

# NASH Vacuum Pumps for Evaporation

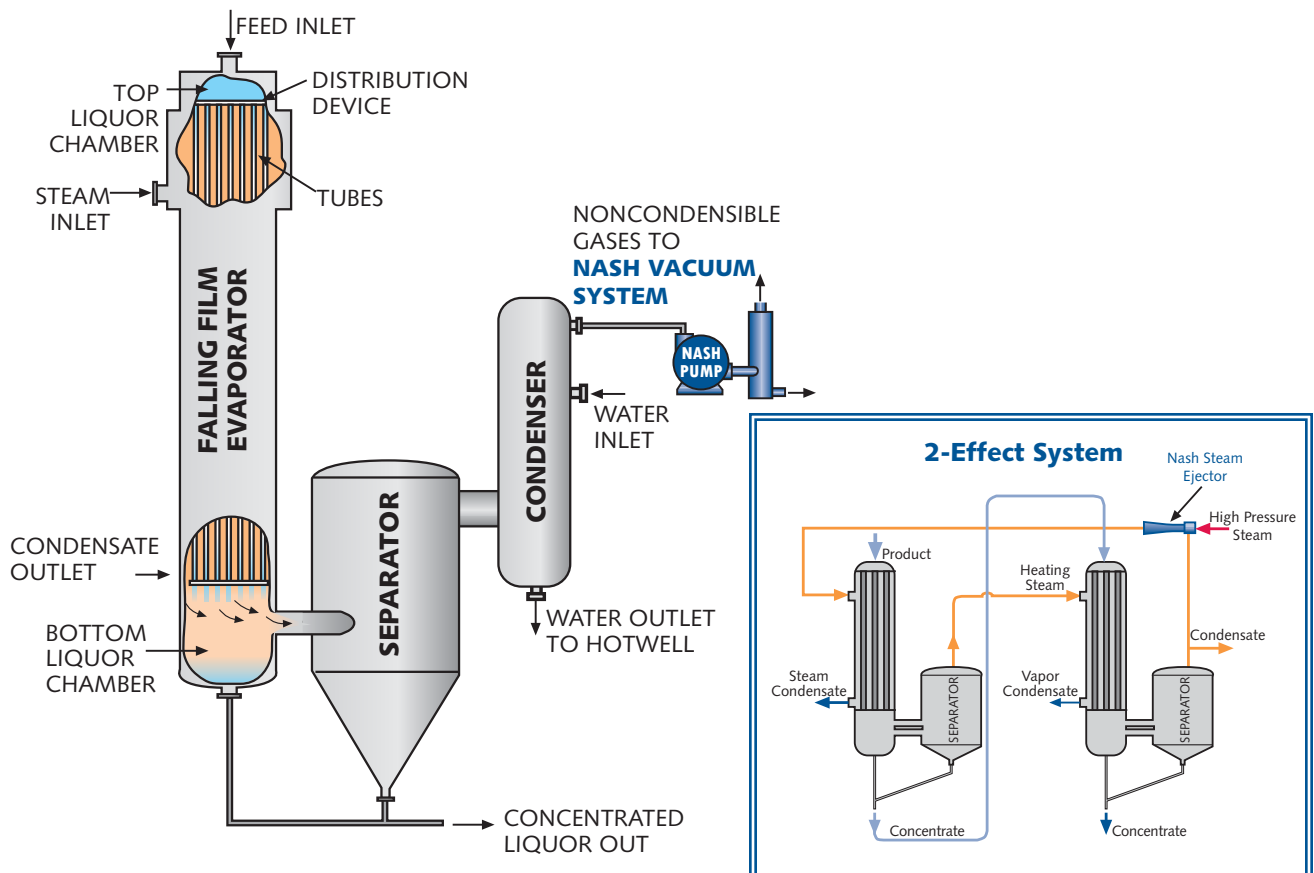
**Thermal Vapor Recompression (TVR), using Nash steam ejectors, saves the same amount of steam/energy as an additional evaporation effect.**

Evaporation is the process of concentrating a product by boiling out a solvent - usually water - so that the end product has optimal solids content and product quality. Used extensively in processing foods, chemicals, pharmaceuticals, fruit juices, dairy products, paper and pulp, and both malt and grain beverages, it is one of the most energy-intensive operations in industry. Using vacuum, however, saves energy by reducing the evaporation temperature. A vacuum system can also prevent leakage to the atmosphere and can reduce disposal costs by 90% by concentrating the effluent.

Most commonly found in industry today are tube type evaporators. These include:

- Falling Film Evaporators for low-viscosity products:  
Dairy products, fruit juices, plant extracts, blood plasma and many pharmaceutical products
- Rising Film Evaporators for medium-viscosity products:  
Caustic soda, nitrates, sweet water glycerine and electrolytic thinning liquids, acid solutions
- Forced Circulation Evaporators for high-viscosity products that are susceptible to scaling or crystallizing
- Wiped Film Evaporators for very high-viscosity products and stripping of solvents to very low levels

