STANDARD UNITS

INTRODUCTION

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

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.

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STANDARD UNITS

1. Glass Reactor With Metal Jacket
2. Simple Distillation Unit
3. Reaction Unit
4. Fraction Distillation Unit
5. Reaction Distillation Unit
6. Liquid-Liquid Extraction Unit
7. Solid-Liquid Extraction Unit
8. Assembly over GLR
9. Gas Scrubber
10. Multi Purpose Unit
11. Mobile Mixing System

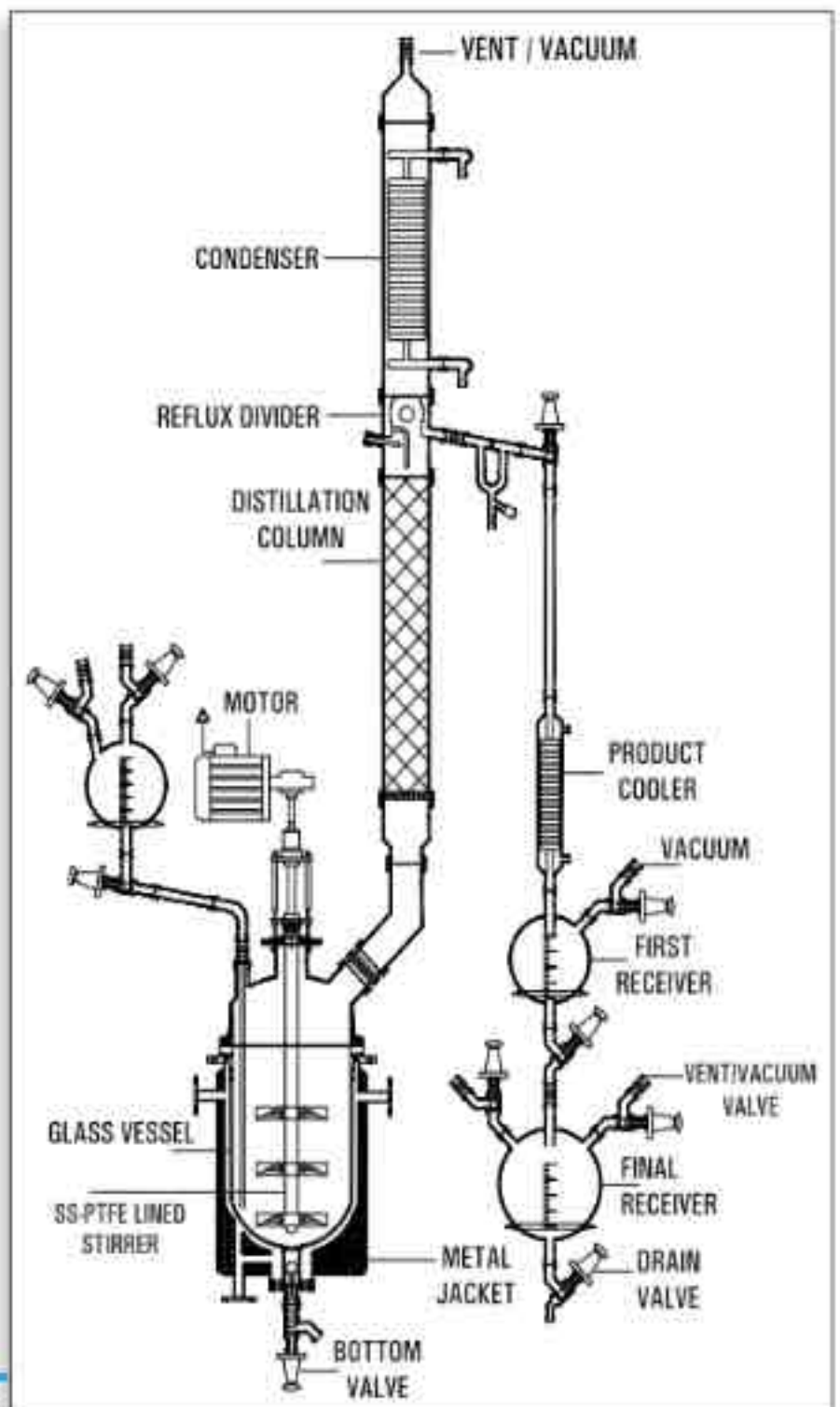
NEW 12. Essential Oil Distillation Unit

13 Agitated Glass Nutsche Filter, Peptide Synthesizer

NEW 14 HCL Adiabatic Absorption

15 Lab Glass Reactor

GLASS REACTOR WITH METAL JACKET



According to the customer's requirements and standard, we manufacture jacketed glass reactor which has many functions to satisfy kinds of experiments.

