BVR Engineered Systems

Corrosion-resistant plant , equipments & piping with "Borosilicate 3.3 glass" for the chemical & pharmaceutical Industries.

High operational reliability with very low Set-up & maintenance cost is the hallmark of BVR products.

Our flexible modular system allows individual solutions of problems in the construction of corrosion-resistant equipment, even at temperatures upto 200°C.

Salient features of our products & services :

1) The corrosion-resistant modular units with the **V-SAFE** flange system.
All parts of the BVR plant construction are exchangeable and provided with a reliable coupling flange system which ensures a very high level of safety against breakages while tightening and also ensures excellent leak-tightedness.

2) We specialize in design, fabrication, engineering, installation & commissioning of Engineered Systems & Teaching units meant for the chemical, pharmaceutical industry. All the equipments are designed, fabricated, selected, tested & installed as per prevalent international standards and available with **CE** marking.

3) Comprehensive engineering for individual solutions.

4) Orientation to customer-specific requirements

5) Integration of self-fabricated & sourced materials

Complete plant on turnkey basis including Design, Engineering, Fabrication & Installation

- Distillation
- Rectification
- Evaporation
- Extraction
- Reaction
- Absorption
- Crystallization

ISO 9001 : 2000 Certified

BVR Engineered Systems

(A Business Value Resources Group Enterprise)

Profile

BVR is an ISO 9001:2000 certified vibrant organization managed by seasoned and qualified professional engineers. We specialize in design, fabrication, engineering, installation & commissioning of Process plants & equipments meant for the chemical & pharmaceutical industry. All the equipments are designed, fabricated, selected, tested & installed as per prevalent international standards like **ASME Section VIII Division 1, ISO & relevant European Norms like ISO 3585, 3586, ENBS 1595 , AD2000 Merkblatt etc. and Sound Engineering Practices (SEP).** We provide total lifecycle management of the units from designing, engineering, installation, commissioning & spare part supplies. Our units can be supplied with the most advanced real-time automation systems like SCADA.

Moreover the corrosion resistant process assemblies & equipments made up of Borosilicate 3.3 Glass are available with CE Marking (we are the only enterprise with this capability in India in this product segment) ; designed & made in compliance with the relevant directives namely - The PED - 97/23/EC , The Machine Directive - 98/37/EC , The European Low Voltage Directive - 73/23/EEC , The EMC Directive - 89/336/EEC.

Our Mission **: To produce the best value of our customers' money with deliverables par excellence by developing innovative products, prompt services and continuous quality improvement by empathising customer needs. Our goal is to become a dependable business associate for them.**

Our Vision **: To be a company that people choose to do business with because we genuinely care about our customers and empathise their needs and are recognized as a dependable resource providing enterprise in the industrial market place - providing outstanding products, value and customer service.**

Our Shared Values :

Innovativation as a tool for development : We embrace the spirit of innovation that acts to realize opportunities to transform our vision into reality.

Empathy & ***Respect*** - Be aware of others' needs and understand the importance of good communication.

Integrity & Trust – We will be honest, transparent & reliable in our day-to-day interaction with customers. We honour our word and keep our commitments, we say what we mean and mean what we say.

Commitment to Service - We put our customers first. We respond to our internal customers and treat them with the same courtesy and respect as our external customers. We facilitate, enable, and problem-solve.

Excellence : We are committed to excellence in all that we do. There will be no place for mediocrity.

Quality : The hallmark of our internal and external outputs and processes will be quality.This will pervade every aspect of our functioning.

Community : We will be responsible and involved members of the communities in which we live and work. We will seek to promote their well being at all times.

Chief Executive Officer : Dr. S.Biswas (BE-Mech, DBA)

Professional Member : AIMA

Member : ASME

Affiliate Member (Professional) : Chartered Institute of Marketing, UK

Contact Details :

Works
D-68 Sardar Estate, Ajwa Road
Vadodara, Gujarat – 390019

Phone No. : +91 9824037528 +91 265 3243430

Corporate Office
A-4 Vishranti Park, Deluxe Charasta
Nizampura, Vadodara – 390002
Gujarat

Phone No. : +91 265 3954050 +91 9824037528

Fax No. : +91 265 2784268

E-Mail : consult@bizvalueresources.com sales@bizvalueresources.com
bizvalueresources@yahoo.com

Website : http://www.bizvalueresources.com/boro.htm

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BVR Engineered Systems

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Quality Policy

BVR is committed to being the preferred global supplier for development, manufacturing & engineering of Process glass equipments & plants. To achieve our strategic vision we must meet and exceed customer requirements and deliver the best value for their money in our deliverables. We will realize this goal by establishing and maintaining outstanding Quality and Quality Assurance Systems through trained manpower and operating as per the following guiding principle framework :

Customer Focused

- Strive to exceed customers' need and expectations.
- Make commitments we fully understand and believe we can meet.
- Meet all commitments to customers on schedule.

Performance Driven

- Verify that our products and services meet agreed requirements.
-
- Monitor, benchmark and continuously improve our products, services, enterprise & team performance and strive to make our deliverables "World-Class" consistently.

Learning Organisation

Inculcating a culture of continuous learning of best practices & systems and un-learning outdated concepts.

Building knowledge capital on a continuous basis.

