PRODUCT RANGE

Vacuum
- Steam Jet Ejectors
- Multi-Stage Vacuum Systems
- Liquid Jet Ejectors
- Liquid Ring Vacuum Pumps
- Air Extraction Systems
- Ring Jets: Steam jet Ejector Liquid
- Ring Vacuum Pump Combination Systems
- Eductor/Jet Mixers/Jet Heaters
- Thermocompressors

Multiple Effect Evaporation Plants with Thermal/Mechanical Vapor Recompression
- Forced Circulation
- Falling Film
- Natural Circulation
- Rising Film

- Horizontal Wetted
- Combination Types
- Multi-Stage Flash
- Multi-Effect Distillation

Crystallizers
- Adiabatic Vacuum
- Evaporative Forced
- Draft Tube Baffle Type
- Spray Evaporator Crystallizer
- Oslo Type

Heat Transfer
- Surface Condensers
- Heat Exchangers
- LHP/VHP Heaters

Zero Liquid Effluent Discharge Systems
- Cooling Concentration Systems
- Salt Recovery Plants
- Pressure Vessels


evaporators & crystallizers

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Evaporators, Crystallizers & Multi-Effect Turnkey Plants
Optimally Designed, Meticulously Built, Shop Tested and Performance Guaranteed

CHEM Process Systems is a leader in Evaporation and Crystallization technology with more than 1,000 installations.

Chem Process is committed to supplying evaporation, crystallization, drying, desalination, vacuum and heat transfer process technology and systems. We design, fabricate, and test systems for the chemical, pharmaceutical, bulk drugs, agrochemicals, fertilizers, biotech, food, dairy, beverage industries, and for environmental applications.

Chem Process provides the complete scope of services, from start to finish, including:

- Pilot plant testing
- Process design
- Plant configuration
- Equipment engineering
- Equipment fabrication
- Automation / Controls
- Pre-fabricated & modular systems
- Turn-key installations
- Start-up and commissioning
- Training
- Documentation
- Service and spare parts

Complete Solutions Range
Chem Process provides the full range of equipment to cater to all application and industries:

Evaporators
- Forced circulation
- Falling film
- Natural circulation
- Rising film
- Plate
- Horizontal wetted
- Combination types
- Multi-stage flash
- Multi-effect distillation

Crystallizers
- Adiabatic vacuum
- Evaporative forced
- Draft Tube Baffle (DTB) type
- Spray evaporator crystallizer
- Oslo Type

Energy Efficiency
Energy Efficiency of Chem Process Evaporators and Crystallizers is a crucial consideration during design of each customer’s specific application. Energy efficient systems utilize waste heat, multiple effects, mechanical vapour recompression (MVR) and/or thermal vapour recompression (TVR).

Multiple Effect Operation
The evaporation duty is separated into stages operating at different temperatures. External heat drives the first effect of the evaporator, with subsequent effects being driven by vapor generated from the previous higher temperature effect. Product may be passed through the evaporator in forward, back or mixed flow configurations. Additional efficiency is achieved with the use of regenerative heaters, condensate heaters, and vapour heaters.

Thermal Vapour Recompression, TVR
Multiple effect evaporation plants save steam by repeatedly using the same quantity of heat from effect to effect. The vapours from the first effect is compressed to a higher pressure by the thermocompressor, and these compressed vapours are the heating medium for the subsequent effect. Vapours from the final effect are condensed, heat is recovered and supplemented by the cooling water if required.

Mechanical Vapour Recompression, MVR
MVR technology yields the greatest energy efficiency for an evaporator, and requires low cooling water. An MVR evaporator may be coupled with TVR and multiple-effects.

Evaporation plants with mechanical vapour recompressors normally require very low live steam and shifts the necessary energy to electric energy.

MVR can be either high pressure fans or centrifugal compressor types depending on the application. Single-effect centrifugal compressors are frequently used. For high pressure increases, multi-stage compressors are provided. To supply the power to the compressor, either electric power, or combustion engines are used where heat is available from the cooling water and exhaust gases. If high pressure steam is available, a steam turbine may be installed for high total energy efficiency.
EVAPORATORS

Falling Film
The falling film evaporators can be operated with a low temperature difference and since the product residence time is very less, they are best suited for liquids which are temperature sensitive, have a high rate of specific heat transfer, particularly for non-crystalline solutions. Having low liquid holding volumes, the falling film evaporators are very easy to operate, clean, switch to another product and are extremely sturdy, thus the most frequently used types.

