

**NEW  
LAUNCH**

# SKID MOUNTED GLASS REACTORS

Cost Effective Kilo Lab Solutions

## Salient Features

- Easy Opening & Cleaning of Reactor
- Interchangeable Reactor of Different Capacities
- Triple Wall Reactor for Cryogenic (-90deg C) Chemistry
- GMP Design / ATEX Compliant
- "ZERO" Hold Up with Temperature Sensing Valve
- Touch Screen HMI Panel along with Process Monitoring & Control

Glass Jacketed Reactors, 20 to 100 Liters, Motorized Lifting for Up-Down



**ablaze**®

Since 1985

**Ablaze Export Incorporation**



**PRODUCT CATALOGUE**

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Discovering  
new boundaries

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Since 1985

### Ablaze Export Incorporation

Ablaze is committed to delight customers by designing and manufacturing highest quality borosilicate glass 3.3 standard and Customized Pilot Plants and Turnkey Projects. Our Products are compliant with international standards such as DIN ISO 3585, 3586, BS1595. Ablaze also offers technical consulting and support service, with presence in over 20 countries worldwide.

### Contents

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Pg. 02	Chap.1	Distillation Plant with Glass Reactor
Pg. 04	Chap.2	Distillation Plant with GL Reactor and Glass Cover
Pg. 06	Chap.3	Distillation Plant with Glass Lined Reactor
Pg. 08	Chap.4	Distillation Plant with Heating & Cooling Oil Bath
Pg. 10	Chap.5	Agitated Glass Nutsche Filter Reactor
Pg. 11	Chap.6	Gas Scrubber System
Pg. 12	Chap.7	Rotary Film Evaporator
Pg. 15	Chap.8	Dry HCl Gas Generation Plant
Pg. 19	Chap.9	Bromine Production Plant
Pg. 22	Chap.10	Sulfuric Acid Concentration Plant
Pg. 23	Chap.11	Sulfuric Acid Dilution Plant



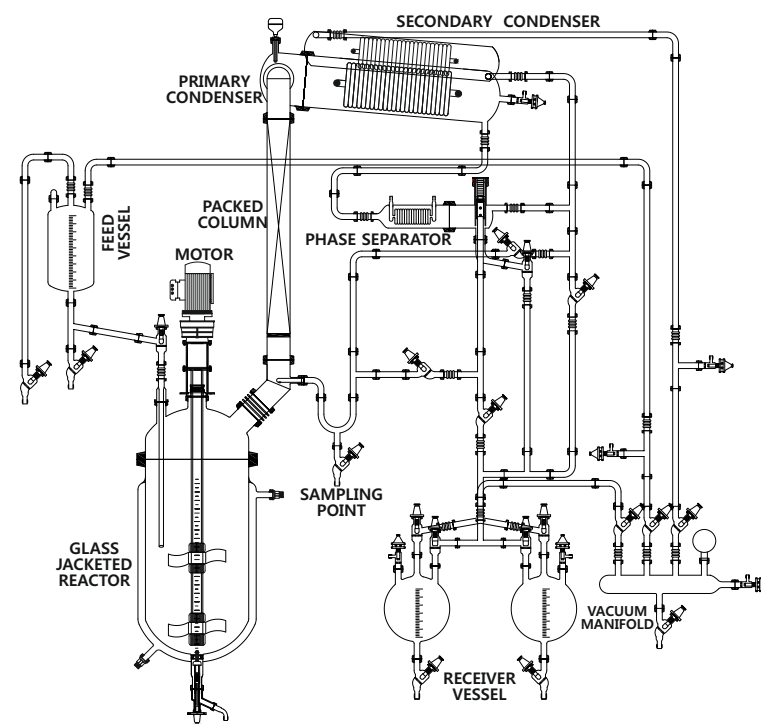
600 DN Borosilicate Glass 3.3 Flange Blowing in Process

## Distillation Plant with Glass Reactor

Ablaze offers customized Distillation Systems with Jacketed Glass Reactor. It includes vapour column, condensers, reflux provision, phase separator, addition and receiver vessels, along with valves at suitable places, and supporting metal structure. The units are supplemented with TCU (Thermal Control Unit) for circulation in Jacket of reactor.

### Salient Features

- Full View Glass Reactor to Improve and Control Chemical Reaction
- Triple Wall Reactor for Cryogenic (-90°C) Chemistry
- Internal Baffles for Improved Mixing
- Complete Documentation (IQ/ OQ/ DQ)
- GMP Design / ATEX Compliant
- Glass / PTFE Pressure Relief Valve and Rupture Disc for Safety
- Integration of Automation with Data Acquisition
- Easily integrated with our Nutsche Filter and Scrubber Systems
- Modular and Compact Steel Frame available to minimize floor Footprint and Height of Pilot Plant
- Control and Sampling Valves at accessible locations



DESCRIPTION		AGR 20	AGR 50	AGR 100	AGR 200
Reactor Nominal Capacity	ltr.	20	50	100	200
Heat Exchanger (Exchange Surface)	m <sup>2</sup>	0.5	1.0	1.5	2.5
Jacket Design Pressure	bar(g)	-1 to +0.5	-1 to +0.5	-1 to +0.5	-1 to +0.4
Vessel Design Pressure	bar(g)	-1 to +1	-1 to +0.7	-1 to +0.5	-1 to +0.4
Plant Working Temperature	°C	-50 to +180	-50 to +180	-50 to +180	-50 to +180
Plant Design Temperature	°C	-60 to +200	-60 to +200	-60 to +200	-60 to +200
Plant Working Pressure	bar(g)	+0.8	+0.6	+0.4	+0.3
Feed Vessel	ltr.	10	20	50	100
Receiver Vessel	No. x ltr.	2 x 10	2 x 20	2 x 50	2 x 100
Vapour Line Column	DN	50	80	100	100
Rupture Disc	bar(g)	0.5	0.5	0.5	0.5
Stirrer Speed	rpm	20 to 250	20 to 250	20 to 250	20 to 250



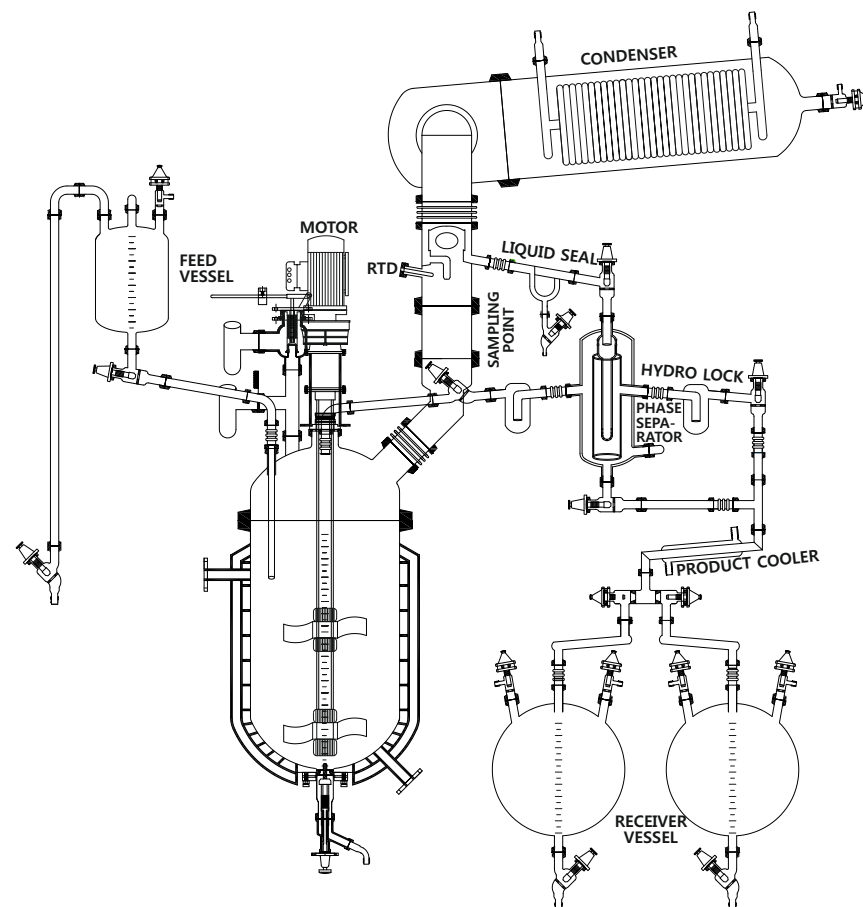
Distillation Plant with 100 Liter Reactor System  
Made in Borosilicate Glass 3.3

## Distillation Plant with GL Reactor and Glass Cover

Ablaze also offers standard distillation systems with Glass Lined Reactors, with rest of the assembly same as type AGR. This helps in scale-up to production design, offers excellent heat transfer and replicates process conditions of production very closely.