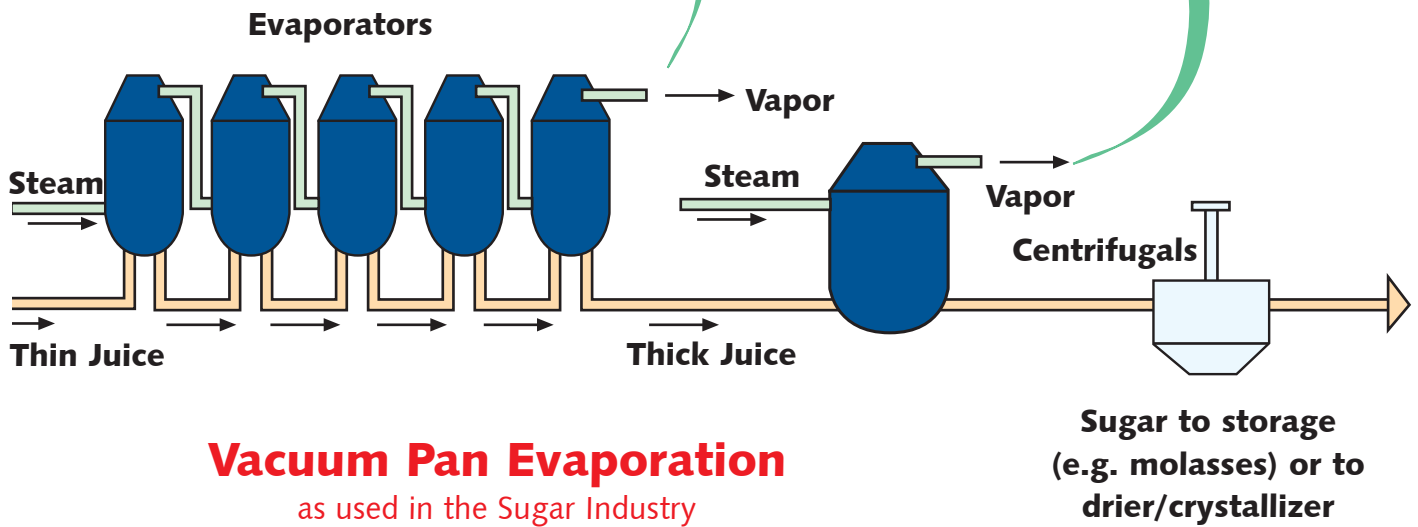
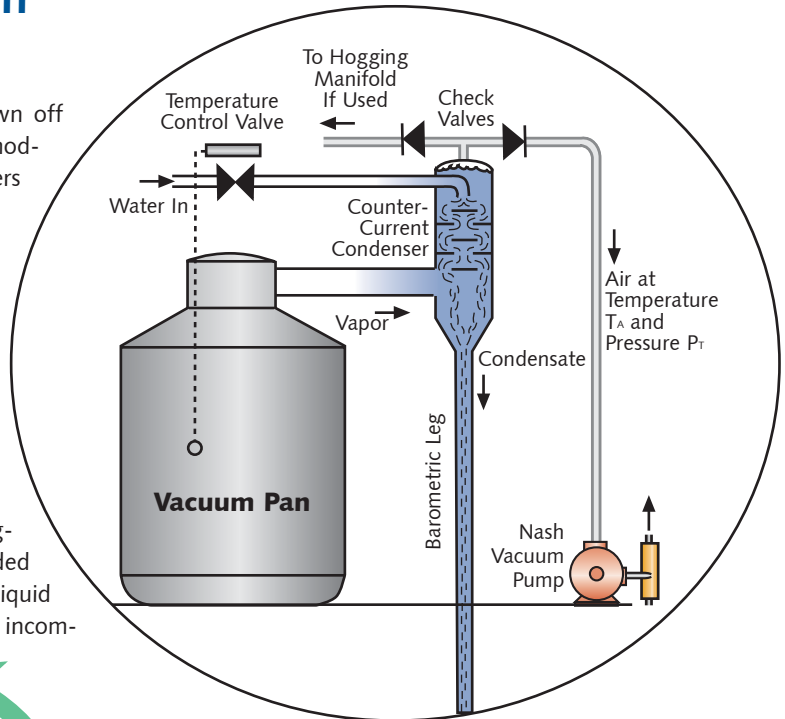
Rising film evaporators use vapor as the transport medium, so no pumping energy is needed for the feed. Falling film evaporators take advantage of gravity for the film flow. The rising film unit usually needs a driving force or temperature difference of at least 25°F, limiting it to four effects. Falling film units, on the other hand, can have as many as ten or more effects. They have a minimum impact on flavor or other sensitive ingredients and have a high efficiency heat transfer when used in multiple-effect arrangements or with Thermal Vapor Recompression (TVR), using Nash steam ejectors. TVR gives the same steam/energy savings as an additional evaporation effect.



## Drawing Non-Condensables Off Condensers

Vapor, air and other non-condensables can be drawn off evaporators and vacuum pans in several ways. The modern approach is to evacuate counter-current condensers with single-stage NASH vacuum pumps.

In a wet vacuum system like this, a NASH vacuum pump serves as a secondary condenser. Liquid compressant in intimate contact with the saturated gas condenses most of the vapor that was not removed in the counter-current condenser. The significance of this is in transforming vapor into liquid decreases the volume that the pump must handle. Its effect is to decrease the size of the pump required by increasing the NASH pump's capacity significantly beyond its dry air rating. How much added capacity can be attained depends on how cool the liquid compressant is with respect to the temperature of the incoming air-vapor mixture.



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