DATE: 01-03-2005

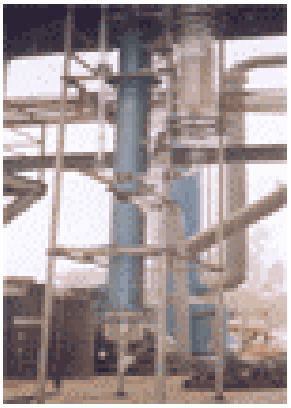
(Subhajit Biswas)
CEO

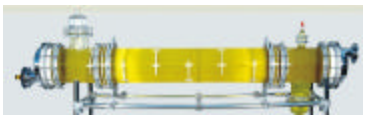
Product Glimpses

The corrosion resistant equipments & assemblies are made up of Borosilicate 3.3 Glass as per ISO 3585, designed , fabricated & engineered as per - ENBS 1595, AD2000 Merkblatt, ASME Section VIII Div.1, & TEMA. And are available with CE Marking ; designed & made in compliance with the relevant directives namely ; The **PED - 97/23/EC** , The **Machine Directive - 98/37/EC** ,The **European Low Voltage Directive - 73/23/EEC** , The **EMC Directive - 89/336/EEC**.

1. Standard Equipments & Components :

- **Spherical & Cylindrical Vessels upto 500 litres**
- **Pipeline Components upto 600DN & valves**
- **Drives & Agitators ; Structures , fittings & gaskets**
- **Columns & internals upto 600DN**





2. Engineered Units :

- Condensation Assemblies on GLR
- Modular units for Reaction, Distillation, Extraction etc.
- Heat Exchangers tubular as well as coil type
- Rotary film Evaporators (upto 100 litres)
- Falling film Evaporators
- Jacketed Reactors (Trolley Mounted)

3. Process Packages :

- Product Recovery and Purification (including solvent recovery)
- Absorption Systems for gases such as HCl, Cl_2, SO_2, HBr, HNO_3, Br_2, NOX
- Anhydrous HCL gas generation Unit
- NAC & SAC Plants
- H_2SO_4 & HNO_3 purification Units
- Bromine recovery from industrial waste / salt bittern

We have a multi-disciplinary engineering team with mechanical, electrical and chemical engineering expertise that enables us to develop your concept to it's greatest potential. We design systems so as to customize equipments providing the greatest value and fastest deliveries. We are aware of the latest innovations in hardware, instrumentation, controls & automation software and select components and materials from industry standard suppliers recognized for high quality performance & durability of their products.

Besides our team of skilled glass blowers can produce a wide range of glassware cost-effectively maintaining quality aspects consistently as per required specifications.

1) Engineered Units made up of Borosilicate 3.3 glass

Available with CE Marking as per PED - 97/23/EC , The Machine Directive - 98/37/EC, The European Low Voltage Directive - 73/23/EEC , The EMC Directive - 89/336/EEC.

Standard Assemblies

Standard Units/ Assemblies are multi-purpose modular units having operational flexibility. These units have been standardized by incorporating all basic & essential functional features such as heating, stirring, condensation, fractionation, cooling etc. for multipurpose use. Therefore, though termed "Standard Units" from constructional viewpoint they actually serve as "Flexi Units" from utility viewpoint

These units find use in educational institutions, R&D centers and industries. They can be conveniently and quickly modified according to specific process needs due to modular construction, Borosilicate glass offers additional benefits of universal corrosion resistance, visibility and cleanliness.

These equipments may be used in simple laboratory scale pilot plant to large commercial scale production for various applications like Distillation, Absorption, Reaction, Evaporation, Mixing, Extraction etc.

A few units, which are used in general are described below, we can undertake projects as per customer requirements right from idea generation, design, detail engineering and fabrication to commissioning.

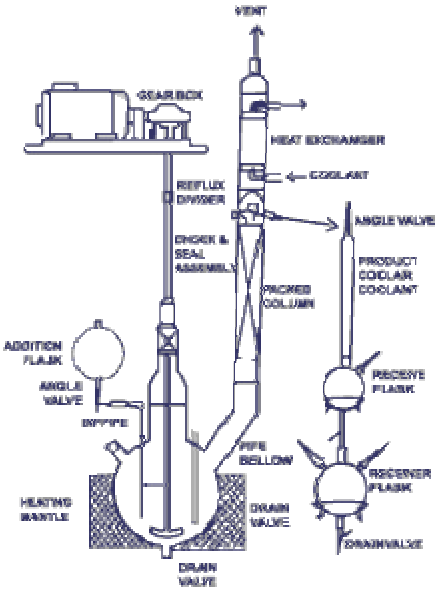
Reflux Reaction cum Distillation Units :

Utility :
This is an all-purpose batch unit, which is operated at atmospheric pressure or vacuum.

Process :
Heating bath heats and evaporates the contents of the vessel, the stirrer keeps on agitating and mixing them to avoid heat spots. Vapours enter the fractionating column and then the condenser through reflux divider, and get condensed. The condensate is then cooled by a product cooler and collected in a receiver.