### Salient Features

- Suitable for high value, low volume production from 25 liters to 630 liters
- Transparency for Better Understanding during Process Development
- Glass Lined Reactor for Cryogenic (-90°C) Reaction
- Glass Lined Steel Stirrer for Zero Contamination
- High mechanical stability & heat transfer
- CIP Capable
- Twin Distillate Receivers for continuous operation without breaking vacuum
- Baffle with PT100 temperature sensor provided



DESCRIPTION		AGR/GL 25	AGR/GL 50	AGR/GL 100	AGR/GL 250
Reactor Nominal Capacity	ltr.	25	50	100	250
Heat Exchanger (Exchange Surface)	m <sup>2</sup>	0.5	1.0	1.5	3.0
Jacket Design Pressure	bar(g)	-1 to +6	-1 to +6	-1 to +6	-1 to +6
Vessel Design Pressure	bar(g)	-1 to +6	-1 to +6	-1 to +6	-1 to +6
Plant Working Temperature	°C	-20 to +180	-20 to +180	-20 to +180	-20 to +180
Plant Design Temperature	°C	-25 to +200	-25 to +200	-25 to +200	-25 to +200
Plant Working Pressure	bar(g)	+1.0	+0.7	+0.5	+0.5
Feed Vessel	No. x ltr.	2 x 5	1 x 10	1 x 20	1 x 50
Receiver Vessel	No. x ltr.	2 x 5	1 x 10	1 x 20	1 x 50
Vapour Line Column	DN	50	80	100	150
Rupture Disc	bar(g)	0.5	0.5	0.5	0.5
Stirrer Speed	rpm	20 to 250	20 to 250	20 to 250	20 to 250



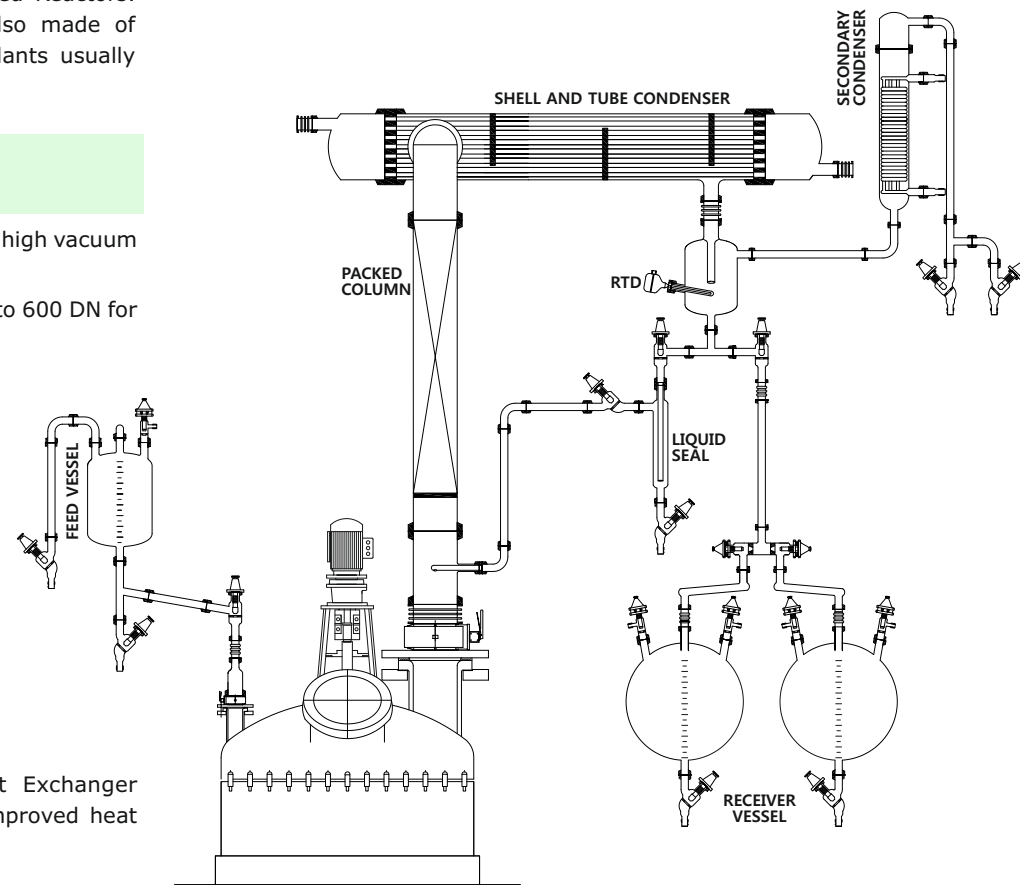
Distillation Plant with 30 Liter Glass Lined Reactor System  
Made in Borosilicate Glass 3.3

## Distillation Plant with Glass Lined Reactor

For production scale chemical synthesis, distillation, solvent recovery, rectification processes, Glass Shell & Tube Condensers are used along with Glass Lined Reactors. Complete process piping is also made of borosilicate glass 3.3. These plants usually operate under vacuum.

### Salient Features

- Suitable for operation under high vacuum and low pressure
- Setup can be configured up to 600 DN for large size reactors
- Visual monitoring of process, improving safety and reliability of production
- Customized compact design as per available space
- Measure and control devices can be easily equipped
- High corrosion resistant Coupling and Fasteners
- Shell and Tube type Heat Exchanger available up to 40m<sup>2</sup> for improved heat transfer efficiency



DESCRIPTION		AGR/GL 1000	AGR/GL 1600	AGR/GL 3000	AGR/GL 5000
Reactor Nominal Capacity	ltr.	1000	1600	3000	5000
Heat Exchanger (Exchange Surface)	m <sup>2</sup>	8.0	12.5	16.0	26.0
After Cooler (Exchange Surface)	m <sup>2</sup>	2.0	2.5	4.0	5.0
Jacket Design Pressure	bar(g)	-1 to +6	-1 to +6	-1 to +6	-1 to +6
Vessel Design Pressure	bar(g)	-1 to +1	-1 to +1	-1 to +1	-1 to +1
Plant Working Temperature	°C	-20 to +180	-20 to +180	-20 to +180	-20 to +180
Plant Design Temperature	°C	-25 to +200	-25 to +200	-25 to +200	-25 to +200
Plant Working Pressure	bar(g)	+0.5	+0.5	+0.5	+0.5
Feed Vessel	No. x ltr.	2 x 100	1 x 200	2 x 200	2 x 200
Receiver Vessel	No. x ltr.	2 x 100	2 x 200	2 x 200	2 x 200
Vapour Line Column	DN	150	225	300	300
Rupture Disc	bar(g)	0.5	0.5	0.5	0.5



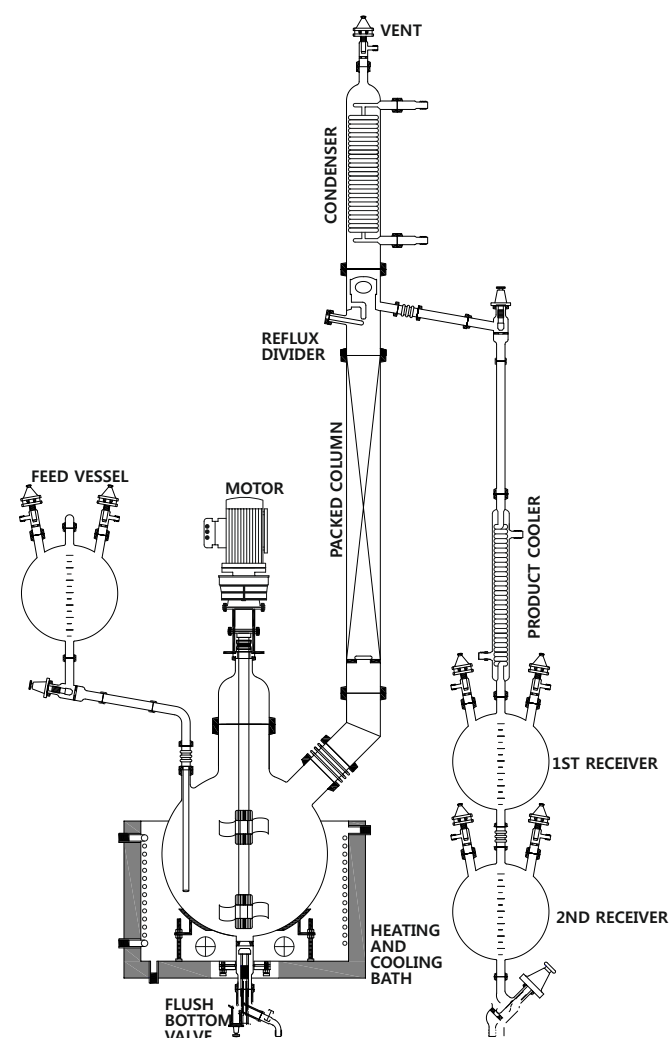
Glass Distillation Plant Overhead with 1000 Liter Glass Lined Reactor  
Made in Borosilicate Glass 3.3

