



Concept
PROCESS EQUIPMENTS



www.conceptprocess.com

COMPANY PROFILE

Concept process equipment is ISO certified company established in year 2014 with strong motivation and objective to manufacture value for money process equipment, which could offer as low as payback period of less than 6 months to our customer majorly in distillation and drying areas, based on a thin film technology. We deal in pharmaceutical, food and chemical industry.

We can proudly say that, we have 25 years plus of similar field experience, with which we can not only manufacture equipment's but also help to our prestigious customer in conceptual process studies, basic and detail process designing of systems, installation as well as commissioning. We believe in provide best services to our customers satisfaction.

To build the confidence before taking commercial decision of huge investment, mobile lab/pilot plant set-ups available on rent basis.

We are committed to deliver continual improvements, growth, quality, safety and service.



QUALITY

We are committed to meeting our customers' needs and requirements.

We are dedicated to continually improving the effectiveness of our QMS.

INTEGRITY

A culture of integrity is a prerequisite for best-in class business. It's not about rule, but about developing and working with integrity.

SAFETY

We operate with pride and protection of one another. Our main train thought at factory is 'Safety'.

Having zero incidents record is extremely important for us.

Agitated Thin Film Evaporator

The Agitated Thin film evaporator (ATFE) consists of two major assemblies – jacketed shell and a rotor assembly which rotates at high speed inside the shell.

The feed enters evaporator at top, tangential to shell and gets distributed along the shell by the distributor. The rotor blades spread the feed evenly on the heated surface into a thin film and further agitate the film.

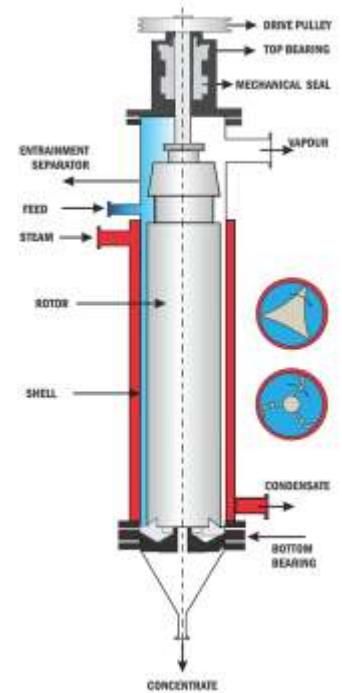
Heating medium passing through the jacket evaporates the volatile component in feed. The vapor generated flow counter currently to feed and gets cleared in entrainment separator before leaving through vapor nozzle. The concentrate product comes out at bottom.

Features

- Residence time of few seconds, hence very useful for heat sensitive product.
- Single pass evaporation without re-circulation and or degradation.
- Scaling on heat transfer surface is avoided due to intense agitation of film.
- Good turn down capability.
- Low product hold up.
- Operating pressure upto 1 mbar(a)
- Different rotors can be used to suit application.

Applications

- Product concentration of heat sensitive products in bulk drugs, fine chemicals, agrochemicals and specialty chemicals.
- Re-refining of lubricating oil & transformer oil.
- Vacuum distillation of fatty acids, amines and esters.
- Concentration of oleo-resins & plant extracts. Stripping of monomers and silicon oils.
- Recovery of solvent and product from residue.



Falling Film Evaporator

A Falling Film Evaporator (FFE) is a combination of vertical shell and tube heat exchanger and vapor- liquid separator mounted at bottom.

The feed is given at top of shell & tube type heat exchanger having distributor. The liquid falling on distributor get distributed in such a way that it flow down as a thin film on inside surface of the tube. Heat is given on shell side by heating medium. As the feed receives the heat, vapor generated moves at centre of tube co-currently with liquid. The drag of vapor increases the turbulence and improves heat transfer performance. The mixture of liquid and vapor gets separated in vapor-liquid separator at bottom.

Features

- Circulation pump is needed in most cases to maintain proper wetting rate at bottom of tube.
- Small hold up gives quick response to change in operating conditions.
- Gentle evaporation with short residence time.
- Suitable for heat sensitive productions.
- Multiple effect arrangement can be provided to reduce steam consumption.

