Pope Wiped-Film Stills

Basic System Configurations

Bulletin No. 2

General Information

Pope Wiped-Film Stills are currently offered in three basic models with differing evaporating surface sizes:

1. 2" model with a 323 sq.. cm. (.35 sq. ft.) evaporator surface.
2. 4" model with a 1,097 sq. cm. (1.18 sq. ft.) evaporator surface.
3. 6" model with a 2,194 sq. cm. (2.36 sq. ft.) evaporator surface.

Model size is based on the diameter of the evaporating chamber. Still components are normally made from borosilicate glass except for the drive system (usually 316 stainless steel) and wiper blades (Teflon™ or ultra-pure high temperature carbon). Other materials are furnished on special order– such as stainless steel or quartz in place of glass and other metals substituted for the drive.

Pope stills are available in a broad range of variations, to more efficiently accomplish the following different types of separation:

Concentration/Evaporation

In the case of concentration/evaporation, the desired final product is usually the residue (bottoms), not the distillate. And water is often the substance removed. Therefore, broader cuts can be made to remove the unwanted material as distillate. The throughput is also usually larger than other types of separation. Because of this, the efficiency of the operation is improved by the following factors:

1. Larger feed and receiver flasks.
2. Extra condensing power, as supplied by Pope external condensers, or stainless steel internal condensers, rather than the glass internal condenser.
3. Higher heating capacity, as affected by metal band heaters, heat transfer fluids or stainless steel bodies.

A basic system for concentration/evaporation (see Figure 1) will include the wiper drive, wiper blades, evaporator body with internal condenser, feed and degasser flask, receiver flasks, external condenser and receiver flask, adapter from condenser to vacuum and the vacuum system. The type of heating system and temperature control will depend upon such factors as maximum body temperature, desired throughput, etc. See Pope Bulletin No. 4 "Temperature Control Systems." Additional components, such as a liquid nitrogen cold trap, various instruments, etc., can also be supplied.

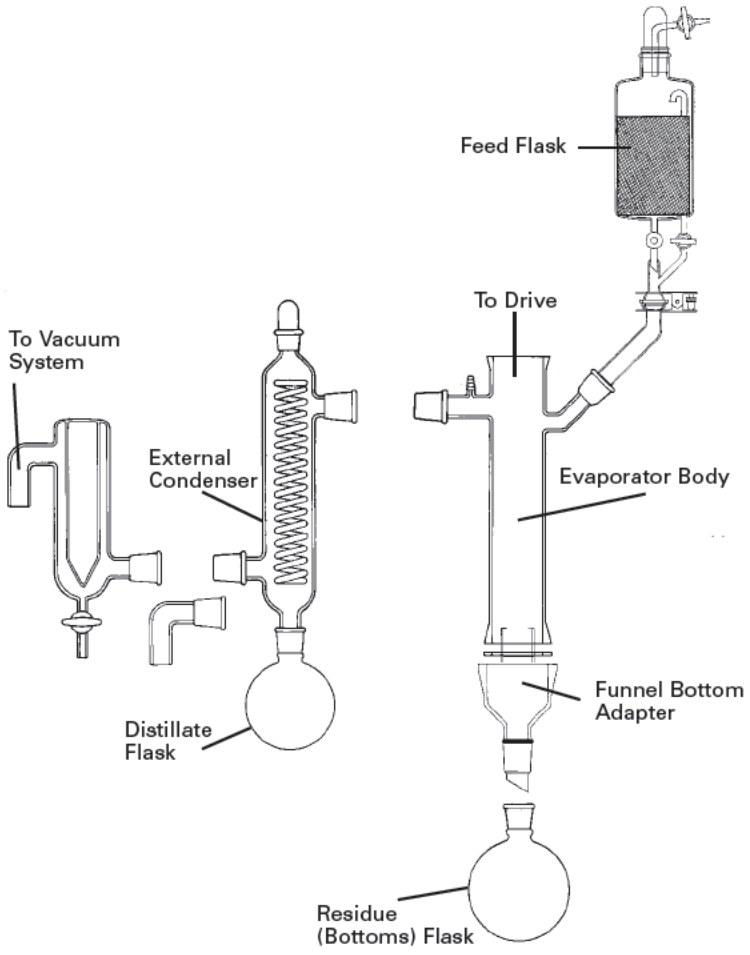


Figure 1: *Pope Concentration/Evaporation unit with necessary components.*

Molecular Distillation

In molecular distillation, the desired final product is usually the distillate. Pope Still bodies are dimensionally designed for more efficient molecular distillation. The condenser is situated inside the evaporator, with its condensing surface sufficiently close to the evaporating surface so as to minimize collisions of evaporated molecules on their path from evaporator to the condenser. Molecular distillation is improved by using:

1. High vacuum systems (see Pope Bulletin No. 6, "Vacuum Systems").
2. More precise temperature control (see Pope Bulletin No. 4, "Temperature Control Systems").