Goel Scientific offers Glass Reactor with Metal Jacket for chemical & pharmaceutical industries for process development. Glass reactor will have metal jacket and metal insulation.

Glass Metal jacketed Reactor 5-200 liter
Pressure: - up to 1 Bar
Temperature: -50°C to +200°C
Material: Borosilicate glass 3.3 /PTFE/ SS 316.

Key Features:

- Reactor lift for easy opening i.e optimised for easy vessel cleaning.
- Temperature monitoring and control.
- Gas purging available.
- Vacuum / exhaust piping arrangement.
- Additional feeders / receivers as per requirement.
- Solid feeding arrangement.
- Ready for Cryogenic reactions (-50°C).
- Mixed systems with pressure reactor and vacuum distillation.

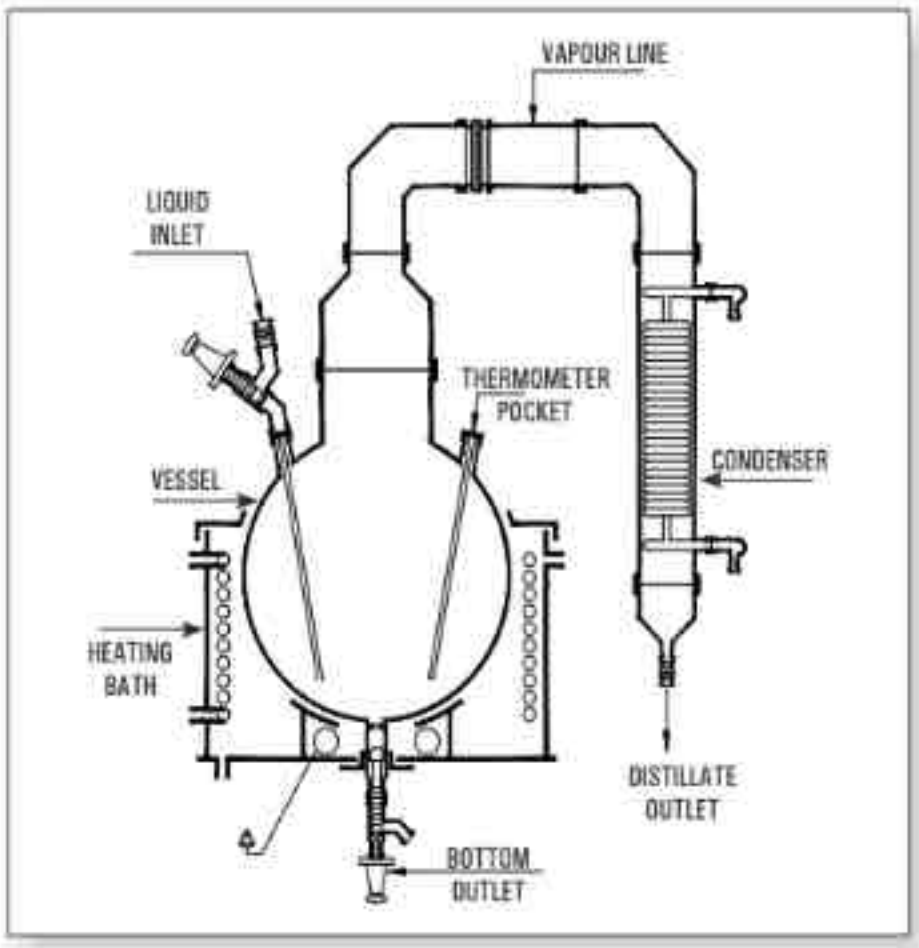
STANDARD UNITS

SIMPLE DISTILLATION UNIT

It consists of a vessel mounted in a heating bath and fitted with a condenser for condensing the vapours. A receiver with drain valve can be added for receiving the condensate.