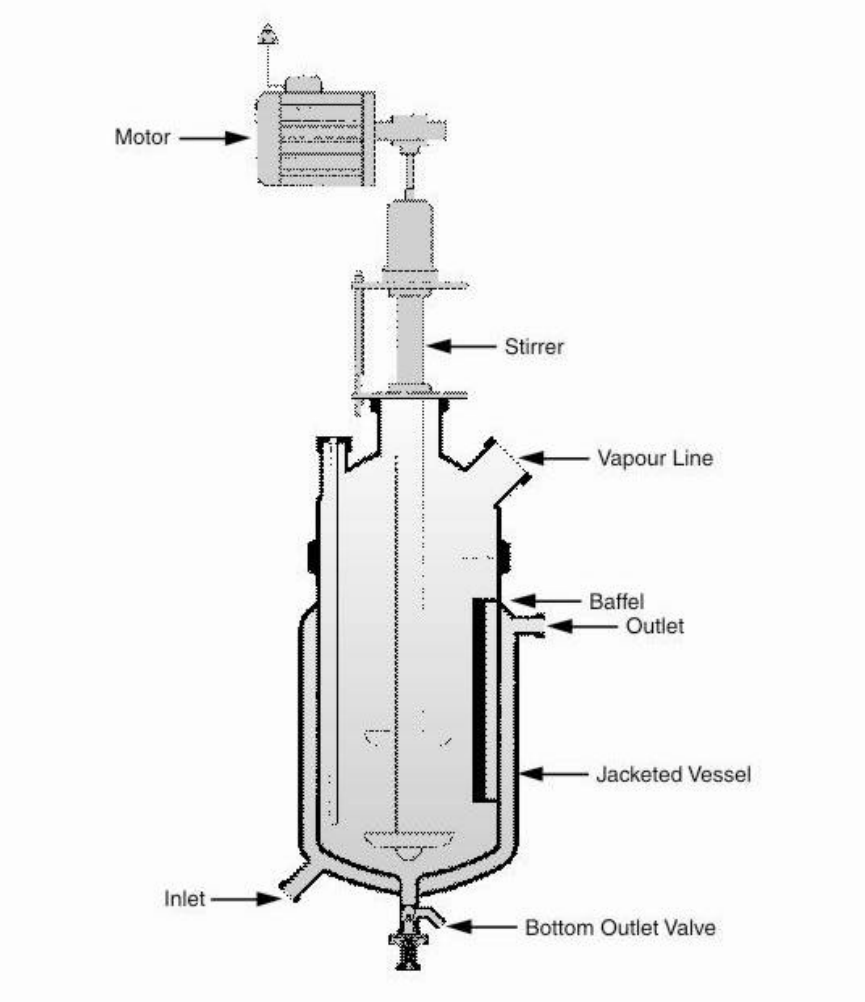
Main Components :
- A spherical vessel
- Heating bath / Mantle
- Packed C olumn
- Stirrer Drive Geared Motor
- Coil condenser
- Reflux divide r
- Product cooler
- Receiver with drain valve.

Capacity :
Available in vessel size of 20, 50, 100 and 200 Litres



JACKETTED REACTOR :

Jacketted reactors are similar to glass lined reactors with provision for heating by steam/ thermic fluid through the jacket. Transparency permits to visibility. Features like thermometer pocket, motor-driven stirrer, gas sparger etc. are incorporated as per requirement. A baffle battery consisting of 4 baffles can be mounted inside. Assemblies like Simple Distillation Unit, Reaction Distillation Unit, Fractional Distillation Unit etc. can be installed above these reactors if required.



Rotary Film Evaporators

Available with CE Marking as per PED - 97/23/EC, The Machine Directive - 98/37/EC, The European Low Voltage Directive - 73/23/EEC, The EMC Directive - 89/336/EEC.

Description

Selecting the correct operating parameters for Rotary Film Evaporators is an important part of your application. Many variables must be considered, i.e. choosing the appropriate bath temperature, vacuum pressure, rate of evaporation, and accessory chiller—so it's no surprise to find more vapors collecting in the lab environment than in the receiving flask! We at **BVR** will be glad to advise you in your selection for the right configuration of Rotary Film Evaporator along with the working parameters and accessories/utilities.

The Rotary Film Evaporator is essentially a thin film evaporating unit incorporating a rotating evaporation flask. The rotary evaporator will evaporate solvent at a much faster rate than systems using stationary evaporation flasks, due to higher convectional heat transfer coefficient.

The rotation transfers a thin film of the liquid to the whole of the inner surface of the flask, markedly increasing evaporation rate due to higher heat transfer between the flask, bath and the thin film. The rotating flask and vapour duct have a sealing system which allows operation under vacuum, further accelerating the evaporation process because of the reduction in boiling point of the solvent and efficient removal of the vapour. Besides the reduction in boiling point there is a considerable decrease in the residence time of the fluid, which also permits heat sensitive materials to be successfully concentrated without degradation.

The evaporators can be evacuated down to less than 1 mbar if the vacuum seals are maintained in good condition. A continuous feed facility considerably increases the capacity of the units and distillate withdrawal facilities on some units allow uninterrupted operation.

Features

Digital display & auto control of rotation speed, vapor temperature and bath temperature.
Convenient controls for adjustment of rotation speed and heating bath temperature
Digital display of process time
Miniature circuit breaker and separate power switches for control panel and heating bath offers safety
Vacuum Controller (Optional)
Bath temperature display accuracy +/- 2 °C
Digital display for vapor temperature +/- 1 °C (Optional)
RS-232 interface (Optional)

The units can be offered with full automation incorporating a PLC based system or even SCADA for real time data acquisition and control. This facilitates you to programme your experiments & piloting with the least possible human involvement thus increasing accuracy of results and efficiency of the product besides consistency of the final product quality when used for production processes.