Applications

- Concentration of dilute solutions of heat sensitive products in water or organic solvent.
- Re-boiler to distillation Column.
- Recovery of solvent from heat sensitive product stream or waste stream.
- Used as a preconcentrator before final thin film evaporator to get complete solvent stripping.
- Dehydration of lubricating oil.
- Low Concentration RO reject Concentration



Rising Film Evaporator

A Rising Film Evaporator (RFE) is combination of vertical shell & tube heat exchanger and vapor- liquid separator mounted on top.

The feed is given at bottom of shell & tube type heat exchanger and rises in tubes. Heat is given on the shell side by heating medium. As feed receives heat, vapor generated pushes the liquid on the wall as a film and lifts the liquid upwards. The mixture of liquid & vapor are separated at top in vapor- liquid separator.

Good thermal performance is achieved because of high velocity generated by vapor lift.

This upward movement against the gravity has the direct effect of creating a high degree turbulence in the liquid. This is one of its biggest advantage for viscous products which have a tendency to foul against the heating surfaces.

Features

- Circulation pump is not needed because of the siphon action in tubes due to boiling.
- Multiple effect arrangement can be provided to reduce steam consumption.
- Can handle small quantities of suspended particles.
- Effective for concentration of liquids which are moderately heat sensitive.

Applications

- Concentration of dilute solutions of plant extract in water or organic solvent.
- Re-boiler to distillation Column
- Used as a pre -concentration before final drying up to saturation point



Short Path Distillation Unit

Operating principle of short path distillation unit (SPDU) is similar to thin film evaporator except internal condenser. Here internal condenser is installed inside rotor cage assembly.

The feed enters the unit at top and get distributed into a thin film on the inside surface of shell. Heating medium passing through the jacket evaporates volatile component in feed. The vapor generated flow across the rotor and condense on internal condenser. This short path of vapor eliminate pressure drop. Hence evaporation can be done at high vacuum as 0.001 mbar(a). The distilled product and balance bottoms are taken out through separate outlets.

Features

- Operation pressure as low as 0.001 mbar(a). Hence production can be distilled at lower temperatures to avoid degradation.
- With high vacuum and high heating temperature, very high boiling components can be distilled easily.
- Residence time a few seconds.
- Single mass evaporation.
- Good turn down capability.
- Low product hold up.
- Use of metal blades at high temperature gives more flexibility than conventional roller design.

Applications

- High vacuum distillation of bulk drugs, natural or synthetic vitamins, esters, epoxy resins, fatty acids, glycerides, tocopherols.
- Re-refining of lubrication oil.
- Purification of natural and synthetic waxes.



Liquid – Liquid Extractor

Liquid – Liquid Extractor (LLE) is having shell with eccentric agitator giving a series of mixers and settlers. It is a mass transfer equipment where desirable component from liquid feed is get extracted in immiscible solvent which has greater affinity towards desirable component in feed.

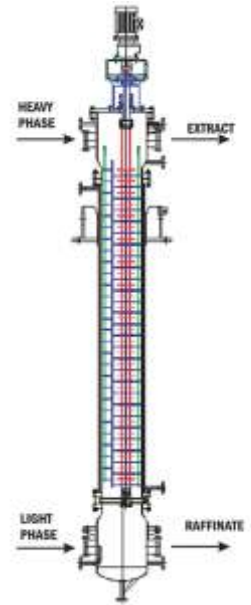
After extraction we get, solvent with desirable component as extract and feed with very little of desired component as raffinate. Continuous and dispersed phase is decided based on properties of two phases.

Features

- Continuous operation as compared to batch operation in kettle.
- Reduction in solvent consumption, power and space as compared to batch operation.
- Consistent results.
- High Extraction Efficiency.

Applications

- Extraction of desired product or impurities from reaction mass.
- Removal of acidity by washing.
- Separation of close boiling components.
- Waste water treatment for reduction in COD & BOD.