The units are available in vessel sizes of 20, 50, 100, 200, 300 & 500 L and is suitable for operation under atmospheric pressure and full vacuum.

Unit Cat.Ref.	Reactor Capacity	Bath KW	Vapour Line	Condenser M^2
SDU20	20 L	4.0	80 DN	0.35
SDU50	50 L	6.0	100 DN	0.50
SDU100	100 L	9.0	150 DN	1.50
SDU200	200 L	12.0	150 DN	1.50
SDU300	300 L	18.0	225 DN	2.50
SDU500	500L	24.0	300 DN	4.00



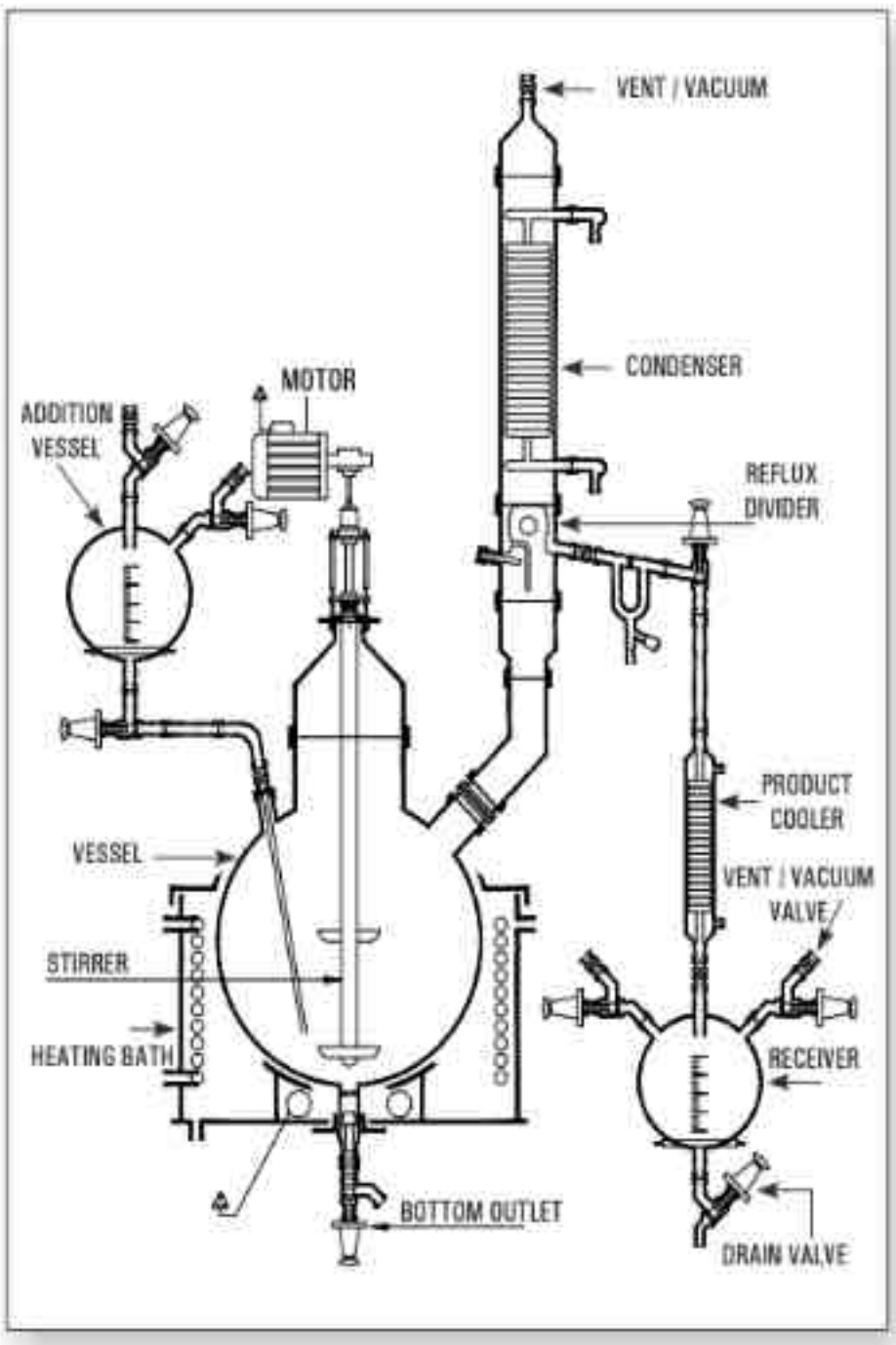
REACTION UNIT

This unit is used for carrying out reactions under stirred condition and with provision for simple reflux distillation.

The reaction vessel is mounted in a heating bath and fitted with addition vessel, motor-driven stirrer and provision for condensation with refluxing. The product is sub-cooled and collected in a receiver.