Our Standard Models

There is a range of models covering an evaporation flask capacity from 1 litre l to 100 litres. The majority of these models may be used on the laboratory bench; the larger models (10, 20, 50 & 100 litres) are designed for use in pilot plants and production facilities.

Model	V-RFE1	V-RFE2	V-RFE5	V-RFE10	V-RFE20	V-RFE50	V-RFE100
Evaporating Flask Capacity	1L	2L	5L	10L	20L	50L	100L
Flask Rotation rpm)	0-80	0-80	0-80	0-80	0-80	0-80	0-80
Motor Power hp)	0.25	0.25	0.25	0.25	0.25	0.50	0.50
Condenser HTA m^2	0.10	0.10	0.20	0.20	0.30	0.50	1.0
Receiver Flask	1L	1L	2L	5L	10L	20L	20L
Heater	1 Kw	2 Kw	2 Kw	4 Kw	4 Kw	6 Kw	8 Kw
Power (Volt) Supply (Hz)	230 / 440V 50 / 60	230 / 440V 50 / 60	230 / 440V 50 / 60	230 / 440V 50 / 60	230 / 440V 50 / 60	230 / 440V 50 / 60	230 / 440V 50 / 60
Bath Movement	Manual or Motorized	Manual or Motorized	Manual or Motorized	Manual or Motorized	Manual or Motorized	Manual or Motorized	Manual or Motorized

Construction Bath,Body, Structure & Supports	SS & MS with PU coating	SS & MS with PU coating	SS & MS with PU coating	SS & MS with PU coating	SS & MS with PU coating	SS & MS with PU coating	SS & MS with PU coating

Choosing a Recirculating Chiller

BVR can advise and offer suitable Chillers to provide the necessary cooling capacity for any application. Chillers offer lower cooling temperatures and higher heat removal capacity than tap water cooling.

Choosing Vacuum Pressure

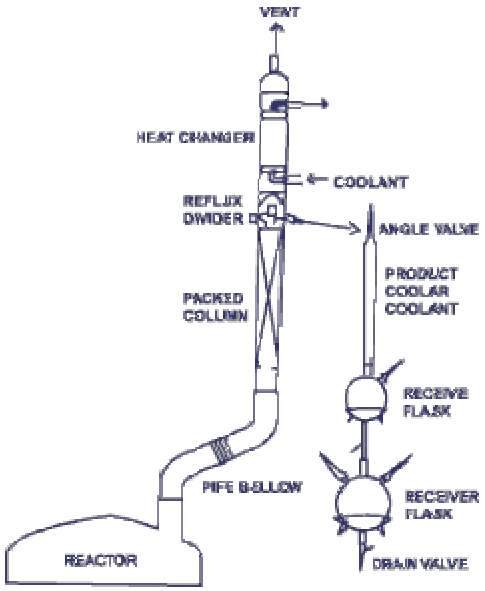
Vacuum Controllers play a critical role in regulating evaporation experiments: without one, experiments can only run at maximum vacuum pressure. Vacuum Controllers reduce the risks of sample loss and lab contamination, and they may be programmed to reduce bumping and foaming and perform automatic distillations. We at BVR can advise and offer suitable vacuum controllers and pump too suitable for the particular model & application.

Besides the aforesaid standard models we can offer special tailor made units as per your requirements, of different configurations and higher capacities too. We can suggest especially designed units too having higher evaporation efficiency and mechanical stability, which is really critical as the size of the rotating flask increases.

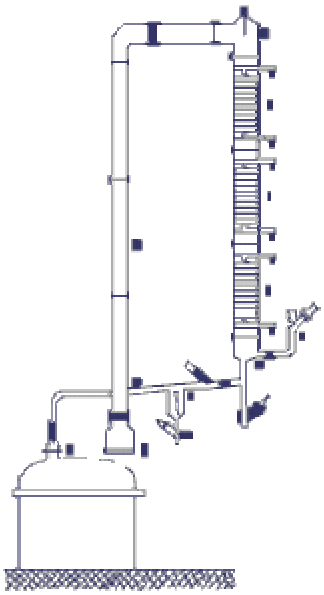
For further information please contact our technical team at consult@bizvalueresources.com

Distillation Assembly over Glass Lined Reactor :

Main Components are Packed Column, Reflux Divider, Condenser, Receivers , Product Cooler, Valves, etc



Condensation Assembly over Glass Lined Reactor(GLR) :

