Industrial evaporation technology requires efficient, economically optimized plants and systems which are precisely aligned to the characteristics of the solution media concerned.

Chem has acquired extensive technical know-how from their own research and development work and numerous designed plants. We are therefore able to offer the correct solution for most products, evaporation rates, operating conditions and fields of application.

Depending on the composition of the solution, its temperature related behaviour and its viscosity, the encrustation properties of the dissolved substances, the production capacity required, we equip our plants with various evaporator types. The type of evaporator to be used is selected depending upon the operating conditions and process parameters of the evaporation plant like specific heat, boiling curve at different pressures, and flow behaviour as well as several other characteristics such as tendency to fouling, sensitivity to temperature, precipitation of salts, etc.

**CHEM MULTIPLE EFFECT FALLING FILM EVAPORATORS**

Chem Falling Film Evaporators are designed to flow liquid and vapour parallelly downwards. Liquor feed is preheated to boiling temperature. Preheated feed is distributed by specially designed distributor positioned above the top tube plate of the calandria. An even thin film is formed in the heating tubes and flows downwards at boiling temperature while evaporation. The falling film is 'going with gravity'. This results in a thinner, faster moving film and improved heat transfer co-efficient. Due to the short times of direct contact and minor differences in temperature between the heating surface and the solvent, this type is particularly suitable for non-crystallizing solutions which are temperature sensitive; high specific heat transfer.

**CHEM NATURAL CIRCULATION EVAPORATORS**

Evaporation by natural circulation is achieved through the use of a short tube bundle within the batch pan or by having an external shell and tube heater outside of the main vessel. The external heater has the advantage that its size is not dependent upon the size or shape of the vessel itself. As a result, larger evaporation capacities may be obtained. Compact straightforward design, used for solutions whose substances do not precipitate in the form of solids during the concentration process; suitable for low to medium concentration duty range.

**CHEM FORCED CIRCULATION EVAPORATORS**

The forced circulation evaporators are used for processing liquors which are susceptible to scaling or crystallizing. Liquid is circulated at a high rate through the heat exchanger, boiling being prevented within the unit by virtue of a hydrostatic head maintained above the top tube plate. As the liquid enters the separator where the absolute pressure is slightly less than the inside tube bundle, the liquid flashes to form a vapour. The main applications for a forced circulation evaporator are in the concentration of inversely soluble materials, crystalizing duties, and in the concentration of thermally degradable materials which result in the deposition of solids. These high recirculation rates result in high liquor velocities through the tube which help to minimize the build-up deposits or crystals along the heating surface. The universal type, preferably used for solutions containing encrusting substances, hardening agents and undisolved solids, and for viscous solutions; also suitable for evaporative crystallization.

**CHEM RISING FILM EVAPORATORS**

The rising film evaporator is designed by using a vertical tube with steam condensing on its outside surface. Liquid on the inside of the tube is brought to a boil, the vapour generated forming a core in the centre of the tube. As the fluid moves up the tube, more vapour is formed resulting in a higher central core velocity that forces the remaining liquid to the tube wall. Higher vapour velocities in turn result in thinner and more rapidly moving liquid film. This provides higher HTC's and shorter product residence time. Preferably used for the evaporation of highly viscous products and products that have a tendency to foul the heating surface. Can also operate as high concentrators with single-pass operation.

**CHEM PLATE TYPE EVAPORATORS**

Chem plate type evaporator involves the use of a number of plate packs, each consisting of alternate plate cavity for steam and the product. Number of plates are hung in a frame which resembles that of a plate heat exchanger. Each body of plate evaporator is designed to give full flexibility in thermal performance. Normally, the feed liquor is introduced at a temperature slightly higher than the evaporation temperature in the plate annuli and the ensuing flash distributes the liquor across the width of the plate. Useful to handle asymmetrical flows - when a limited pressure drop is acceptable for one of the media but pressure drop is not a limiting factor for the other. Also used for even and gentle evaporation of the product.
Multiple effect evaporation plants save heating steam by repeatedly using the same quantity of heat from effect to effect. The condensation heat can also be recovered, if the vapours of a boiling chamber are compressed to the higher pressure of the heating chamber according to the heat pump principle. The saturated steam temperature corresponding to this pressure is also higher and the vapour can be reused for heating several times. Steam jet vapour recompressors are frequently used for this purpose.

Jet compressors operate at very high flow velocities and have no moving parts. Construction is simple and operation reliable. Chem evaporation plants are equipped with jet compressors developed and designed in our own laboratory. We hence have expert knowledge about the behaviour of our jet compressors over changing operating conditions. This enables us to guarantee that our evaporation plants are designed to operate correctly over a wide range of application at a high efficiency.

A certain quantity of steam is required to operate a jet compressor. This represents the heat input to the plant and can be calculated from the motive steam pressure and the required compression ratio. Due to the presence of this motive steam in the mixed flow, more vapours will be evaporated than the compressor can entrain.

Chem has successfully designed, installed and commissioned more than 800 Vacuum Packages comprising of Multistage Steam Jet Ejectors with Surface Condensers with Barometric Condensers and has been successful in securing orders against foreign firms in India like Weigand, Koerting, Croll-Reynolds, Schutte & Koerting Inc., Hicks & Hargreaves, etc.

**EVAPORATOR APPLICATIONS**

**CHEMICAL AND PHARMACEUTICAL INDUSTRY**

- Caustics
  caustic soda and caustic potash solution
- Organic acids
- Inorganic acids
- Salt solution
  ammonium nitrate, ammonium sulphate, calcium nitrate, process caustics, sulphur sodium, sodium sulphate, calcium chloride, ammonium chloride, etc.
- Amines
  urea, diethylene
- Alcohols
  phenol, methanol, ethanol, butanol, Glycerin, glycols
- Petroleum products
- Synthetical products
  caprolactum water, synthetic glue, stabilizers, aromas
- Pharmaceutical solutions
  enzymes, antibiotics, drug extracts, sugar substitutes, sorbitol, stobose, gluconates
- Effluents
  leakage water, wash water, oil emulsions, photographic effluents, etc.

**ORGANIC NATURAL PRODUCTS INDUSTRY**

- Spent wash
  grain, whisky, and potato wash
- Steep water
  corn, sorghum
- Stick water
  slaughterhouse effluents, fish stick liquor, fruit peel press water, beet chips fibre press water
- Organic effluents
  wash water, wheat and potato starch effluents

**FOOD INDUSTRY**

- Milk and Milk products
- High protein juices
  soya whey, yeast extract and fodder yeast
- Fruit juices
- Vegetable juices
- Starch products
  glucose, dextrose, fructose, isomerose, maltose, starch syrup, dextrose
- Extracts
  meat and bone extract, coffee and tea extract, hop extract, malt extract, yeast extract, pectin

Chem having its manufacturing base, pilot and test laboratory at Ahmedabad, India extends quality and precision in all its heat exchange, vacuum and evaporation products.

Commitment to customers is our policy and we aim to provide compact and powerful heat transfer and vacuum solutions, distinguished in the first instance by high efficiency.

**Chem Process Systems Pvt. Ltd.**

Evaporation, Vacuum and Heat Transfer Technologies

13 Siddheshwar, B/h GNFC Info Tower, Sarkhej Gandhinagar Highway, Bodakdev, Ahmedabad 380 054 India
Tel.: +91-079-26859498, 26859540 Fax: +91-079-26859540, 26850800
Email: chem@chemprosys.com OR inika@icenet.net URL: www.chemprosys.com