The units are available in vessel sizes of 20, 50, 100, 200, 300 & 500 L and is suitable for operation under atmospheric pressure and full vacuum.

Unit Cat.Ref	Reactor Capacity	Bath KW	Addition Vessel	Vapour Line	Condenser HTA M^2	Cooler HTA M^2	Receiver Size
RDU20	20 L	4.0	2 L	80 DN	0.35	0.10	5 L
RDU50	50 L	6.0	5 L	100 DN	0.50	0.20	10 L
RDU100	100 L	9.0	10 L	150 DN	1.50	0.35	20 L
RDU200	200 L	12.0	20 L	150 DN	1.50	0.35	20 L
RDU300	300 L	18.0	20 L	225 DN	2.50	0.50	20 L
RDU500	500 L	24.0	50 L	300 DN	4.00	0.70	50 L



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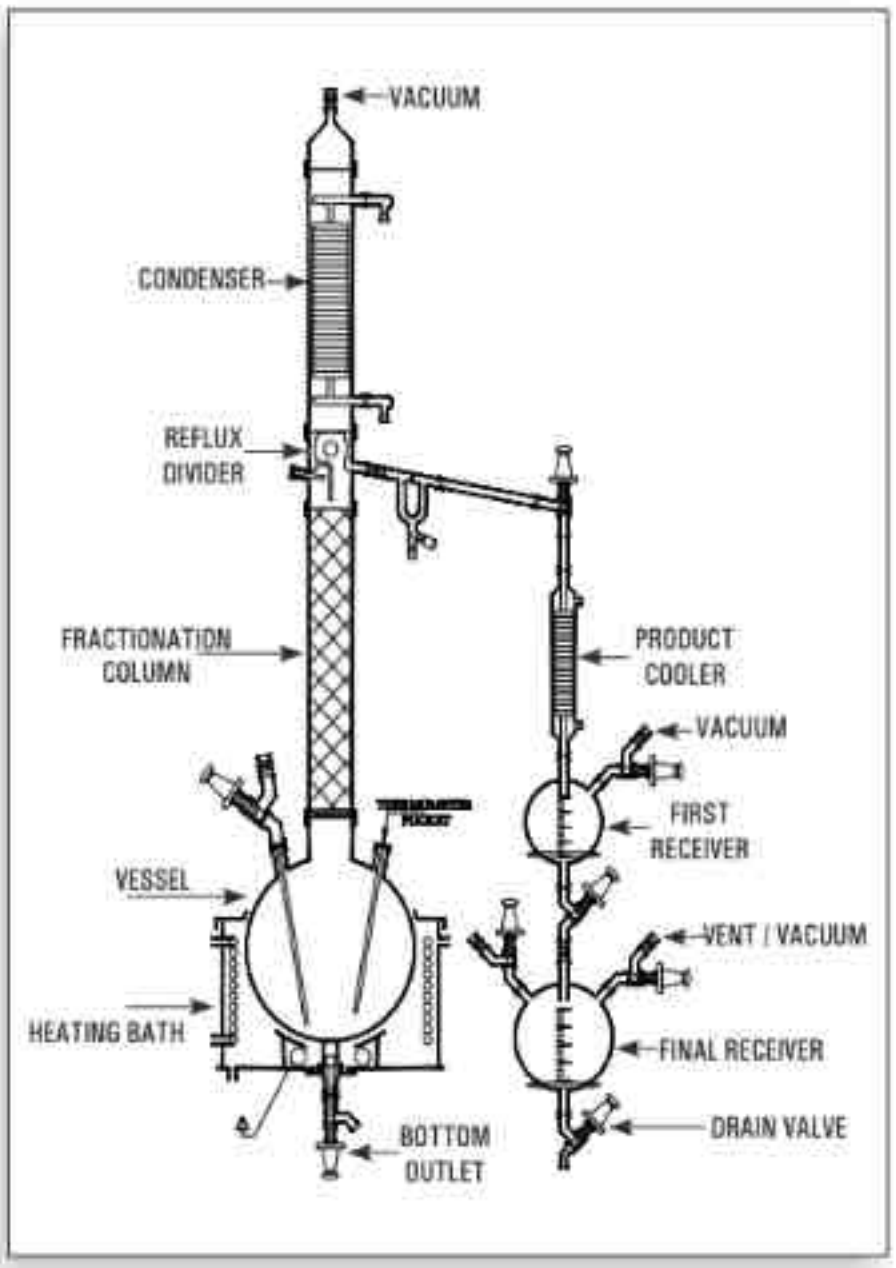
STANDARD UNITS