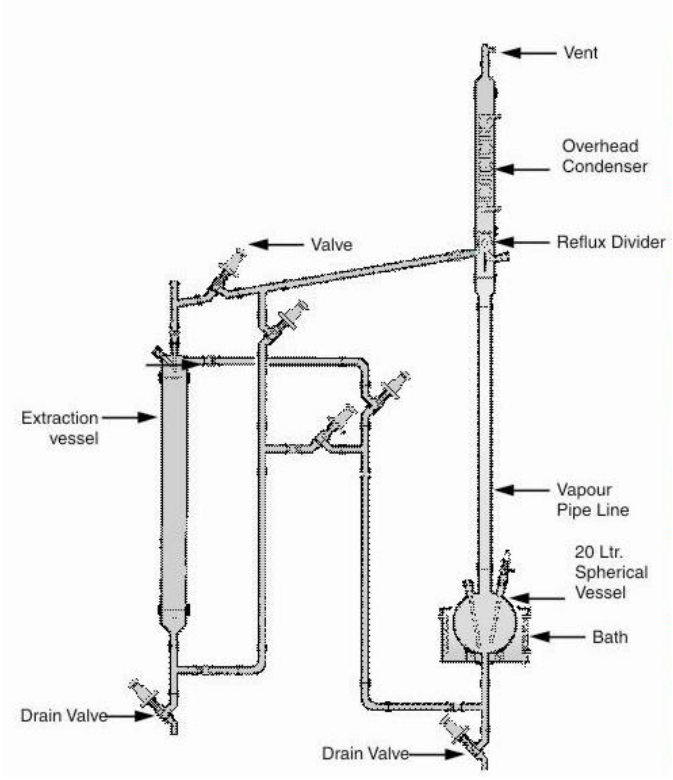


LIQUID-LIQUID EXTRACTION UNIT :

Liquid extraction, sometimes called solvent extraction, is the separation of constituents of a liquid solution by contact with another insoluble liquid. The unit described here is for a semi-batch operation.

The liquid to be extracted is poured into an extraction vessel. Solvent is boiled in a reboiler vessel and condensed in an overhead condenser, the condensed liquid collecting in a reflux divider and passing through pipework to the extraction vessel. The pipework incorporates valves in order that the solvent can enter the extraction vessel at either the base of the top, depending on the relative densities of the solvent and liquid to be extracted. The solvent and the extracted liquid pass back to the reboiler and the process is repeated until the extraction is complete. The extraction vessel is then drained and the solvent evaporated from the reboiler vessel and collected in the extraction vessel enabling the two liquids to be drained from their respective vessels.

The units are available in vessel sizes of 10, 20 & 50L and is suitable for operation under atmospheric pressure.



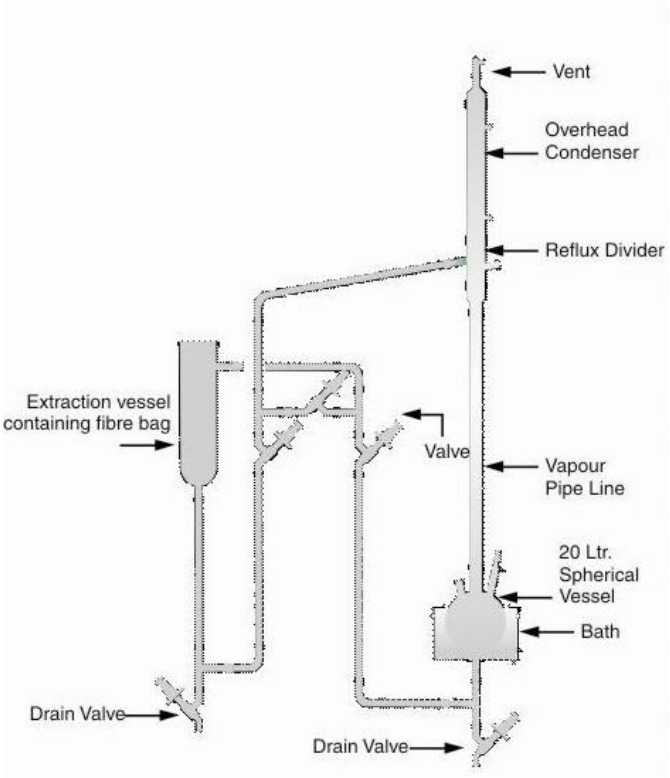
SOLID-LIQUID EXTRACTION UNIT :

This operation involves preferential solublising of one or more soluble constituents (solutes) of a solid mixture by a liquid solvent. The unit described here is for a semi-batch operation.

The solid to be extracted is put inside a glass fiber bag and placed in an extraction vessel. Solvent from the reboiler is continuously evaporated, condensed and circulated through a reflux divider by means of piping network and valves. When desired/ steady concentration of solute is achieved in the solution the operation is discontinued. The solution is drained off and collected for further use.

After charging fresh solid in fiber bag and solvent in reboiler, the cycle can be restarted again.

The units are available in vessel sizes of 10, 20 & 50L and is suitable for operation under atmospheric pressure.



Multi-Stage Mixer-Settler Assemblies

Brief Description

The Mixer-settler system can be fabricated and assembled in various modular designs. For Laboratory usage a compact design is usually used world wide as an international standard. The mixer as well as the settler is both integrated together instead of being separate entities. This allows the system to be compact and ideal for laboratory usage. A single stage of Mixer-Settler consists of a mixing zone and settler decanting zone connected to each other through a Weir zone. A brief description of the zones is as follows :

Mixing System

The Laboratory mixer consists of a special glass mixing zone, suitable high speed agitator and a variable speed drive. Besides providing an intimate dispersion the stirrer provides the necessary pumping action. This eliminates the need for external pumps and ensures a large interfacial area for mass transfer. The energy required to produce this dispersion will depend very much on the characteristics of the material and the system used (interfacial tension, viscosity, flows etc).

Between the mixing and separation zones, a weir is incorporated to prevent back mixing taking place and maintains the level of liqid in the mixing zone. Besides it also acts as a baffle to dampen the flow of liquid into the decantor(settler)for enhancing efficient phase separation.