## Distillation Plant with Heating & Cooling Oil Bath

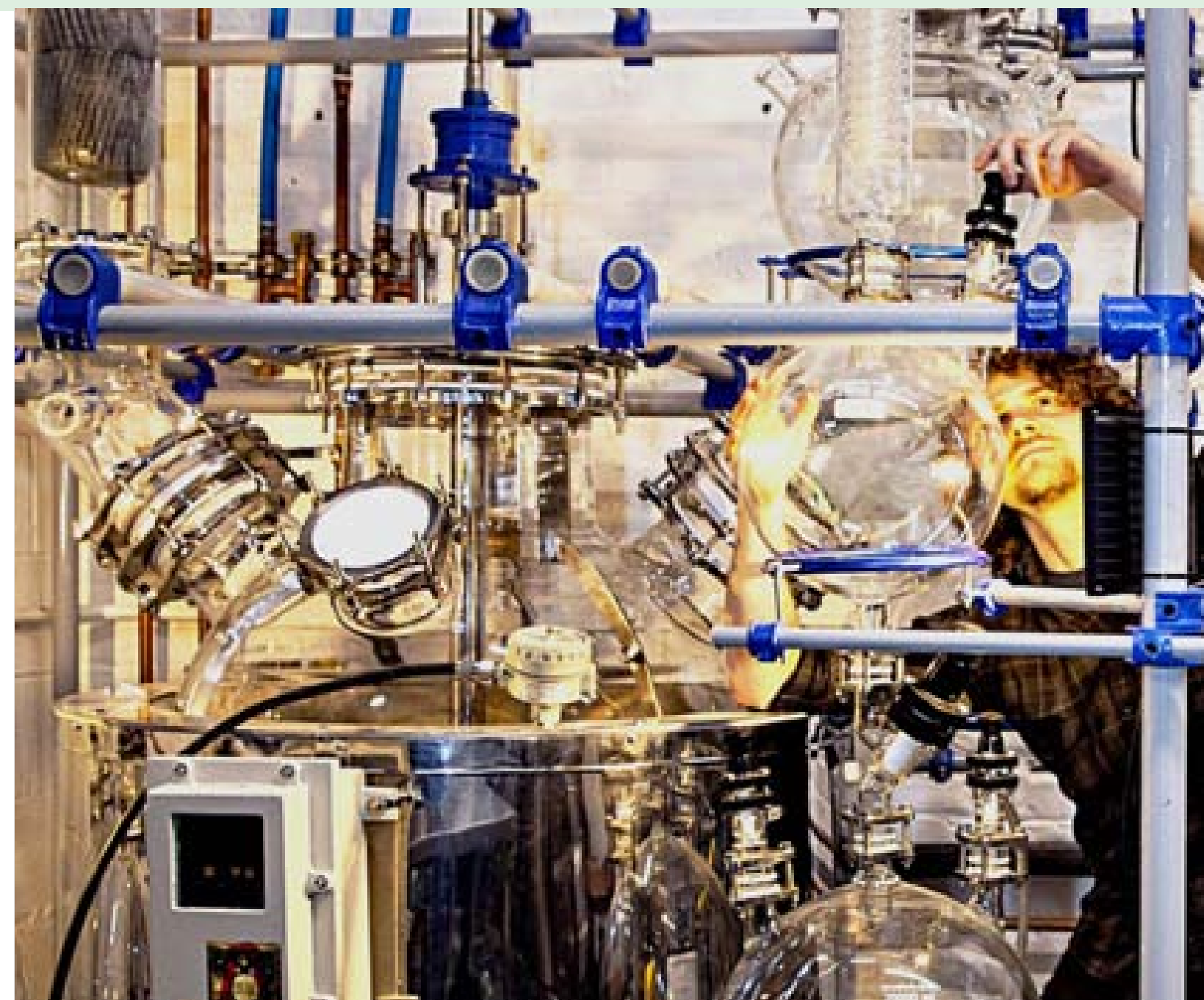
Ablaze also offers Reactors with Oil Bath. It a traditional, yet effective design for distillation where in the reactor is put in a metallic bath with coils for heating or cooling. Such units can sustain higher utility pressure and are available in standard and customized designs.

### Salient Features

- Reactor up to 500 liter capacity
- "ZERO" Hold Up with Temperature Sensing Valve
- Quick Closer for addition of Solid
- Visual monitoring of process, improving safety and reliability of production
- Dual functional heating & cooling oil/water bath
- Can be designed for batch as well as continuous operations
- All wetted parts are made from Borosilicate Glass, and PTFE, providing universal corrosion resistance
- Low CAPEX, and easy to maintain
- Suitable for installation in fume hoods
- Zero Hold-up in reflux
- Wide range of operation -90°C to +250°C available on request



DESCRIPTION		ARRDU 50	ARRDU 100	ARRDU 200	ARRDU 500
Reactor Nominal Capacity	ltr.	50	100	200	500
Heat Exchanger (Exchange Surface)	m <sup>2</sup>	0.5	1.5	2.5	5
Bath Heater Capacity	kW	6	8	12	18
Vessel Design Pressure	bar(g)	-1 to +0.6	-1 to +0.5	-1 to +0.4	-1 to +0.3
Plant Working Temperature	°C	-20 to +180	-20 to +180	-20 to +180	-20 to +180
Plant Design Temperature	°C	-25 to +200	-25 to +200	-25 to +200	-25 to +200
Plant Working Pressure	bar(g)	+0.5	+0.4	+0.3	+0.2
Feed Vessel	No. x ltr.	1 x 5	1 x 10	1 x 20	1 x 50
Receiver Vessel	No. x ltr.	2 x 5	2 x 10	2 x 20	2 x 50
Vapour Line Column	DN	50	100	150	200
Rupture Disc	bar(g)	0.5	0.5	0.5	0.5
Stirrer Speed	rpm	20 to 250	20 to 250	20 to 250	20 to 250



Reflux Reaction Cum Distillation Unit up to 500 Liter  
Made in Borosilicate Glass 3.3

## Agitated Glass Nutsche Filter Reactor

Ablaze's Nutsche Filters are specially designed for effective filtration. It can be conveniently combined with our standard reaction unit to enable Solid Liquid Separation. All contact parts are inert and hence allow the same equipment to be used with a wide range of chemicals and solvents. Appropriate filter is used to separate the solid particles of the slurry, forming a filtered cake.

The filtrate drains to the bottom and can be collected from the bottom outlet valve. The filter cake can be easily removed .

### Technical Data

**Capacity:** 5 to 200 Liter Jacketed & 300 liter Single Wall

**Temperature:** Up to 200°C

**Filter Cloth:** Various Mesh Size and MoC available as per requirement

**Material of Construction:** Borosilicate Glass, PTFE. Customized Configurations available as per requirement

### Salient Features

- Lifting System for Easy Cake Removal ( Motorized / Manual Lifting)
- Easily Integrated with our Reactors for Solid / Liquid Separation
- GMP Design / ATEX Compliant
- Manual Stirrer or Electrical Stirrer
- Modular & Compact Design
- High Filtration Efficiency
- Easy, Safe & Reliable Operation

### Applications

- Heating & Drying
- Solid & Liquid Separation
- Crystallization
- Filtration
- Chromatography
- Solid Phase Peptide Synthesis (SPPS)



## Gas Scrubber System



Ablaze's Gas scrubbers are used to defuse corrosive exhaust gases, before being released. The stripping liquid is chosen as per the nature of vapour to be scrubbed. A corrosion resistant recirculation pump is taken which ensures constant flow of solvent through the system. The solvent and gas come in contact with each other in the column, which is packed to increase surface area for gas absorption. Scrubbers are available from lab scale up to pilot scale of 500L.