FRACTIONAL DISTILLATION UNIT



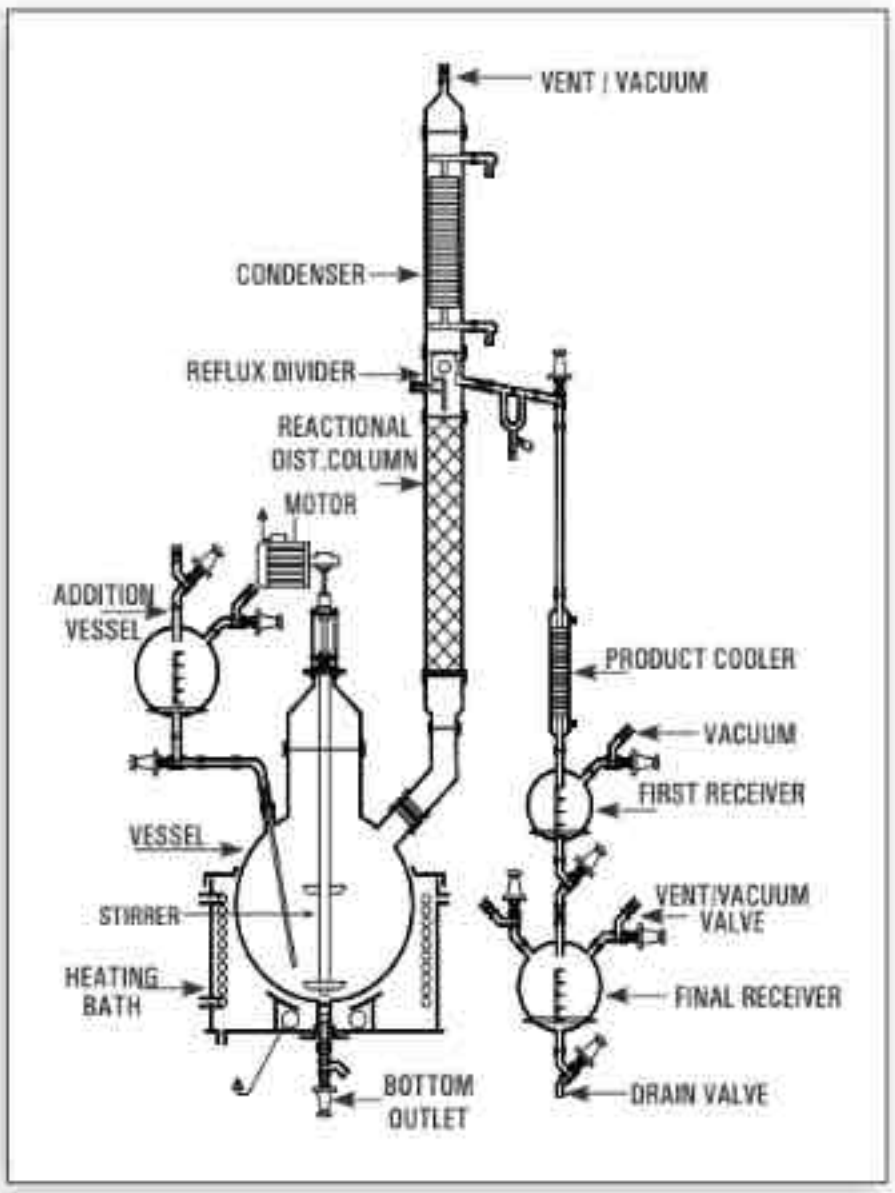
This is essentially a compact batch-type fractional distillation unit in which the reboiler consists of a vessel mounted in a heating bath and with a packed column above. The vapours from top is condensed and can be refluxed as per requirement.