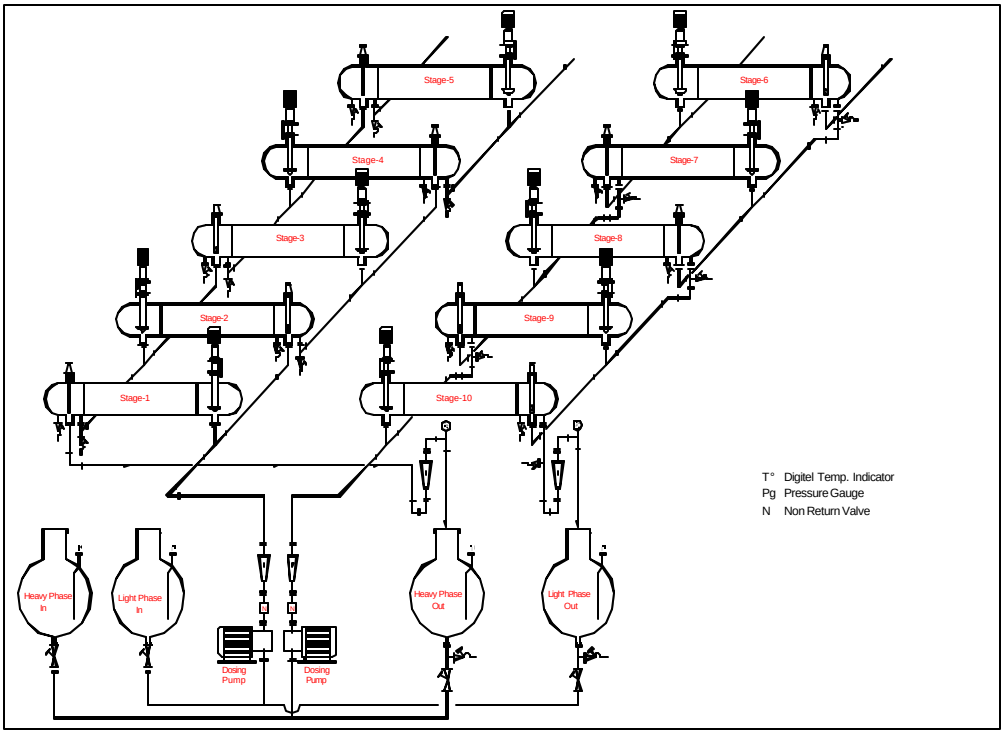
Settling System

The settler comprises a horizontal cylindrical pipe which depending upon size may be one or more pipe sections. From the settler, the outlet of the heavy phase, is controlled by an overflow valve. The design of the settler will be influenced by the throughput of both phases and the material physical properties (density difference, viscosity, interfacial tension etc).

Multi-Staging Mixer-Settlers

Different stages can be connected to each other and the interconnecting pipelines can be done as per your required flow logic. As a general practice the two input feeds are fed counter current i.e. the last stage mixer is fed with the feed solution depleted in the previous stages along with virgin solvent. Virgin solvent and feed would both be stored in 2 nos. spherical vessels of 20 litres capacity each and pumped from there to the respective mixer-settler stages with 2 separate corrosion resistant pumps. The final required output phases would be collected in 2 nos. separate spherical vessels of 20 litres capacity each.

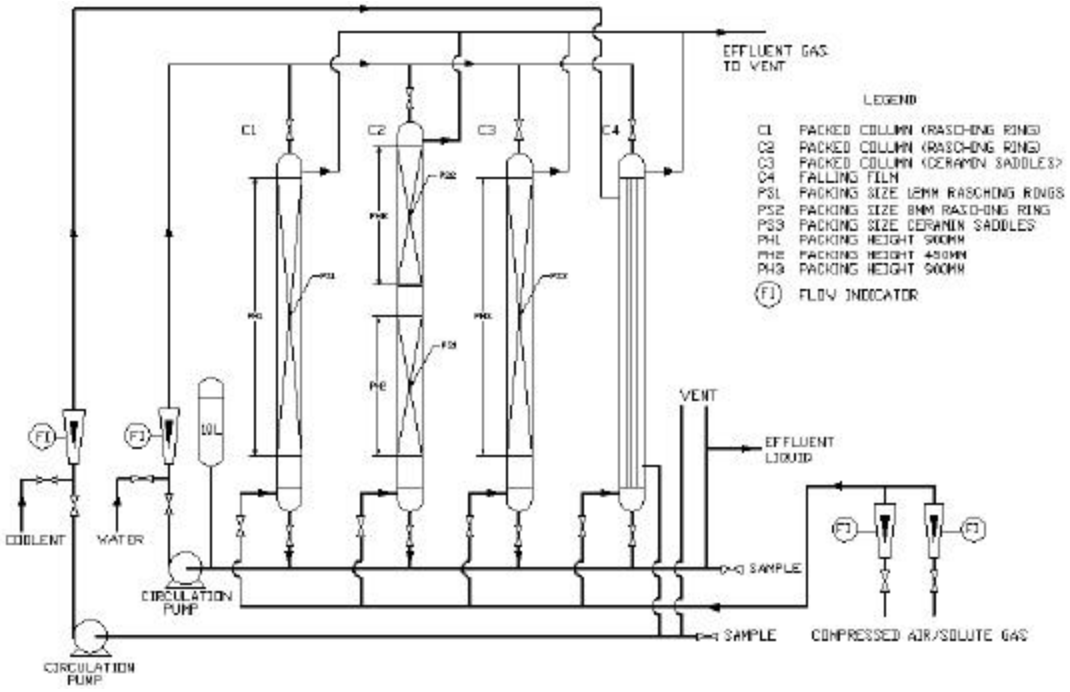
The whole assembly would be controlled through a control panel consisting of suitable circuit breaker MCBs, Relays, digital controllers etc.