Wiped Film Evaporator

The Wiped Film Evaporator (WFE) is used for concentration, distilling, stripping, dehydration and deodorisation of products which are heat sensitive or viscous. The equipment can handle a very wide range of feed compositions ranging from 1% to over 95% concentration. WFE has several advantages as stated in the table below. The operation is continuous with a single pass; the self cleaning continuous contact wipers produce and renew the thin film. Such an operation improves product yield, avoids residue and colour formation. It has an internal condenser (optional) that minimizes the pressure drop and maintains vacuum.

The operation process in the WFE is simple but yet effective. Feed is introduced at the top of the unit and spread on the shell inner surface by the rotating distribution plate. Specially designed wipers wipe the feed thus creating and renewing the film. This thin film enables an efficient heat transfer even for highly viscous fluids. The low boiling component evaporates and passes through an entrainment separator. This minimizes the carry over of liquid droplets along with the vapors.

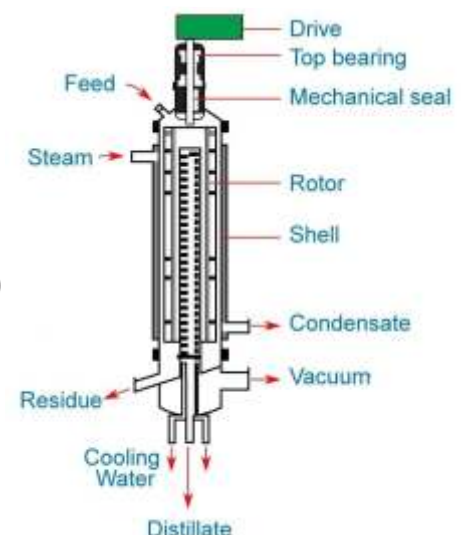
The vapors are removed through the vapor line to an external condenser (optional) and condensed. For specific applications which demand low pressure drop, the central section of the evaporator is provided with a condenser, thus making the unit a short path/molecular distillation unit. In this case, the vapors are allowed to condense on the outside of the tube bundle and flow out of the vaporator via the condensate outlet provided at the centre.

Features

- Low rotational speed
- Higher power to take care of feed fluctuations
- Large internal condenser
- Chevron rotor with interchangeable panels for ease of cleaning
- No bottom bearing
- Conical bottom with auger
- Swing / Hinge wiper blades

Applications

- Evaporation at low operating temperature
- High heat transfer coefficients
- Suitable for viscous liquids
- Low maintenance
- No degradation or loss of active ingredients
- Self cleaning\wiping of the heat transfer surface
- Short residence time (few seconds)
- Low pressure drop on vapor side
- Continuous operation



Agitated Thin Film Dryer – Vertical

The Agitated Thin Film Dryer - Vertical (ATFD-V) has two major assemblies – jacketed shell and rotor assembly having closely fitting hinged blades which rotates inside the shell.

The feed enters the dryer tangentially and gets distributed equally along inside surface of shell in the form of thin film. The hinged rotor blades keep the film under intense agitation preventing any scale formation. Heating medium passing through the jacket evaporates volatile component in feed. The vapor generated flow counter currently to feed and leaves through vapor nozzle at top of dryer. The dry powder solids at bottom of dryer are collected in receiver.

Features

- Residence time of few seconds eliminates degradation of heat sensitive product.
- Drying in absence of air with indirect heating, hence effective for light and oxygen sensitive products.
- Complete solvent recovery is possible since no air is used for drying as in case of all direct (air) contact dryer.
- Operating pressure can be as low as 1 mbar Thermal efficiency of more than 85%, hence low operating lost compared to other dryer.
- Fine powder of uniform consistency eliminate use of pulverizer for grinding in downstream step. Amorphous powder can be obtained.
- Different rotor designs available for process & effluent drying.

Applications

- Drying of bulk drugs, intermediates, dyes, pigments, organic & inorganic salts.
- Drying of effluent stream to get zero discharge.
- Recovery of solvents like DMF, DMSO & Glycerin from salt.



Agitated Thin Film Dryer – Horizontal

Agitated thin film dryers-horizontal are continuously operating contact dryers and are used for a broad range of applications under vacuum, atmospheric pressure and overpressure. They consist of a horizontally arranged heated shell with end covers and a rotor with bolted-on blades. The wet product fed through the inlet nozzle is picked up by the rotor blades, applied on the hot wall and simultaneously conveyed towards the outlet nozzle at the opposite end of the body.