Caution must be used to ensure a continuous film wetting rate and to prevent nucleate boiling; otherwise, the rate of heat transfer will fall dramatically, and the rate of feeding on the heat transfer surface will increase.

- Vapour Induced Film
- Falling Film Tubular & Plate
- Rising Film Tubular & Plate
- Mechanically Agitated Thin Film

Natural Circulation Evaporators
Natural circulation evaporators are very simple and are normally used where the effluent has a high viscosity, higher levels of hardening agents, undisolved solids, for products which are affected by their own high temperatures and longer residual times. The operation could be continuous, batch or semibatch and do not require pumps for recirculation or intermediate product transfer.

Forced Circulation Evaporators
Normally used for liquids which are prone to fouling, scaling, crystallizing or for those which are reversibly soluble or while concentrating thermally degradable materials. Here high recirculation rates allow high liquor velocities through the tubes which help to minimize the build up of deposits or crystals along the heating surface.

Plate Type Evaporators
Plate type evaporators are of a compact design and are designed for single pass (climbing film operations), which result in even and gentle evaporation of the product. 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.

Horizontal Wetted Tube Type Evaporators
In the horizontal wetted tube evaporators, the heating fluid or vapour flows inside the tubes, while the liquid to be evaporated flows outside the tubes within the evaporator shell. There are many advantages offered by these types; the space within the tube bundle allows the evaporated vapours to flow at a low velocity and hence evaporation can be carried out a very low temperature. Other benefits relate to easy mechanical cleaning, possibilities of tube bundle removal, low risk of liquid priming, low height requirements and ease of retrofitting.

Multi-Stage Flash
In multi-stage flash evaporators, the product flows with a positive pressure through the tubes of all the stages i.e. from the last stage to the first stage, where the liquid is heated gradually by the vapour condensed in all the stages. From the last stage the liquid is discharged by the concentrate pump. The distillate is collected from all the condensers in the last stage condenser and from here it is discharged by the distillate pump. The non-condensable gases released in all the stages are discharged by the ejectors.

Chem Process designs and manufactures multi-stage flash evaporation plants, which may be used for producing fresh water from sea water, well water or industrial water. A special advantage of the multi-stage flash technology is that the thermal efficiency can be tailored to the individual client requirements. Chem Process multi-stage flash evaporation plants are also used for reduction of the volumes of industrial waste waters generated by industries.

Multi-Effect Distillation
In multi-effect distillation evaporators, the upper end of the rising film evaporation tubes protrude from the upper tube plate of the calandria, so that the liquid after evaporation does not flow back into the tube and the vapour produced inside the tubes can leave the tubes without passing the liquid level on the upper tube plate. This avoids the excessive entrainment of the liquid and higher vapour and distillate salinity.

Chem Process multi-effect distillation evaporators have removable covers for easy accessibility to the demister pack. On the condensation side the heating elements are designed with special internal air cooling zones which ensure optimum concentration of the non-condensable gases which are evacuated by the ejector.

CRYSTALLIZERS

Adiabetic Vacuum
Chem process batch vacuum crystallizers are used for cases requiring very low operating temperatures achieved only by very high vacuum, and for those applications involving relatively small amounts of material, or where the material being processed must be handled on less than a continuous basis, it is often both convenient and economical.

The material is cooled down through a very wide range and/or to a final temperature which requires very high vacuum, a large ejector or booster is utilized to compress the vapor to a pressure high enough for condensation with available cooling water. In such cases, the batch vacuum crystallizer steam economy is achieved by multiple stage continuous equipment of five or more stages.

Euporative Forced
Forced Circulation Crystallizers are of the Mixed Suspension Mixed Product Removal types and operate either on controlled or natural vacuum cooling and for processes having a moderate evaporation rate. Almost any material of construction can be considered for the fabrication of these crystallizers.