A basic system for molecular distillation (see Figure 2) will include the wiper drive, wiper blades, evaporator body with internal condenser, feed and degasser flask, receiver flasks, liquid nitrogen cold trap and the vacuum system. The type of heating system and temperature control utilized will depend upon such factors as maximum body temperature, desired throughput, etc. Please refer to Pope Bulletin No. 4, "Temperature Control Systems." Additional components, such as instruments, can also be added.

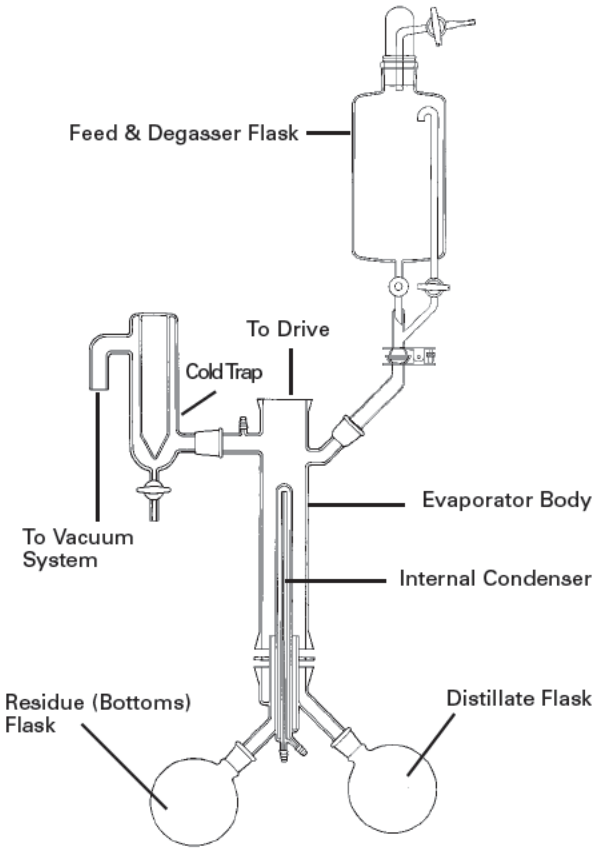


Figure 2: *Pope Molecular Still with necessary components. Note that cold trap has been substituted for external condenser.*

Solvent Stripping

Solvent stripping is essentially the same type of separation as concentration/evaporation. The desired product is usually the residue (bottoms). The distillate (the removed solvent) is generally sufficiently pure enough to be reused. Because the latent heat of vaporization for solvents is typically 1/4 to 1/6 that of water (which is usually removed in the evaporation/concentration mode), throughputs are considerably higher. Feed pumps are often used to pump the feedstock out of large feed vessels. Thus, a run of many hours can be performed without any operator assistance necessary on Pope automated systems. Note that the largest throughputs are obtained with the stainless bodies using an external condenser.

A representative system for solvent stripping will include the wiper drive, wiper blades, evaporator body with stainless steel internal condenser, large feed flask with feed pump, receiver flasks sized to accommodate desired throughput, external condenser with receiver flask, adapter from external condenser to vacuum system and the vacuum system. As in all cases, the type of heating system and temperature control will depend upon such factors as maximum body temperature, desired throughput, etc. See Pope Bulletin No. 4, "Temperature Control Systems."

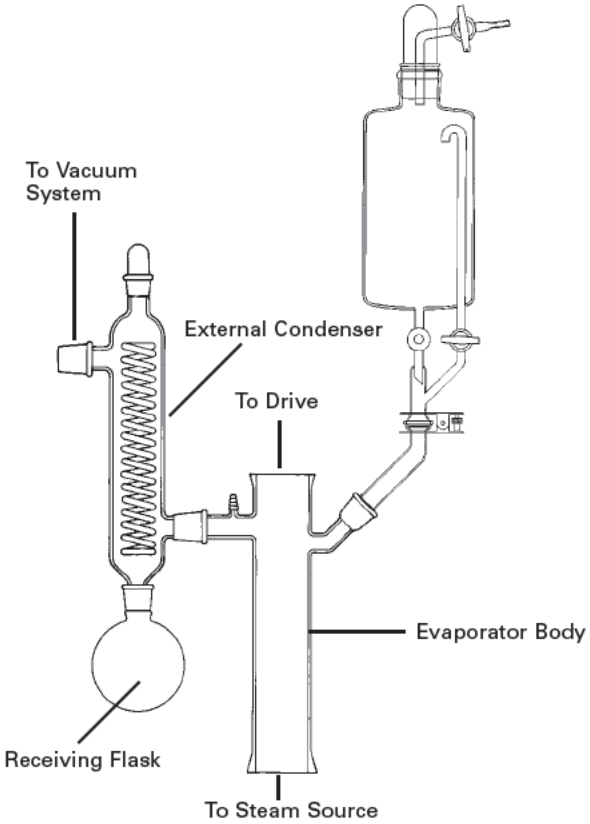


Figure 3: *Pope steam stripper unit with necessary components.*

Steam Stripping

Steam stripping can also be performed efficiently with Pope stills. The steam is introduced at the bottom of the still body through special inlets provided by Pope Scientific. The thin, highly turbulent film formed by the wiper blades allows for every efficient contact between the steam and the liquid. An external condenser is then used to collect the steam and remove the solvent.