The top product is sub-cooled and collected in receivers. The bottom product is finally drained from the reboiler through a drain valve.

The units are available in vessel sizes of 20, 50, 100, 200, 300 & 500 L and is suitable for operation under atmospheric pressure and full vacuum

Unit Cat.Ref	Reactor Capacity	Bath KW	Vapour Line	Condenser HTA M^2	Cooler HTA M^2	Receiver Size
FDU20	20 L	4.0	80 DN	0.35	0.10	2L , 5L
FDU50	50 L	6.0	100 DN	0.50	0.20	5L , 10L
FDU100	100 L	9.0	150 DN	1.50	0.35	10L , 20L
FDU200	200 L	12.0	150 DN	1.50	0.35	20L , 20L
FDU300	300 L	18.0	225 DN	2.50	0.50	20L , 20L
FDU500	500 L	24.0	300 DN	4.00	0.70	20L , 50L

REACTION DISTILLATION UNIT



This is a versatile unit and can be used as Reaction Distillation Unit, Fractional Distillation Unit or a combination of both. All features of Reaction Distillation Unit and Fractional Distillation Unit are incorporated.

The units are available in vessel sizes of 20, 50, 100, 200, 300 & 500 L and is suitable for operation under atmospheric pressure and full vacuum.

Unit Cat.Ref	Reactor Capacity	Bath KW	Addition Vessel	Vapour Line	Condenser HTA M^2	Cooler HTA M^2	Receiver Size
FRU20	20 L	4.0	2 L	80 DN	0.35	0.10	2L, 5L
FRU50	50 L	6.0	5 L	100 DN	0.50	0.20	5L, 10L
FRU100	100 L	9.0	10 L	150 DN	1.50	0.35	10L, 20L
FRU200	200 L	12.0	20 L	150 DN	1.50	0.35	10L, 20L
FRU300	300 L	18.0	20 L	225 DN	2.50	0.50	20L, 20L
FRU500	500 L	24.0	50 L	300 DN	4.00	0.70	50L, 50L