Draft Tube Baffle Type
The Draft Tube Baffle type of crystallizer is an elaborated mixed suspension mixed product removal design, which is suited for vacuum cooling and for processes having a moderate evaporation rate. Since almost heat make-up is required, the arrangement is compact and hence initial investment is minimized. These units operate with low supersaturation, which at times is a limitation to crystal growth. Very large crystals can be produced only by providing extensive and costly dissolving of fines. When destruction of fines is not needed or wanted, baffles are not provided and the internal circulation rate is set to have the minimum nucleating possibilities of tube bundle removal, low risk of liquid priming, low height requirements and ease of retrofitting.
influence on the suspension. When large evaporation rates are required, external heating has to be provided.

Oslo Type Crystallizer
Oslo-type crystallizers are the oldest design developed for the production of large, coarse crystals. The design basis are desupersaturation of the mother liquor by contact with the largest crystals present in the crystallization chamber and keeping most of the crystals in suspension without contact by a stirring device, thus enabling the production of large crystals of narrow size distribution.

Spray Evaporator Crystallizer
Chem Process Spray Evaporator Crystallizer is a direct contact heat and mass transfer system which works similar to the principle of the induced draft cooling tower. The warm process slurry is sprayed against an ambient air stream, which is humidified through the removal of water from the spray and the sprayed liquid is cooled and concentrated. For increasing the evaporation rate, an external heat exchanger is utilized by adding energy to the recalculating slurry.

Chem Process Research, Development & Test Centre
Chem Process offers complete testing and pilot plant facilities to check the behavior of the product during evaporation and crystallization process. This is particularly important when considering applications for which the product characteristics are unknown, or not well defined. Pilot units are available on a rental basis for short term, client-based testing.

Criteria for Selection
- Evaporation capacity, operational data, including quantities, concentrations, temperatures, annual operating hours, change of product, controls, automation, etc.
- Product characteristics, including heat sensitivity, viscosity and flow properties, foaming tendency, fouling and precipitation, boiling behavior, etc.
- Required operating media, such as steam, cooling water, electric power, cleaning agents, spare parts, etc.
- Capital, financial and operational costs
- Choice of materials of construction and surface finishes
- Site conditions, such as available space, climate (for outdoor sites), connections for energy and product, service platforms, etc.
- Legal regulations covering safety, accident prevention, sound emissions, environmental requirements, and others, depending upon the specific project.

Evaporator Applications
- Food
- Natural Juices & Beverages
- Dairy
- Sugar
- Starch
- Natural Extracts & Products
- Organic & Inorganic Wastewaters
- Chemicals
- Pharmaceuticals
- Soaps
- Specialty Chemicals
- Desalination
- Power
- Water Treatment
- Agrochemicals & Pesticides
- Textiles, Dyes & Dye Intermediates
- Petrochemicals & Refineries

Crystallizer Applications
- Aluminum Chloride
- Ammonia
- Ammonium Chloride
- Ammonium Nitrate
- Ammonium Sulphate
- Calcium Chloride
- Calcium Sulphate
- Ferrous Sulphate
- Manganese Sulphate
- Mercierizing Caustic
- Monomethylethyl Glycol
- Phosphoric Acid
- Potassium Chloride
- Potassium Sulphate
- Sodium Acetate
- Sodium Carbonate
- Sodium Chloride
- Sodium Hydroxide
- Sodium Nitrate
- Sodium Phosphate
- Sodium Silicate
- Sodium Sulphate
- Sodium Thiosulphate
- Sulphur Dioxide
- Sulphuric Acid

Chem Process Evaporation & Crystallization System Features
- Design compliance to ASME, TEMA and Local Codes
- Once through product flow scheme i.e. no recirculation for heat sensitive products
- Multi-pass provided to permit once through operation, yielding higher efficiency and requiring less heat transfer surface
- Low product retention time
- Simplified maintenance
- Facilities for CIP
- Feed preheating
- Product heat treatment systems
- Feed balance tanks and automation
- Product recovery from initial start up and shutdown
- Product flash cooling
- Crystal growth and centrifuging
- Product flash cooling
- Crystal growth and centrifuging