### Technical Data

**Capacity:** 5 to 500 Liters Spherical Vessel

**Exhaust Gas Temperature:** -60 to +150 °C

**Scrubbing Liquid Temperature:** 0 to 80 °C

**Operating Pressure:** -1.0 to +0.5 bar(g)

**Material of Construction:** Borosilicate Glass 3.3, PTFE. Customized configurations available as per requirement

**Circulation Pump:** PVDF / PTFE lined Centrifugal Pump

### Salient Features

- Highly Corrosion Resistance
- Portable, Mobile and Compact Design
- Optimal Circulation Temperature Maintained
- Ability to handle large gas flow rates
- Flameproof / ATEX / PVDF Pump
- Spiral product cooler maintains temperature of solvent
- Complete Documentation and certificates (IQ / OQ / DQ)
- Easily integrated with our Reaction Systems
- Transparency aids in better understanding of process during R&D
- pH of scrubbing liquid can be monitored

### Applications

- Neutralization of exhaust gases
- Scale up Studies
- Gas Liquid Reaction
- Gas Absorption

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## Rotary Film Evaporator

Ablaze's series of Rotary film Evaporators are designed for Pilot and industrial scale evaporation applications.

Exclusive use of superior quality Borosilicate 3.3 glass and PTFE for all components coming in contact with product ensures complete chemical resistance against almost all mediums.

It is primarily used for distillation of heat sensitive and volatile components, owing to its unique construction. It can operate under full vacuum and is an essential equipment in chemical and pharmaceutical industries.

### Technical Data

- Capacity: 10, 20, 30, 50, 100 and 200 Liters
- Models: GMP / non-GMP
- Electricals: ATEX / Flame-proof / Weather-proof

### Applications

- Distillation
- Concentration
- Solvent Recycling
- Reflux process reactions
- Component Purification
- Fine Chemical Synthesis
- Crystallization

	ARE 10	ARE 20	ARE 30	ARE 50	ARE 100	ARE 200
Evaporation Flask Capacity	10L	20L	30L	50L	100L	200L
Heater	4kW	4kW	6kW	10kW	12kW	12kW
Bath Lift	Electrically Controlled					
Rotation Speed	0-90 rpm	0-90 rpm	0-90 rpm	0-90 rpm	0-50 rpm	0-50 rpm
RPM Indicator	Digital Display					
RPM Control	Controlled through Panel (VFD)					
Temperature Range (Heating Bath)	Digital: 20-90°C (water bath) / Digital: 20-180°C (oil bath)					
Temperature Control	PID controlled from main heater					
Overheat Cut-Off Protection	Yes					
Ultimate Vacuum	1 Torr	1 Torr	1 Torr	1 Torr	3 Torr	5 Torr
Receiving Flask Capacity	10 ltr.	10 ltr.	20 ltr.	20 ltr.	30 ltr.	50 ltr.
Condenser Area	> 0.5 m <sup>2</sup>	> 0.5 m <sup>2</sup>	> 1.0 m <sup>2</sup>	> 1.5 m <sup>2</sup>	> 2.5 m <sup>2</sup>	> 4 m <sup>2</sup>
Power Source	AC 230V / 3Phase / 50 Hz					

### Salient Features

- Universal heating bath upto 200°C
- High Quality (Reinforced PTFE) seal ensures perfect vacuum & maintenance free operation
- Digital display / control of critical process parameters on control panel
- Uniform heating and reduced residence time
- Mounted on castor wheels for easy movement
- Visibility of entire process

### Applicable Industries

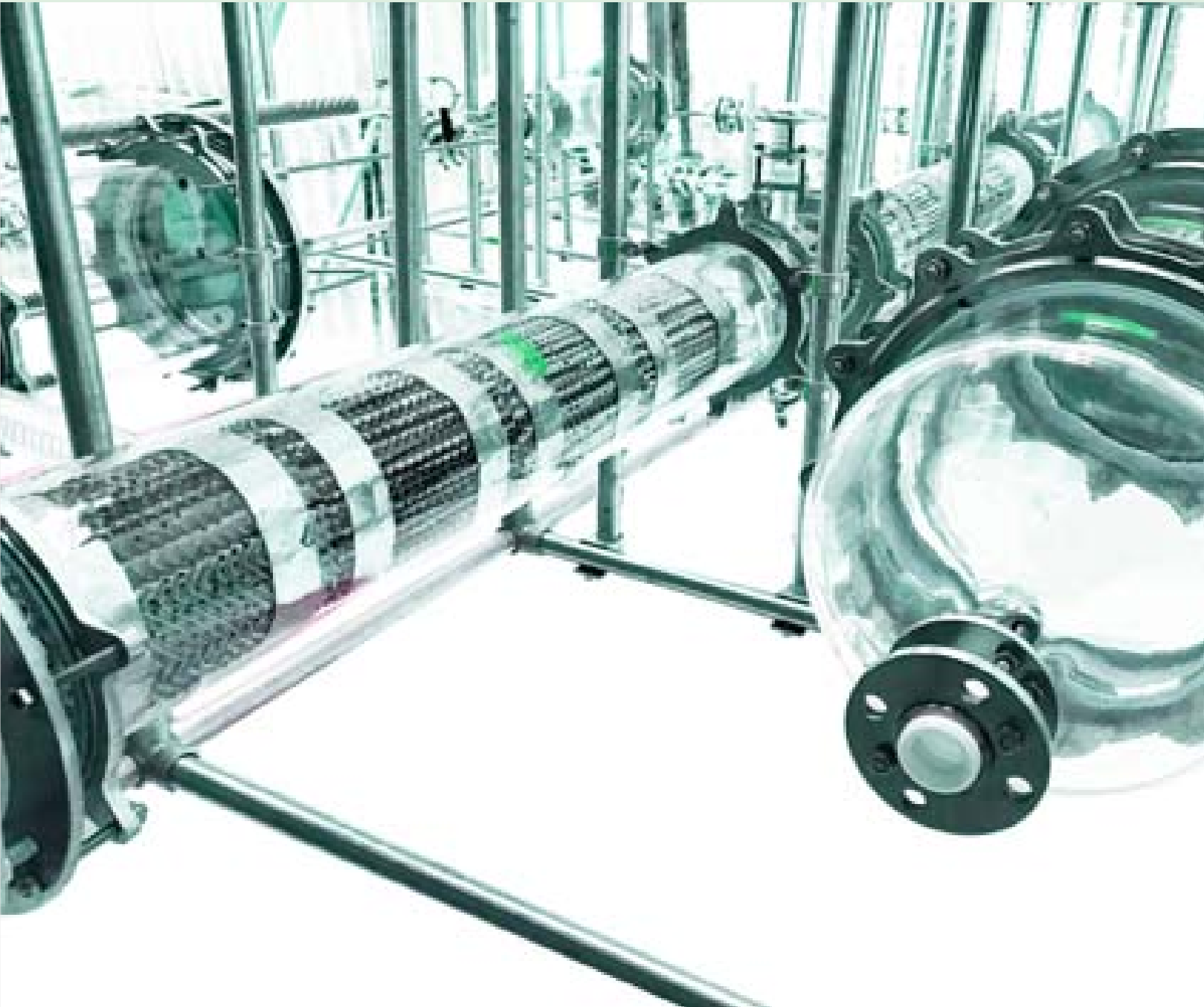
- Pharmaceutical
- Chemical
- Herb Extraction
- Petrochemical
- Cosmetics
- Fragrance and Aromatics



Rotary Film Evaporator up to 200 Liter  
Made in Borosilicate Glass 3.3



## Turnkey Projects



Our team of experienced engineers have vast experience of commissioning Turnkey Projects. Ablaze undertakes complete process plants from designing, engineering, scale-up studies, instrument selection and installation to commissioning phase. We aim at providing a solution with technical inputs, for maintenance free operation, with the desired output quality.

## Dry HCl Gas Generation Plant



Commercial Hydrochloric acid in the market is available as 30% aqueous solution and is widely used in industry in large quantities. However for certain application, such as hydrogenation reaction and in bulk drug /pharmaceutical industry, HCl is required in gaseous and anhydrous form.

Different processes for HCl gas generation from commercial grade HCl Acid are offered based on customer requirement. These processes are as follows.

- ▶ **Concentrated Sulfuric Acid Route**
- ▶ **Distillation or Boiling Route**
- ▶ **Calcium Chloride Route**

HCl Gas Generation Plants are normally available from 5Kg/Hr up to 250 Kg/Hr capacity. Large capacity plants can also be provided on request .