STANDARD UNITS

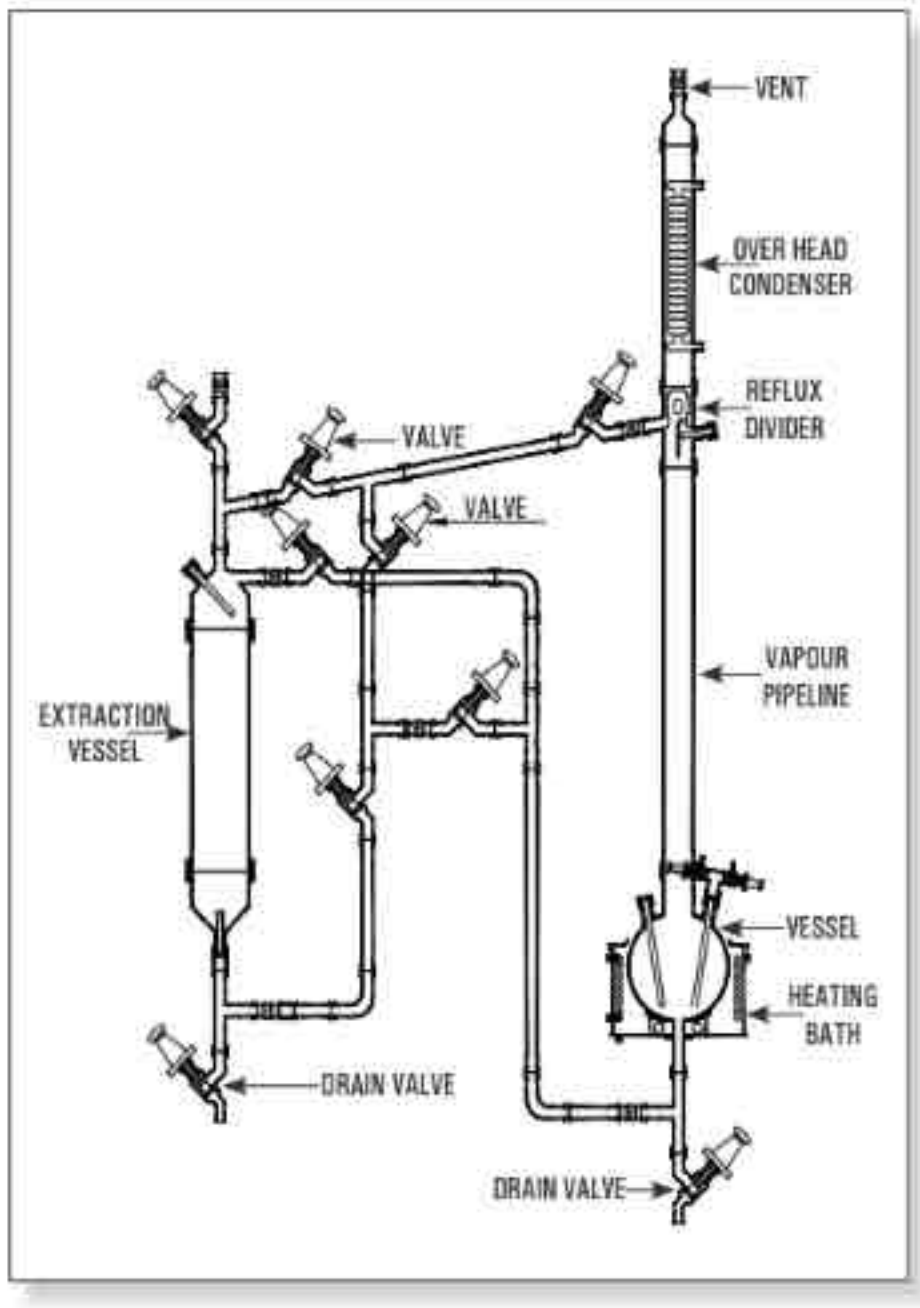
LIQUID-LIQUID EXTRACTION UNIT

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 20, 50, 100, 200 & 300 L and is suitable for operation under atmospheric pressure.

Unit Cat.Ref.	Reactor Capacity	Bath KW	Vapour Line	Extraction Vessel	Condenser M^2
LLU10	10 L	3.00	40mmx1m	10 L	0.35
LLU20	20 L	4.00	50mmx1m	20 L	0.50
LLU50	50 L	6.00	80mmx1m	50 L	1.50
LLU100	100 L	9.00	100mmx1m	100 L	1.50
LLU200	200 L	12.00	150mmx1m	200 L	2.25
LLU300	300 L	18.00	225mmx1m	300 L	4.00