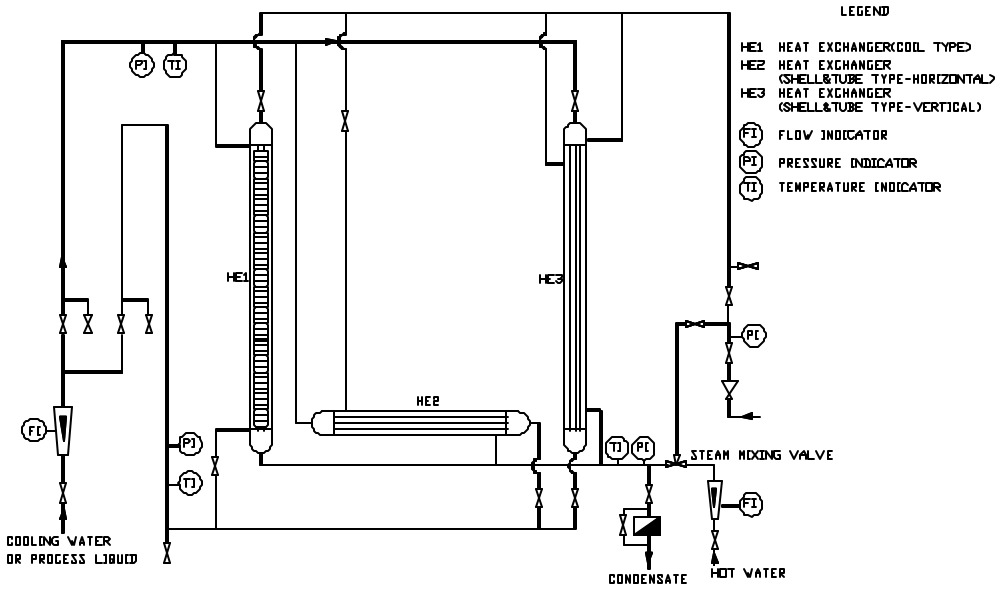
Teaching Units & Miniplants

Teaching units are possible for various experiments to be performed in Chemical engineering laboratories pertaining to various processes like distillation, absorption, heat & mass transfer, decantation etc.

A) Teaching Unit for performance of Falling film and Packed towers with different packings for absorption process.



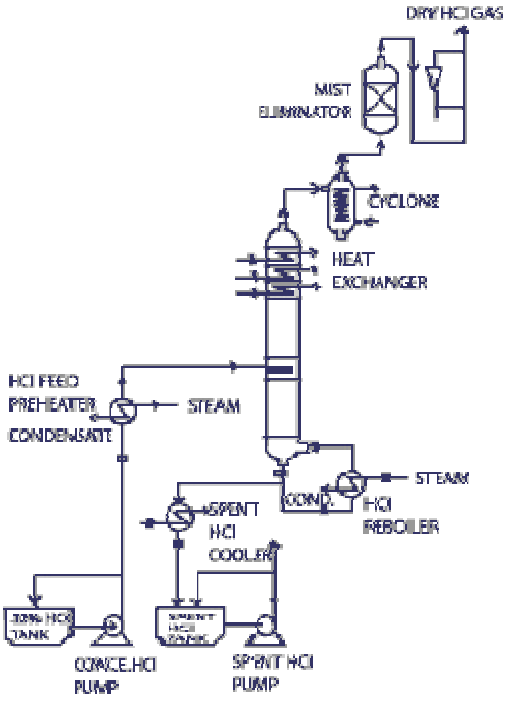
B) Teaching Unit for performance of different type of Heat exchangers



2) Process Packages

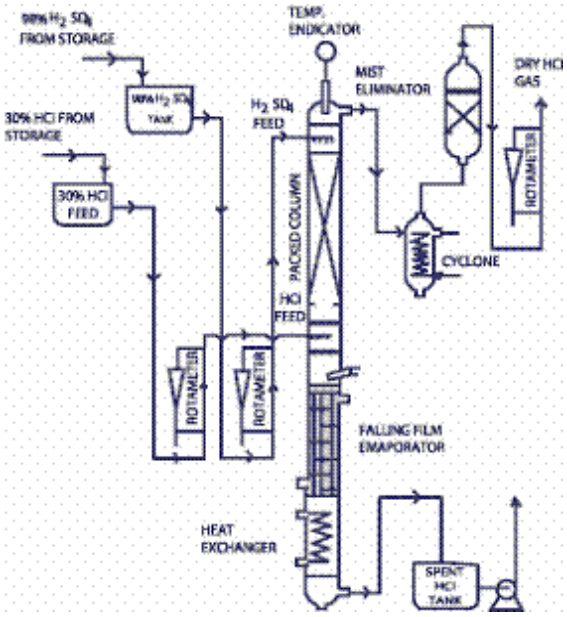
HCl Gas Generation Unit - Azeotropic Boiling Route :

AZEOTROPIC BOILING ROUTE Up to 200 Kg./Hour. Spent Acid (20% HCL) as byproduct · Moisture Content Less than 500 ppm.