Ablaze has a long and successful record of design and supply of several engineered systems for HCl gas generation. Being manufacturer of Borosilicate glass equipment, PTFE Components and PTFE lined components, Ablaze is well qualified to handle such systems, as these are the major material of construction used in such systems, Ablaze also has in-house capabilities for instrumentation and automation , which is necessary for reliable and safe operation.

### Applicable Industries

- **Chemicals:** For production of Methyl Chloride, Vinyl Chloride, Synthetic Rubbers, etc
- **Petrochemical Industry:** To promote and regenerate catalysts and to add viscosity to oils
- **Electronics:** For selective etching, as cleaning agent for electroplating
- **Textile:** For separation of cotton from wool, in delinting of cotton
- **Steel and Metal:** In production of hard metals
- **Pharmaceutical and Biotechnology:** In Pharmaceutical synthesis



## Concentrated (H<sub>2</sub>SO<sub>4</sub>) Sulfuric Acid Route

The plant produces dry HCl gas by the process of distillation of 30% hydrochloric acid with concentrated sulphuric acid as entrainer.

Feed Sulphuric acid is fed from top to the packed column and feed 30% hydrochloric acid is also fed to the column. Both the acid flow cocurrently.

HCl gas is generated by mixing of the two liquid acid feeds. The top portion of the packed column acts as drying zone for the product HCl gas.

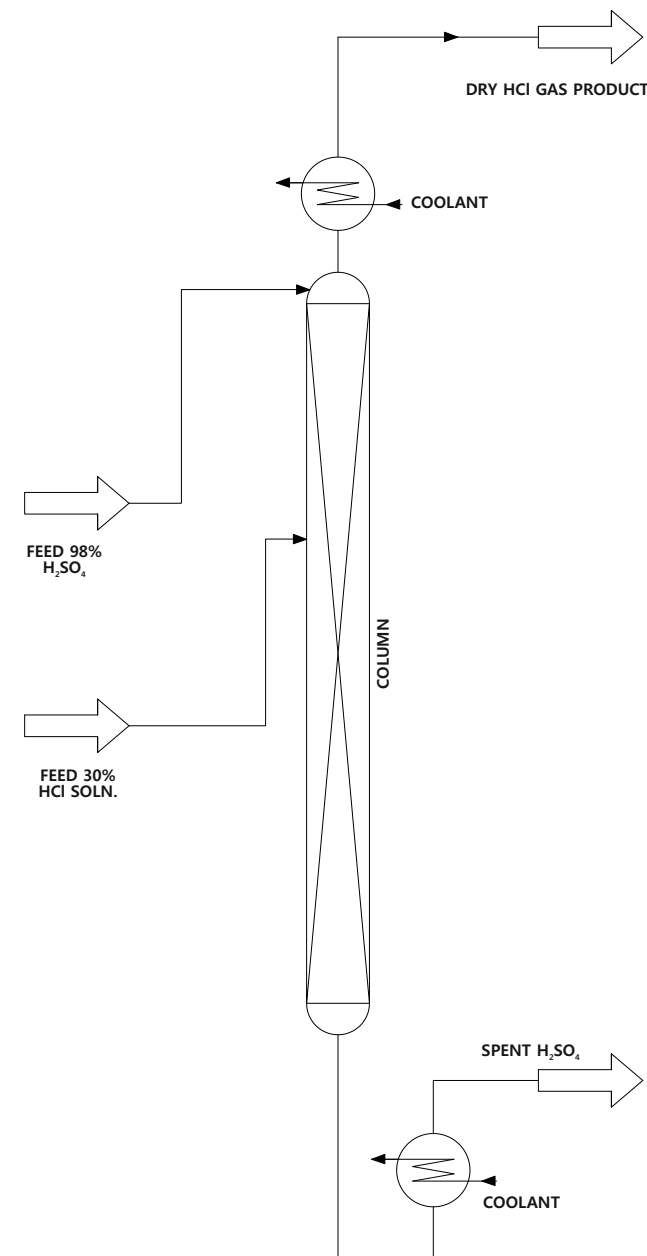
Condenser / Cooler are provided on top of column to cool the outgoing HCl gas. Suitable drying section removes final traces of moisture from outgoing HCl gas.

The bottom product from the plant is spent Sulphuric acid with 70% strength (with 1-1.5% HCl content). It is cooled in heat exchanger prior to discharge.

All the wetted parts of the system are fabricated from corrosion resistant materials (Glass and PTFE).

### Salient Features

- Low capital cost
- Simple process
- Very compact design
- Spent Sulphuric acid (approx 70% w/w) with 1% HCl content as by product
- Medium operating cost



Flow Sheet - (H<sub>2</sub>SO<sub>4</sub>) Sulfuric Acid Route

## Distillation or Boiling Route



The plant produces dry HCl gas by the process of distillation of 30% hydrochloric acid solution as a continuous process.

The feed 30% HCl acid is pre heated by the outgoing hot bottom product in the heat exchanger and fed to the azeotropic distillation column by the pump in controlled rate.

The heat energy is supplied by steam to the thermosiphon reboiler at bottom of the column.

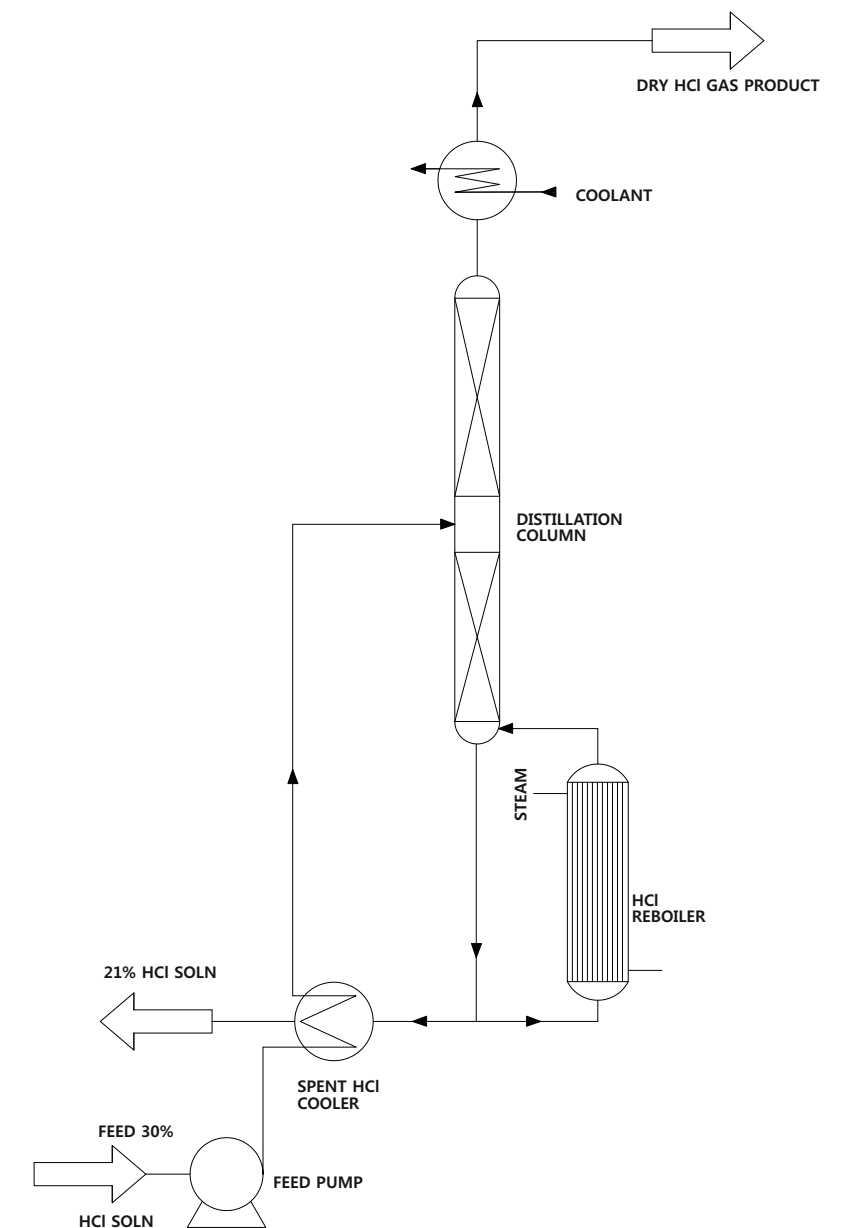
The bottom product from the plant is constant boiling approx 21% acid solution which is cooled by the cold 30% acid feed solution prior to discharge.