The basic steam stripping system is similar to a solvent stripping system, except that the (see Figure 3) internal condenser is not required. An external heating system is not needed (although one may be installed to increase efficiency) since the steam provides the heat for the evaporation of the solvent. A stainless steel body is also recommended for steam stripping.

Reactors

Pope Wiped-Film Stills are beginning to find increased application as thin film vacuum reactors. Special inlets can be added to the still bodies to allow for liquid/liquid or gas/liquid reactions. The thin, turbulent film provided by Pope wipers allows more complete, efficient reaction. Consult with the Pope Scientific staff for more information on the reactor ode.

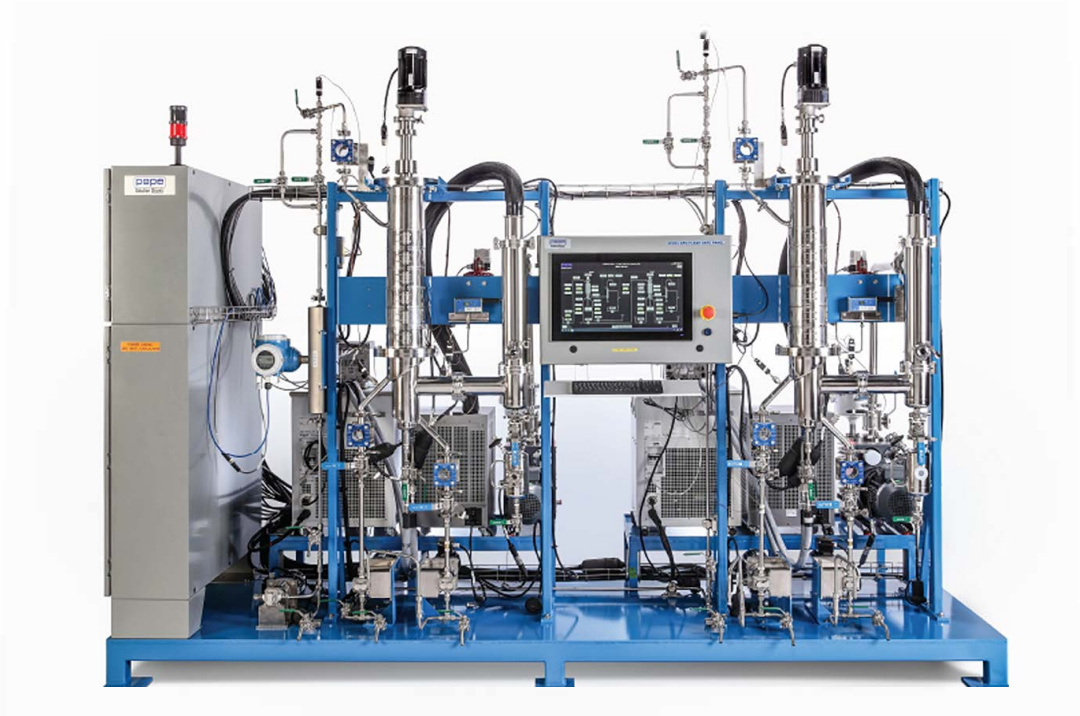
Instrumented Wiped-Film Stills

All Pope Stills are available in the standard version which is ready to operate as a batch still. Note that the vacuum system and instruments are not included.

The Pope standard still can be supplied with any of the heating systems discussed in Pope Bulletin No. 4, "Temperature Control Systems." Pope Scientific can also furnish vacuum systems, individual instruments or complete instrument packages for Pope stills. A complete instrument package (see photo) may include a console with still body temperature control, feed temperature control, feed pump control, wiper drive speed control, rpm indicator, vacuum control and the various switches, fuses, circuit breakers, etc., required. All controls and other ancillary equipment are selected for compatibility with Pope systems.

Tandem Stills

Pope Wiped-Film Stills are essentially single step or single plate distillation systems. Therefore, only a limited degree of separation can be made when components of the feed material have similar volatilities.. In order to accomplish further separation of the given feed material, it is common practice to recycle the desired product on a batch basis. That is, the product from a run is processed again through the system. This recycling can also be accomplished by mounting two or more stills in tandem, and by pumping the desired product continuously into the next still body.



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