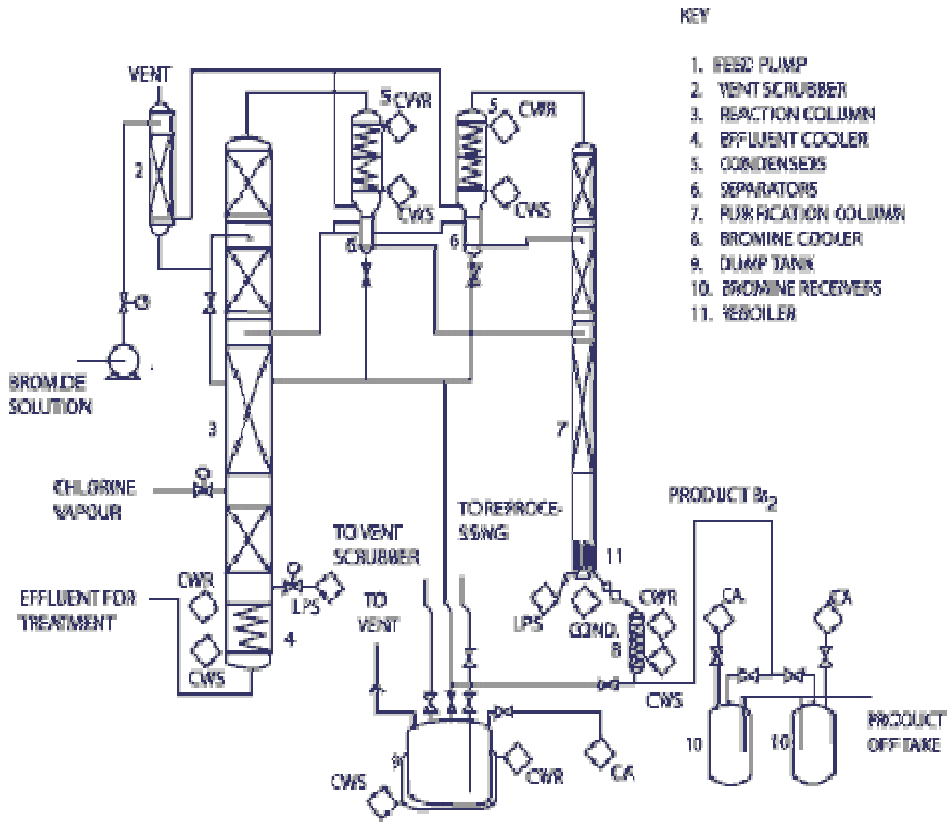
HCl Gas Generation Unit - Sulphuric Acid Route :

SULPHURIC ACID ROUTE · Up to 200 Kg / Hr. Spent Acid (70% H2SO4) as by-product. Moisture Content Less than 500 ppm.



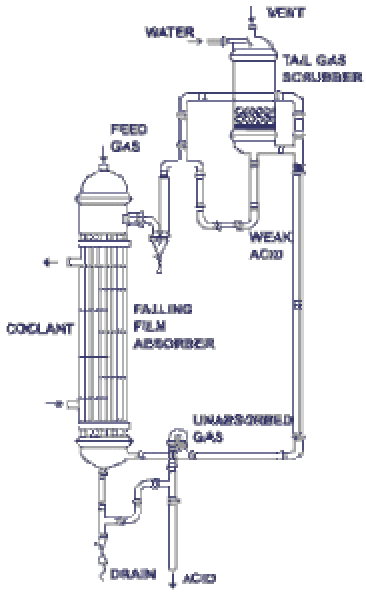
Bromine Recovery Plant :

From Industrial effluents (NaBr / KBr / HBr) and From Sea-Bittern.
Available up to 600 mm Diam eter column assembly.
Purity : 99.5% w/w (Min.)



Absorption System (HCl, HBr, Cl2 , SO2 , NOX , etc.) :

The system consists essentially of a Falling Film assembly known as the cooler-absorber, a packed tail gas scrubber and interconnecting piping.
Size : Upto 600mm Shell Diameter.
Capacity for HCl gas absorption : Up to 2700 Kg/Hr. ; Acid Output 30% HCl 9000 Kg/Hr.



Besides our team of skilled glass blowers can produce a wide range of glassware cost effectively maintaining quality aspects consistently as per required specifications. **We practice latest techniques for product & process quality control like regular & systematic calibration of instruments, periodic & preventive maintenance of machines, jigs & fixtures, Statistical Quality Control (SQC) techniques etc. in our production system. These allow us to maintain a high level of production efficiency along with a consistent quality.**

We can work with you at all stages of your glass apparatus or component design. If your requirement demands we shall produce CAD drawings from your initial sketches before producing a proto-type for your approval. We believe close coordination is an essential part of product development

Our Technical team would be glad to attend to your further queries on all the above mentioned units as well as any other special requirement you might have to satisfy your process needs or glass item requirements. Please feel free to contact us with all your needs & queries.

ISO 9001 : 2000 Certified

BVR Engineered Systems

(A Business Value Resources Group Enterprise)

D-68 Sardar Estate Ajwa Road Vadodara-390019 Gujarat India

☏ : **+91 265 3243430 +91 9824037528 +91 265 3254050**

Fax : +91 265 2784268

E-mail : consult@bizvalueresources.com sales@bizvalueresources.com

Website : www.bizvalueresources.com