The top product HCl gas is dried in the Drying Unit using Sulphuric acid / suitable dehydrating agent. The product HCl gas is anhydrous.

All the wetted parts of the system are fabricated from corrosion resistant materials (Glass and Graphite).

### Salient Features

- Medium capital cost
- Simple process
- Compact design
- Pure 21% HCl as bottom product
- Low operating cost.



Flow Sheet - Distillation or Boiling Route

## Calcium Chloride Route(CaCl<sub>2</sub>)

The plant produces dry HCl gas by distillation of 30% hydrochloric acid with Calcium Chloride solution as entrainer.

Preheated 30% HCl acid is fed to the azeotropic distillation column. Co-current feed of concentrated Calcium Chloride solution is also fed to the distillation column. HCl gas is generated by mixing of both liquids and rises in the column. The top product HCl gas is dried in the Drying Unit using sulfuric acid / suitable dehydrating agent.

Thermosiphon reboiler provides the heat energy for the distillation process using steam. The bottom product from the

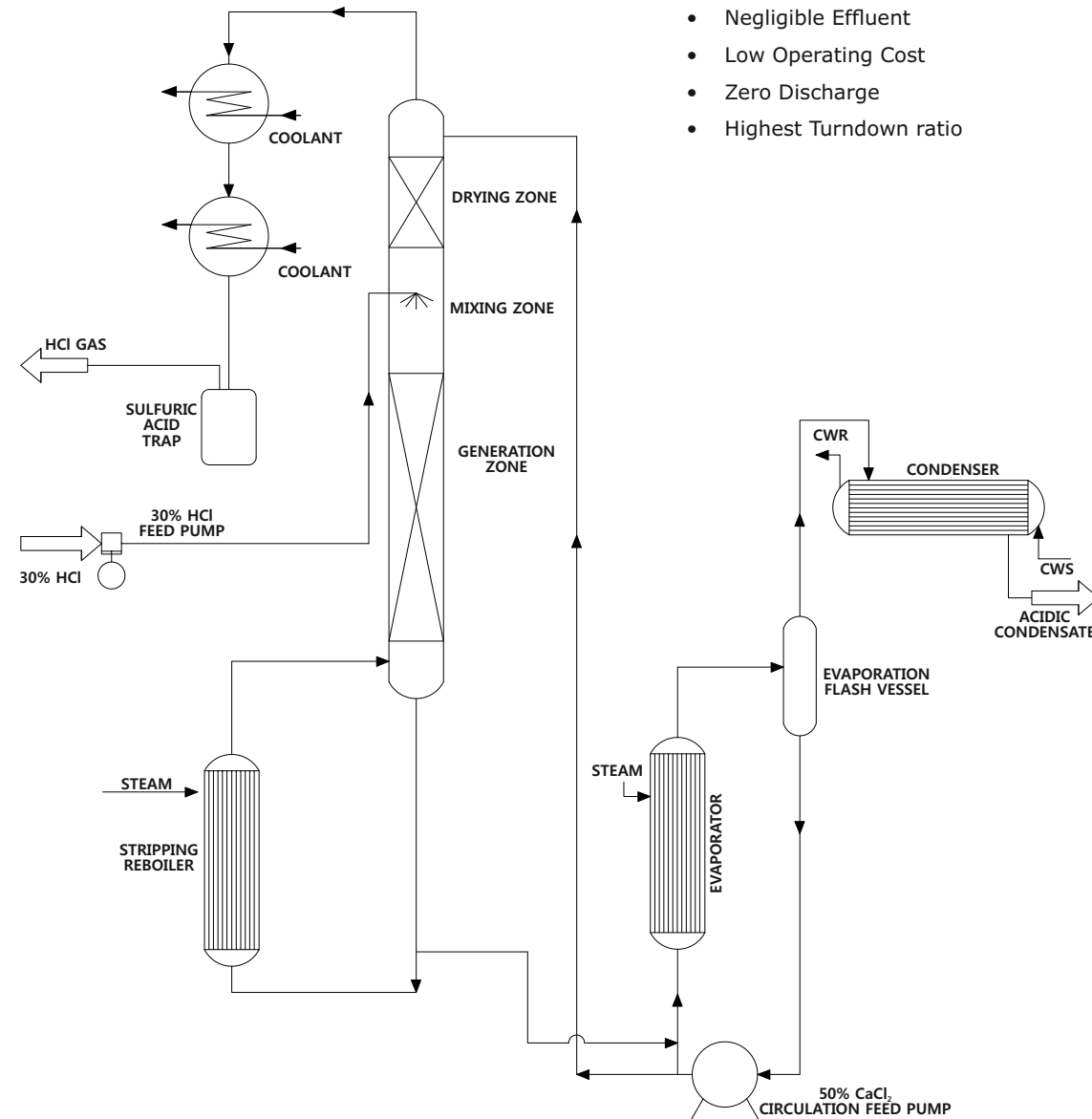
column is dilute Calcium Chloride solution with dissolved HCl content.

The dilute CaCl<sub>2</sub> solution is concentrated in the evaporator by steam and the re-concentrated CaCl<sub>2</sub> solution is recycled to the distillation column by pump. The vapour from the evaporation process is condensed and consists of water and approx 1% HCl.

All the wetted parts of the system are fabricated from corrosion resistant materials (Glass and Graphite etc.)

### Salient Features

- Negligible Effluent
- Low Operating Cost
- Zero Discharge
- Highest Turndown ratio



Flow Sheet - Calcium Chloride Route(CaCl<sub>2</sub>)

## Bromine Production Plant



Bromine finds its application directly and indirectly in manufacture of pesticides, agrochemicals, pharmaceuticals, fire-retardants, photography chemicals and many others.

Bromine occurs in nature as Bromide salt present in sea-water and in-land brine which is used for grassroots production of Bromine. It is also recovered from industrial effluents/byproducts where it occurs as different Bromide salts.

Ablaze has a long and successful record of design and supply of several Bromine recovery systems – both grass-root and from industrial effluents. Being manufacturer of Borosilicate Glass equipment, PTFE components and PTFE lined components, Ablaze is well qualified to handle such recovery systems as these are the major Material of Construction used in such systems.

Custom made designs are offered for various Bromine recovery systems, depending on the source of Bromide and the end use of final product Bromine.

Typical Product quality for Bromine recovered from such recovery plants is as follows

- **Bromine** 99.5% w/w min
- **Chlorine** 0.3% w/w max
- **Moisture** 0.1% w/w max

However, system can be designed to give desired product quality as per the customer requirement. For eg. system can be designed to give dry Bromine if so required.

There are two established processes for recovery of Bromine from aqueous Bromide solutions

- Hot Process
- Cold Process

For grass root bromine recovery, either Hot Blowing Process or Cold Blowing Process is selected depending on the Bromine content in the bittren. Also, Cold Process is preferred for very large production capacities.

As the industrial effluents are more concentrated in Bromine/Bromide content, Hot Process is employed for Bromine recovery from industrial effluents.

However, since the industrial effluents invariably contain some impurities carried over from the source process, such recovery system is preceded by a suitable pre-treatment system.

### Salient Features

- Energy efficiency
- Lower specific consumption figures
- Instrumentation
- Safety
- Alternative/ options of MoC

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## Hot Process Bromine Recovery

