid forming the bottom product flows out of the system continuously while the vapor is condensed either inside or outside the system depending on the type of design.

Why Thin Films?

Thin films are created in Pope Wiped-Film Stills for a variety of reasons:

1. Turbulence created by a rapidly moving wiper or controlled clearance blade greatly assists in heat transmission, thereby lowering the temperature required on the inside evaporator wall for a given system pressure.
2. A maximum surface area per unit volume of flow is generated facilitating rapid evaporation.
3. The liquid exposure time to the elevated wall temperature can be controlled within seconds or less. This minimizes product degradation of heat sensitive materials by controlling the wiper assembly speed.
4. High viscosity materials can be transported through the system for distillation or solvent stripping.
5. Pope slotted wiper blades promote plug flow with little back mixing. This minimizes dwell time distribution, ensuring that material flowing through the system has a uniform exposure to process conditions.



Wiper blade moves each plug of material downward.

The Pope Dimension of Excellence

Pope adds superior design and construction to the basic wiped-film still process. This has enabled Pope stills to sustain pressures down to one micron for either solvent stripping or molecular distillation.

Pope variable speed control of the wipers coupled with the ability to reverse rotation, allows an extremely wide variation of hold-up time for the process fluids in the evaporator body. Pope supplies either Teflon or carbon wiper blades with carbon preferred on applications with temperatures over 200 degrees Centigrade.

When increased condensing capacity of a non-corrosive distillate is required, the conventional glass "cold finger" can be replaced by a stainless steel condenser presenting a unique combination of Pope process capabilities. It is the ability of Pope artisans to work in both glass and stainless steel and combinations of both that provides a unique dimension of excellence — a combination of process variables not available elsewhere. Pope Scientific offers you flexibility! In those instances when corrosiveness to stainless steel is a problem, Hastelloy, Titanium, C-20, other alloys, or glass can be offered as the preferred construction materials.

Pope Scientific observes the most stringent quality control. To generate sound research and development data for molecular distillation or solvent stripping process, variables must be rigorously controlled — i.e. feed rate, wiper revolution rate, still body temperature and pressure. Pope Scientific provides the capability to control each of these variables to the degree required for efficient and repeatable processing.

Typical Applications

The thin film evaporator/molecular still technique has been successfully utilized since the 1940's. It remains a primary means of separation for many applications, including:

- Solvent stripping
- Stripping monomer from polymer
- Stripping free fatty acids from fats and oils
- Distilling fats and oils
- Concentrating or distilling heat-sensitive pharmaceuticals, nutraceuticals and biomaterials
- Distillation of polymers
- Distillation of petroleum fractions
- Reactives from solid catalysts
- Concentration of fruit juices
- Isolation of aromatic compounds
- Deodorization of oils
- Removal of colors
- Separations of waxes or silicones
- Foods and flavors purifications

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