The generated vapours are streaming counter-currently to the product flow and are leaving the dryer close to the feed nozzle. Evaporating and conveying capacity are adapted by the right rotor blade arrangement.

Entrained particles from the dry zone are removed in the wet zone. Moisture levels of less than 1 % can be achieved. The residence time of the product is typically between 5 and 15 minutes.

Horizontal thin film dryers are suitable also for applications other than drying like solid particle cooling and product melting.

The outstanding heat transfer rate for hot solid products enables cooling of large amounts of solids in a compact machine compared to usually used cooling screws and without cooling air.

In product melting like the melting of urea, the particles are heated up and molten inside the dryer. The melt can be mixed with other liquid and solid additives to improve the properties of the final products.

Features

Broad range of feed properties: liquids, pastes, solids

High throughput rates per unit based on thin-film principle

Drying of products being sticky during transition from paste to solids

Small product hold-up in dryer

Fast start-up and shut-down

No residual product inside at standstill

Applications

- Sewage sludge
- Refinery sludge
- Carbon, carbon black
- Polyvinyl oxid
- Pectin
- Industrial sludge
- Catalysts
- Limestone
- Terephthalic acid
- Intermediate products
- Sweets



Rotary Vacuum Paddle Dryers

Rotary vacuum dryer offers clean, simple and effective method of drying wet cake, powder and even slurry.

Advantages

- Minimum Labour and Energy Cost.
- Minimum Product Loss.
- Can dry, heat sensitive material at low temperatures under vacuum.
- Complete Solvent Recovery Possible.
- Uniform heating of material because of heating of jacket, shaft and paddles.



Nauta Mixer

Nauta Mixer consists of a conical container which houses a continuous flight screw. The screw rotates about its own axis and revolves along the walls of the cone. The material of widely differing densities and particle shapes and sizes are mixed homogeneously without any degradation. Fragile filaments and flakes are safe from degradation and mixing is accomplished with minimal heat build-up and aeration in the product. The floor space required for this type of mixer is very less. The mixer can be started on full load. Due to the conical shape the unloading of the material is helped by gravity and is complete without any hold-up. Addition of liquids is easily possible by providing atomizing nozzles at the top of the mixer. There are no bearings or seals in direct contact with the product.

Features

- Exceptional Mixing Accuracy
- Cone screw mixer (Nauta Mixer) require approximately 50% power over conventional blender.
- Materials are mixed successfully to an accuracy of 1 part in 1,00,000(0.001 %) or better. With no degradation or separation, it thoroughly blends materials of widely differing densities and particle shapes and sizes.
- It achieves a thoroughly homogeneous mix in 30 to 40 % the time of most conventional mixers in the same category such depending on mixing element speeds.
- Fragile filaments and flakes are safe from degradation and mixing is accomplished with minimal heat built-up and aeration in the product.
- Since mixer occupies less floor space, user can free up space for other plant operations.
- Its screw agitator begins axially rotating and loosens batch material before its orbiting motion starts. This design feature prevents stalling and permits starting under full load in the event of a power failure. Soft starters are available to reduce excessive torque at start-up.
- Its unique cone design provides for gravity unloading, gives cleaner and faster batch discharge.
- Liquids are injected and atomized into the top of the mixer through the hollow shaft of the drive system.
- Partial or full load batches are mixing equally well with no reduction in mixing efficiency.

Application :

- Solvent recovery system
- Typical applications include dyes, herbal, pharmaceutical, plastic, food, ceramic, agricultural products, shampoos, tooth paste, chocolates, gelatins etc.



Distillation Column

Distillation column is used to separate two closed boiling components from each other by heat and mass transfer.

Distillation columns are one of the most often used types of separation equipment in industry.