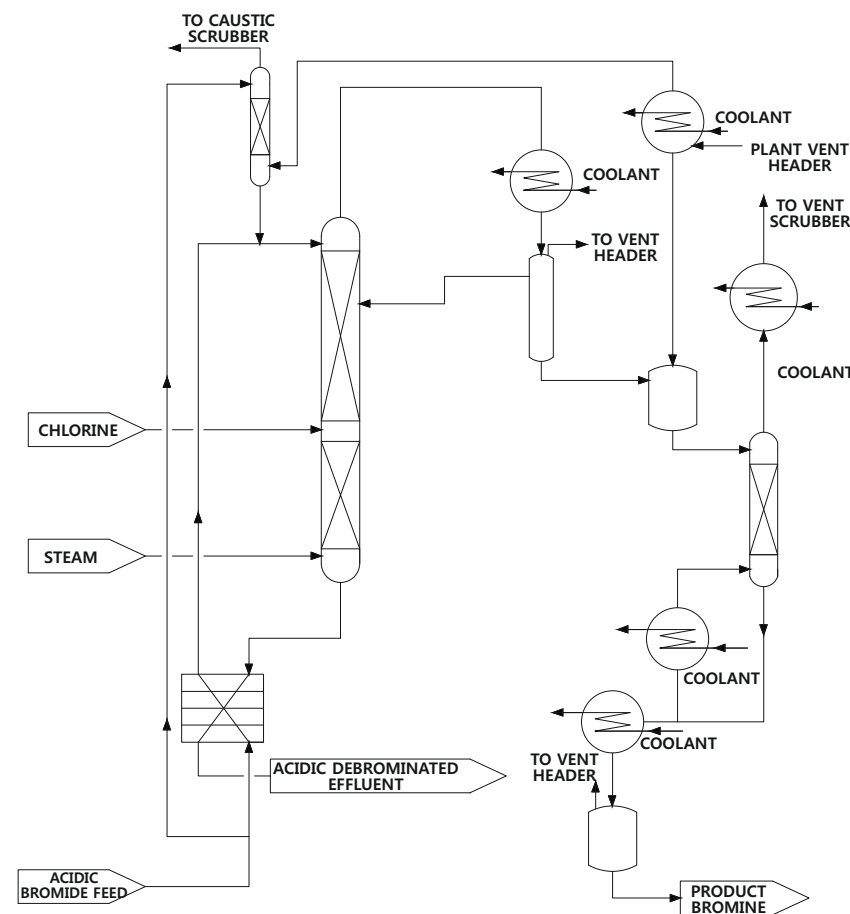
The acidified feed containing Bromide salts is preheated and fed to Reaction-cum-stripping tower, where Chlorine gas and steam are injected. The Chlorine gas liberates free Bromine which is stripped out by live steam in form of vapors.

These vapors are condensed in series of condensers, and condensate is collected in phase-separator. The water phase is refluxed to the tower and separated Crude Bromine goes for distillation to remove dissolved Chlorine.

Pure Bromine after distillation is collected as bottom product. This Bromine is cooled and collected in product receiver/s.

A Vent condenser condenses most of the Bromine and recycles into the system. The non-condensibles are taken to the Vent scrubber.

The debrominated effluent from the stripping tower exchanges heat with the feed and is relatively cooled down. It may be taken for neutralization and effluent treatment.



Flow Sheet - Hot Process Bromine Recovery

## Cold Process Bromine Recovery

The acidified feed containing Bromide salts is fed to Reaction-cum-Air blowing tower, where dry Chlorine gas and Low Pressure Air are injected. The Chlorine gas liberates free Bromine which is stripped out by Air in form of vapors.

These vapors enter Absorption tower where Alkali solution is circulated and a Bromide-Bromate solution is formed. The Bromine content in the resultant solution is highly enriched compared to original content. The unabsorbed air is vented out.

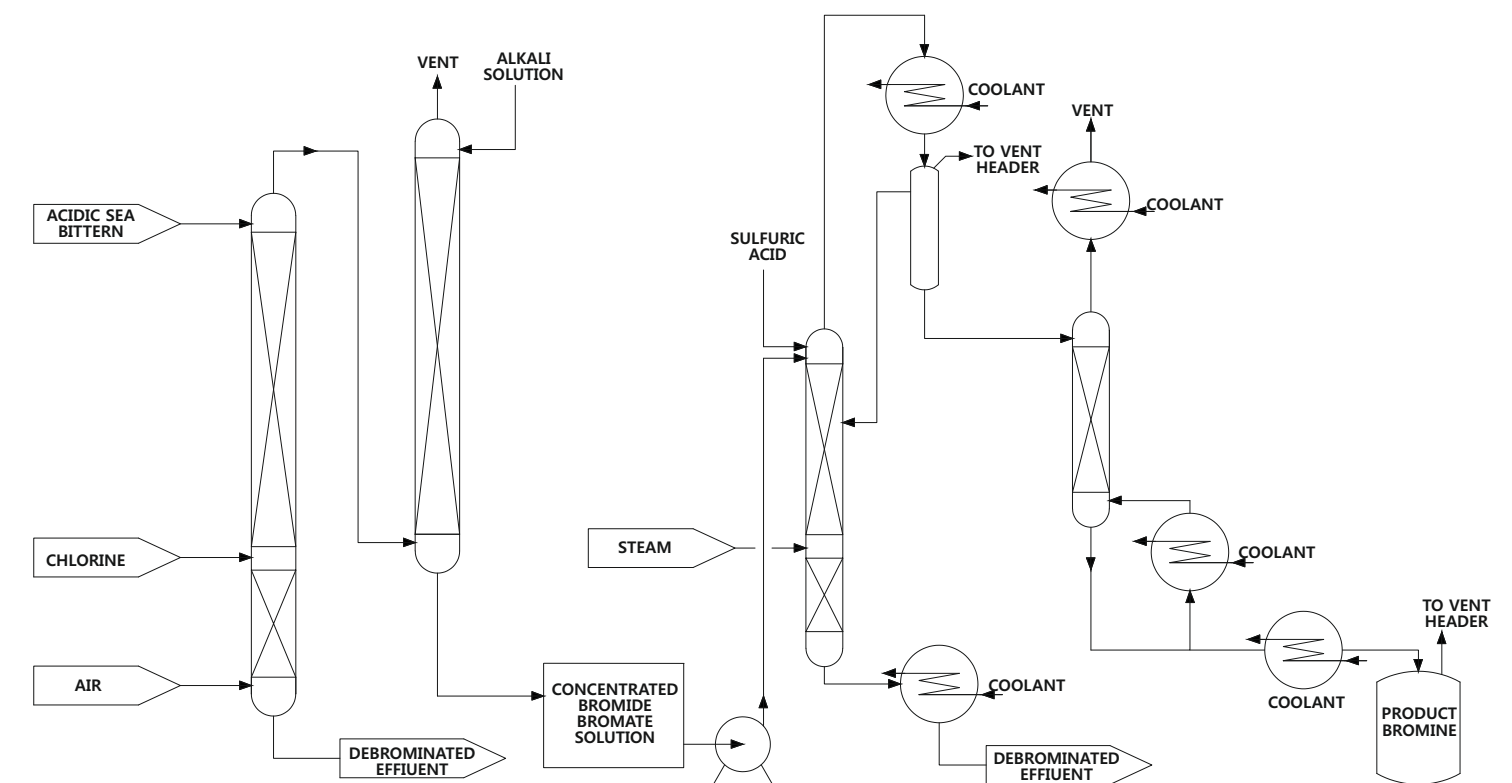
The enriched Bromide-Bromate solution is subjected to acidification in the liberation tower, where Bromine vapors are liberated and stripped out by steam injected at the bottom of the tower. The vapors leave the top of the tower.

These vapors are condensed in series of condensers, and condensate is collected in phase separator. The water phase is separated from Bromine and is refluxed to the tower. The Bromine so separated is Crude Bromine and is subjected to distillation.

Under distillation, Chlorine is removed and pure Bromine collected as bottom product. This Bromine is cooled through Product coolers and collected in product receiver/s.

A Vent condenser condenses most of the Bromine and recycles into the system. The non-condensibles are taken to the Vent scrubber.

The debrominated effluent from the Air blowing tower may be taken for neutralization and effluent treatment.



Flow Sheet - Cold Process Bromine Recovery

## Sulfuric Acid Concentration Plant

Sulfuric acid finds its application directly and indirectly in manufacture of fertilizers, dyes, intermediates and many others. Commercial Sulfuric acid is typically available as 98% w/w concentration.

Several applications of Sulfuric acid involve the use of medium or high concentration acid, which ends up as relatively dilute acid by picking up water from the reaction. This dilute acid may be concentrated to bring it to the desired concentration level and recycled in the process. This takes care of effluent problem and also, reduces requirement of fresh make-up acid.

Sulfuric acid is highly toxic and corrosive and reacts readily with metals, depending on its strength and operating parameters. Thus, very few Material of Construction are compatible to handle, process and store Sulfuric acid. Thus, special design and special knowledge is required to set up and operate plants handling Sulfuric acid.

Ablaze has a long and successful record of design and supply of several Engineered systems for mineral acids. Being manufacturer of Borosilicate Glass equipment, PTFE components and PTFE lined components, Ablaze is well qualified to handle such systems as these are the major Material of Construction used in such systems. Ablaze also has in-house capabilities for Instrumentation and Automation, which is necessary for reliable and safe operation.

Custom made designs are offered for Sulfuric concentration systems, depending on the initial and final concentrations of acid, heating medium and cooling medium available, etc.