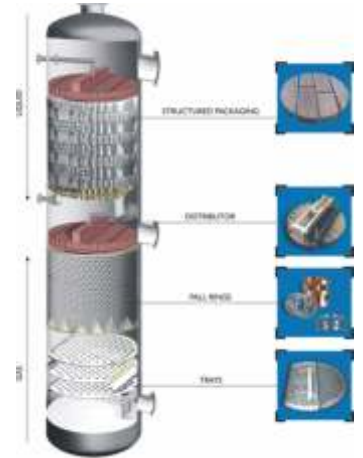
Column will be provided with suitable random or structured packing, liquid distributor & other internals. Complete set up will have condenser at top with or without reflux and falling film or thermosiphon re-boiler at bottom.

FEATURES

- Can be supplied with process guarantee or as a fabricated item as per customer drawing.
- can be supplied as a complete system with instrumentation.

APPLICATION

- Chemical Industry
- Power plants
- Petrochemical plants
- Natural Gas Processing



Zero liquid discharge / Multiple Effect Evaporator

The Multiple Effect Evaporator (MEE) / Zero Liquid Discharge (ZLD) is an apparatus for efficiently using the heat from steam to evaporate water. In a multiple-effect evaporator, water is boiled in a sequence of vessels, each held at a lower pressure than the last. Because the boiling temperature of water decreases as pressure decreases, the vapor boiled off in one vessel can be used to heat the next, and only the first vessel (at the highest pressure) requires an external source of heat. While in theory, evaporators may be built with an arbitrarily large number of stages, evaporators with more than four stages are rarely practical except in systems where the liquor is the desired product such as in chemical recovery systems where up to seven effects are used.

Originally designed for concentrating sugar in sugar cane juice, it has since become widely used in all industrial applications where large volumes of water must be evaporated in chemical industries & effluent treatment plants.

Features

Use of MEE and ATFD reduces operating and disposal cost.

Use of forced circulation evaporator minimize scaling in evaporator.

Indirectly heated dryer gives no dusting, smell or air pollution as in case of direct contact dryer like spray or flash dryer.

Complete skid mounted system can be offered.

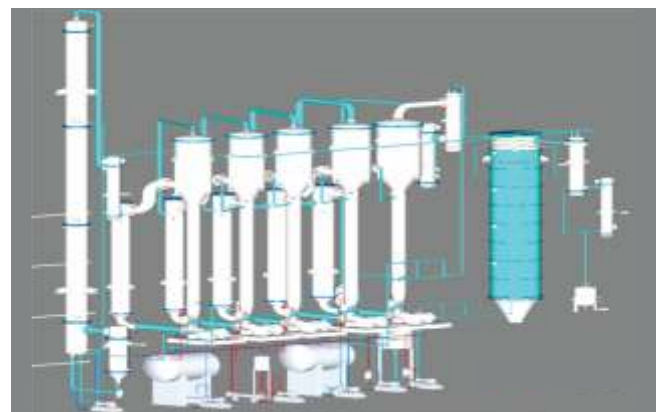
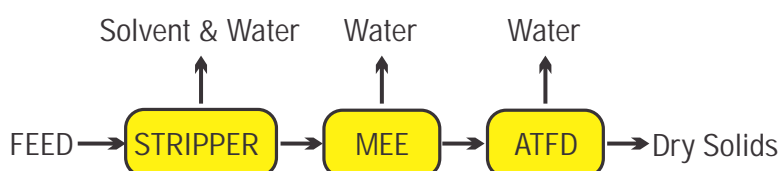
Fully automatic operation is achieved by PLC based SCADA system.

1st Stage (Stripper) : Stripper isolates volatile organics from feed to reduce COD.

2nd stage (MEE) : MEE concentrate feed up to flowable slurry level by water evaporation under vacuum.

3rd stage (ATFD) : ATFD does final drying of MEE concentrate to get dry solids which can be land filled.

Multiple effect evaporator will be falling film or forced circulation evaporators in series with or without thermo compressor to get steam economy. No. of effects will be optimized based on total evaporation load and cost of steam & power at site.



Agitator with Tank & Reactor

Our firm has presented these Pressure Vessel in leak proof frame. Offered with rigid support, these vessels are offered with durable and hard framed tap. Weather proof in nature, these vessels are easy to install at commercial place for storing pressure for commercial purposes. In addition to this, these pressure vessels are rust resistant in frame.



Agitator Basics

What are agitators? Agitators are devices that are used to stir or mix fluids, especially liquids, which is one of the basic mechanical process engineering operations. Essentially, agitators are used for the homogenization of liquids or liquid-solid mixtures by generating horizontal and vertical flows. These flows are generated by rotating agitator blades.

Agitator Types

Agitators come in many sizes and shapes. There are two types of agitators – mechanical and electronically controlled. In the first article, we will cover mechanical process agitators.

The basic types of mechanical agitators are : Paddle Agitators

This is one of the most primary types of agitators with blades that reach up to the tank walls. Paddle agitators are used where an uniform laminar flow of liquids is desired.

Anchor Agitators

This simple agitator consists of a shaft and an anchor type propeller and can be mounted centrally. It is mainly used in reactors.

Propeller Agitators

A propeller agitator is shaped with blades tapering towards the shaft to minimize centrifugal force and produce maximum axial flow. Propeller agitators are popular for simple mixing jobs.

Turbine Agitators

Yet another type of process agitator is the turbine agitator. Turbine agitators can create a turbulent movement of the fluids due to the combination of centrifugal and rotational motion.

Choosing an agitator depends upon the specific gravity and viscosity of the products to be mixed. Agitators need to be designed, engineered and manufactured to suit individual applications. Core knowledge of fluid mechanics is essential for choosing the right type of agitators.

Shell & Tube Heat Exchangers

Amongst of all type of exchangers, shell and tube exchangers are most commonly used heat exchange equipment. it is heavy duty equipment which is widely used in process industries it can handle higher temperature up to 900-degree C & even more.

STHEs can handle higher temperatures and pressures and hence higher heat duty. This is because besides providing a higher overall heat transfer coefficient, additions can also be made to negate thermal expansion effects and the thickness can also be varied

From the design point of view, STHEs are the most versatile of all heat exchangers. Being tubular in shape, heads / closures of required shape and thickness can be used. The number of tubes and tube pitch can be selected according to operating conditions. Expansion bellows can be used to negate thermal expansion effects, baffles if different cuts and spacings can be used to influence the overall heat transfer coefficients and there's even something called a floating head which can be added to negate thermal expansion of the tubes. The number of passes on shell side and tube side can be altered as well.

- Capacity to manufacture single HE up to 200 Sq. mt. area.
- Design code – ASME Section VIII, Div- I
- TEMA C, B & R Both fixed and removable tube bundle and U-tube design available

Application : Used as a regular heat exchanger for distillation columns, Condensers, chemical equipment's stream cooling and heating purpose. Used internally in reboilers and evaporators.



Lab & Pilot Model

We are manufacturing Lab SPDU set up consist of SPDU, cold trap, feeding arrangement & glass receivers for distillate & concentrate.

To build the confidence before taking commercial decision of huge investment, mobile lab/pilot plant set-ups available on rent basis.

Features of Lab SPDU Set up

- Suitable for feed rate of 1-2 lit/hr
- Heating by thermic fluid or steam up to 300 °C
- Achievable pressure down to 0.001 mbar
- Very low residence time
- Required distillation achieved in single pass
- Suitable heat sensitive product



Pilot plant SPDU

We are manufacturing pilot plant SPDU- With intention to generate scalable data and results during the pilot tests (with small sample quantities) to enable a later scale up to industrial systems for applications.

Pilot unit is skid mounted unit, consist of feeding arrangement, pre-heater, degasser, cold trap & receivers for distillate & concentrate.

To build the confidence before taking commercial decision of huge investment, mobile lab/pilot plant set-ups available on rent basis.

Features of Pilot plant SPDU

- Along with degasser
- Suitable for feed rate of 10-20 lit/hr
- Heating by thermic fluid & steam up to 400 °C
- Achievable pressure down to 0.001 mbar
- Very low residence time
- Required distillation achieved in single pass
- Suitable heat sensitive product
- Completely jacketed (trace-heated) systems



Lab ATFD / Pilot plant ATFD

We are manufacturing Lab ATFD / Pilot plant ATFD- Feed in form of slurry (range from 30 to 50 % w/w) or solution is converted into thin film which is agitated by rotor on top of dryer. Depending upon the nature of feed we get dry powder at bottom of dryer. Lab & Pilot unit is skid mounted unit consist of feeding arrangement, external condenser & receivers for distillate & concentrate.