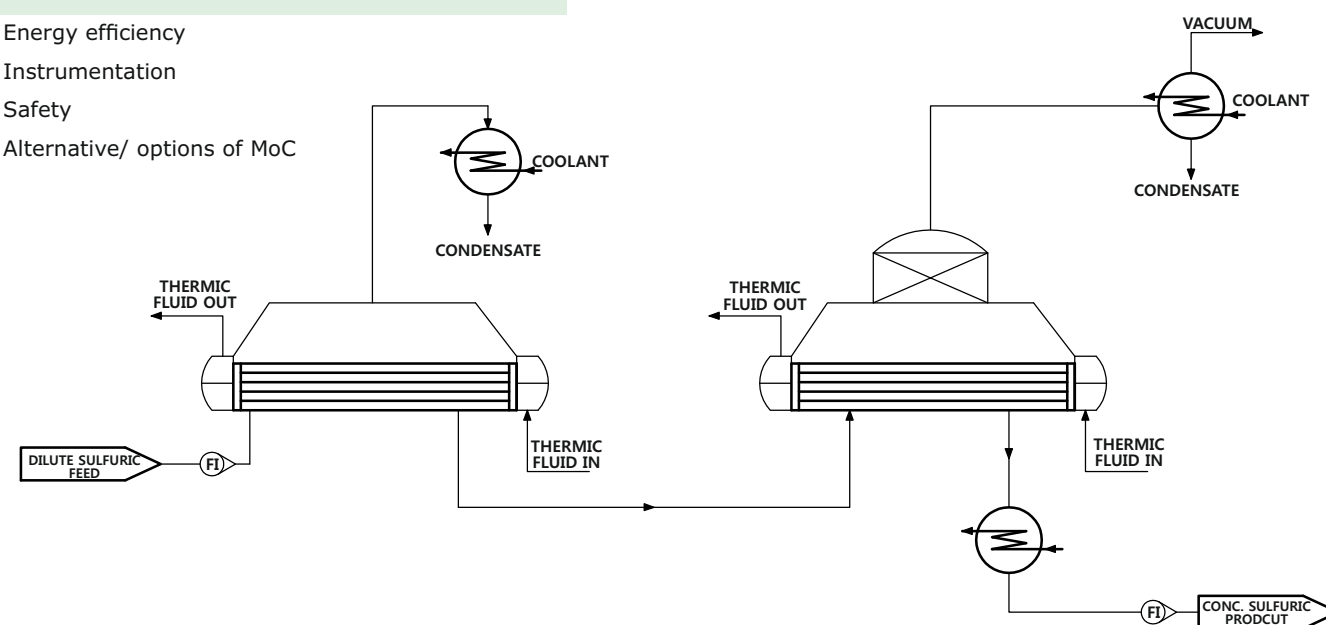
The process basically involves boiling of Sulfuric acid to preferentially evaporate water. The process scheme and operating parameters are selected based on several factors like plant capacity, feed composition/ impurities, initial and final concentration, utilities available etc.

A typical and generic flow scheme is shown for concentration of Sulfuric acid. The actual process scheme is decided based on the above factors.

Feed Dilute Acid is fed to the Evaporator/ Boiler at suitable operating pressure. The preferentially evaporated water is condensed in a condenser and the condensate collected. Multiple stages and Vacuum operation may be considered depending on final strength, utilities available and the plant capacity. At higher concentrations of acid, proper demister needs to be provided to avoid carryover of Acid mist.

### Salient Features

- Energy efficiency
- Instrumentation
- Safety
- Alternative/ options of MoC



Flow Sheet - Sulfuric Acid Concentration Plant

## Sulfuric Acid Dilution Plant



Sulfuric acid finds its application directly and indirectly in manufacture of fertilizers, dyes, intermediates and many others. Commercial Sulfuric acid is typically available as 98% w/w concentration.

Several applications of Sulfuric acid involve the need of diluting high concentration acid to medium or low concentration to be used in reactions. Dilution of Sulfuric acid evolves high amounts of heat, posing engineering challenges.

Sulfuric acid is highly toxic and corrosive and reacts readily with metals, depending on its strength and operating parameters. Thus, very few Material of Construction are compatible to handle, process and store Sulfuric acid. Thus, special design and special knowledge is required to set up and operate plants handling Sulfuric acid.

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Custom made designs are offered for Sulfuric dilution systems, depending on the initial and final concentrations of acid, cooling medium available, etc.

### There are two Established Methods For Sulfuric Dilution

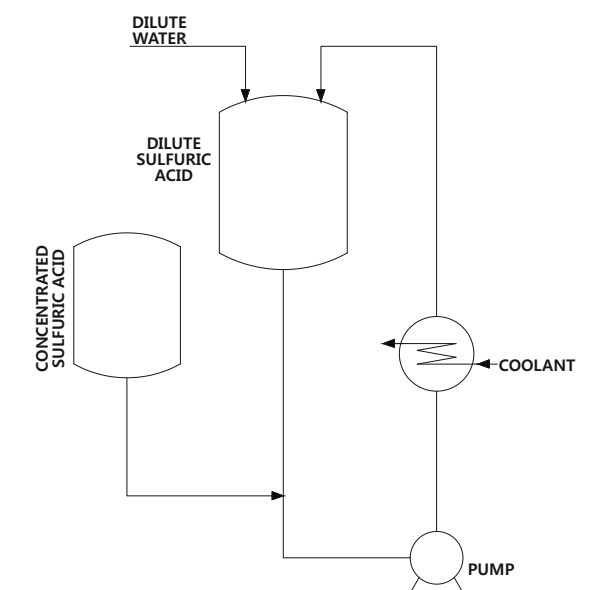
- **Batch / Re-circulatory process** – typically used for small to medium capacity units
- **Continuous/ Once through process** – typically used for medium to high capacity units

### Batch / Recirculatory Process

The Dilute acid Tank is filled with required amount of Dilution water. This water is circulated through pump and a cooler back to the tank.

Metered quantity of concentrated Sulfuric acid is added online to the circulating stream. The heat generated is controlled and removed through the cooler while addition is being carried out.

At the end of the process, addition of concentrated Sulfuric acid is stopped and the tank is ready with the required dilute Sulfuric acid.



# Sulfuric Acid Dilution Plant

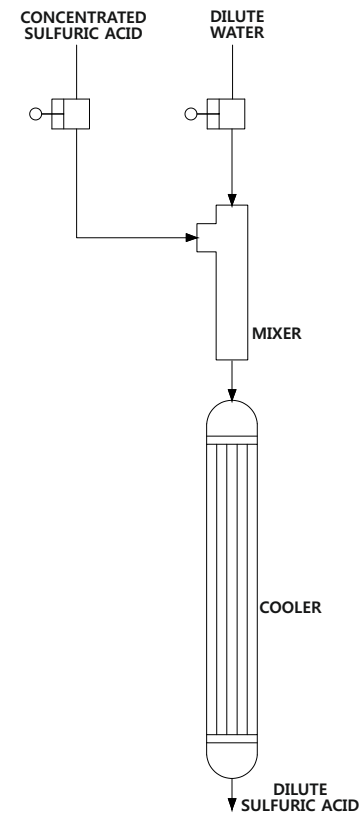
## Continuous / Once Through Process

This process may be carried out in single or multiple stages, depending on initial and final concentrations. For high range of dilutions, multiple stages are required to limit the temperature rise arising from dilution.

The concentrated Sulfuric acid is pumped from Feed tank to the Mixer, where Dilution water is added in metered quantity. This section allows intimate mixing of concentrated Sulfuric acid with water to yield intermediate / required strength of Sulfuric acid. The resultant acid is now passed through shell and tube type cooler where it is cooled down by circulating cooling water.

For multiple stages, this process is repeated. The intermediate concentration is carefully calculated and selected to optimize the system.

The final Dilute Sulfuric acid is taken to the storage facility for further use.



## Other Technical Packages

- Sulfuric acid Purification
- Nitric acid Purification
- Nitric acid Concentration
- Solvent Recovery plants
- Purification of Spent acids
- Purification of natural extracts such as essential oils
- Waste water treatment plants
- De- Nitration plants
- NOx absorption
- Precious metal recovery and refining
- Integrated NAC / SAC
- Exhaust Gas Purification
- HNO<sub>3</sub> Purification
- Sodium Hypochlorite



# Our Worldwide Presence



America Region	Europe Region	Asia Pacific Region
▶ Canada	▶ Czech-Republic	▶ Netherlands
▶ Guatemala	▶ France	▶ Russia
▶ Uruguay	▶ Georgia	▶ Turkey
▶ USA	▶ Italy	▶ United Kingdom
		▶ Australia
		▶ China
		▶ Iran
		▶ India
		▶ Israel
		▶ Sri Lanka
		▶ South Korea
		▶ Taiwan