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Features of Lab ATFD / Pilot plant ATFD

- Lab ATFD Suitable for feed rate of 1-2 lit/hr & Pilot plant ATFD Suitable for feed rate of 10-20 lit/hr
- Heating by hot water or steam up to 200°C
- Achievable pressure down to 1 mbar
- Very low residence time
- Required recovery of solvent can be achieved with external condenser
- Well suitable heat sensitive product



Pilot plant ATFE

We are manufacturing Pilot plant ATFE- Feed entered passes through the distributor plate on internally heated wall. Thin film gets agitated by high speed rotor. Vapor generated in this process flows counter-currently & passes through entrainment separator. Pilot unit is skid mounted unit consist of feeding arrangement, pre-heater, flash separator, external condenser & receivers for concentrate & residue.

To build the confidence before taking commercial decision of huge investment, mobile lab/pilot plant set-ups available on rent basis.

Features of Pilot plant ATFE

- Suitable for feed rate of 8-15 lit/hr
- Heating by hot water or steam or thermic fluid up to 400°C
- Achievable pressure down to 1 mbar
- Low residence time eliminate thermal degradation
- No scale formation of heat transfer surfaces
- Suitable for highly viscous solutions
- Well suitable heat sensitive product



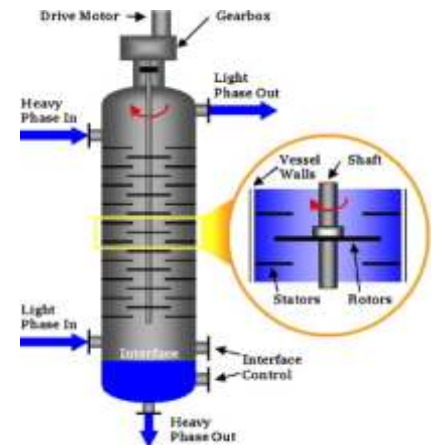
Liquid-Liquid Extractor Pilot plant (LLE)

We are manufacturing Liquid-Liquid Extractor Pilot plant (LLE)– It is rotating disc type extraction column. Counter current extraction process take place in LLE. At outlet we get extract enriched with desired product & raffinate with small amount of product. Pilot unit is skid mounted unit consist of feeding arrangement for light phase, heavy phase & settlers.

To build the confidence before taking commercial decision of huge investment, mobile lab/pilot plant set-ups available on rent basis.

Features of Liquid-Liquid Extractor Pilot plant (LLE)

- Suitable for feed rate of 10-20 lit/hr of light phase or heavy phase
- Suitable for continuous extraction
- Improvement in yield



Rising film & falling film evaporator Pilot plant

We are manufacturing Rising film & falling film evaporator Set up skid mounted unit of pilot plant consist of separator, condenser & receivers for distillate & concentrate.

Features of our Rising film & falling film

- Suitable for feed rate of 10-20 lit/hr
- Heating by hot water or thermic fluid or steam up to 300 °C
- Can operate under reasonable vacuum
- Low residence time
- Suitable for heat sensitive products



1) Evaporation Technology

- Agitated Thin Film Evaporator
- Short Path Distillation Unit
- Wiped Film Evaporator
- Falling Film Evaporator
- Rising Film Evaporator

2) Drying Technology

- Agitated Thin Film Dryer-Vertical
- Agitated Thin Film Dryer-Horizontal
- Rotary Vacuum Paddle Dryers

3) Extractor

- Liquid – Liquid Extractor

4) Zero Liquid Discharge / Multiple Effect Evaporator

5) Agitator With Tank & Reactor

6) Heat Exchanger

- Shell & Tube Heat Exchangers
- Corrugated Tube Heat Exchangers

7) Nauta Mixer

8) Lab & Pilot Model

- Lab SPDU / Pilot plant SPDU Set up
- Lab ATFD / Pilot plant ATFD
- Pilot plant ATFE
- Liquid-Liquid Extractor Pilot plant (LLE)
- Rising film & falling film evaporator Pilot plant



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