SOLID-LIQUID EXTRACTION UNIT

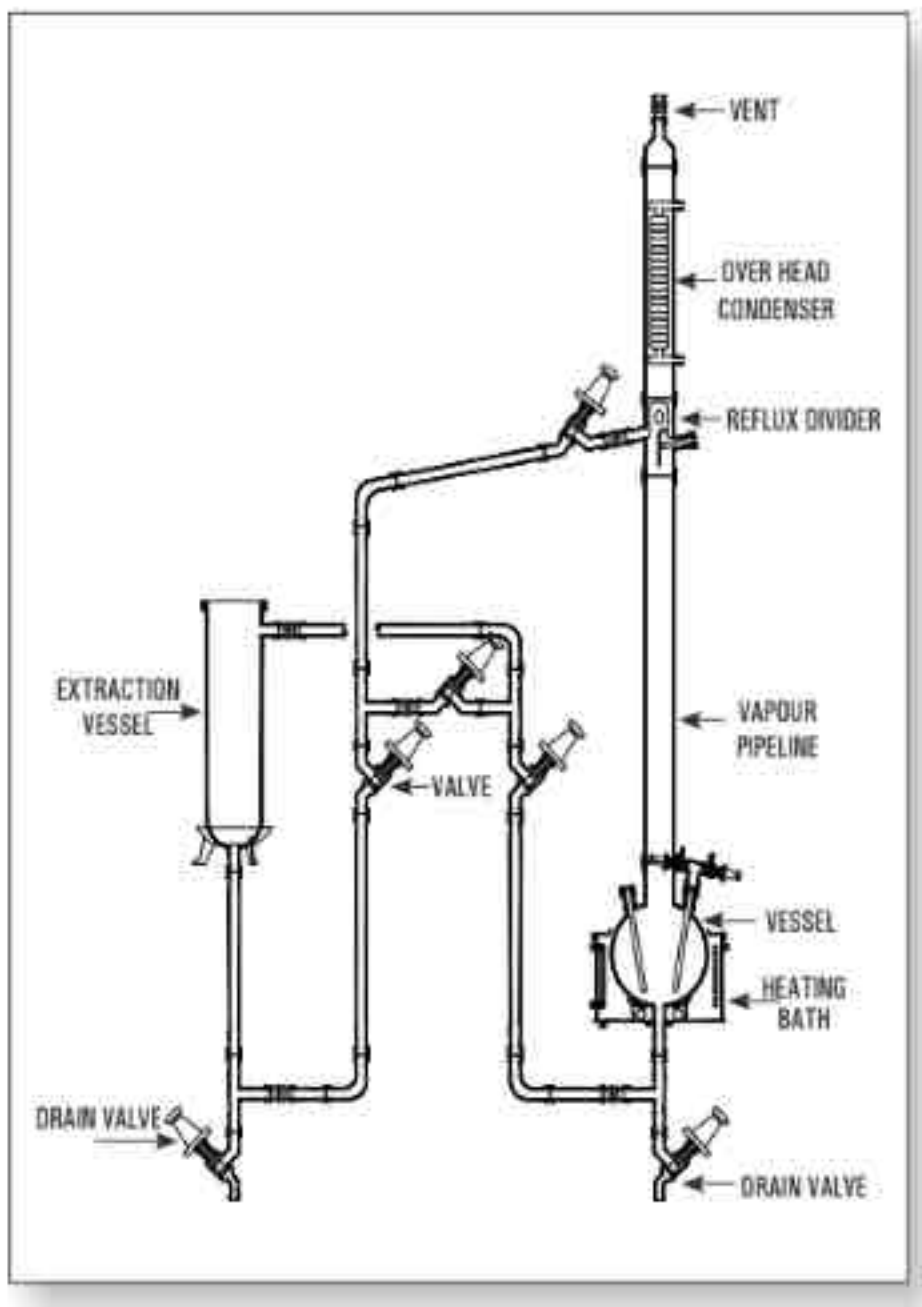
This operation involves preferential solublising of one or more soluble constituents (solutes) of a solid mixture by a liquid solvent. The unit described here is for a semi-batch operation.

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 20, 50, 100, 200 & 300 L and is suitable for operation under atmospheric pressure.

Unit Cat. Ref.	Reactor Capacity	Bath KW	Vapour Line	Extraction Vessel	Condenser M^2
SLU10	10 L	3.00	40mmx1m	10 L	0.35
SLU20	20 L	4.00	50mmx1m	20 L	0.50
SLU50	50 L	6.00	80mmx1m	50 L	1.50
SLU100	100 L	9.00	100mmx1m	100 L	1.50
SLU200	200 L	12.00	150mmx1m	200 L	2.25
SLU300	300 L	18.00	225mmx1m	300 L	4.00



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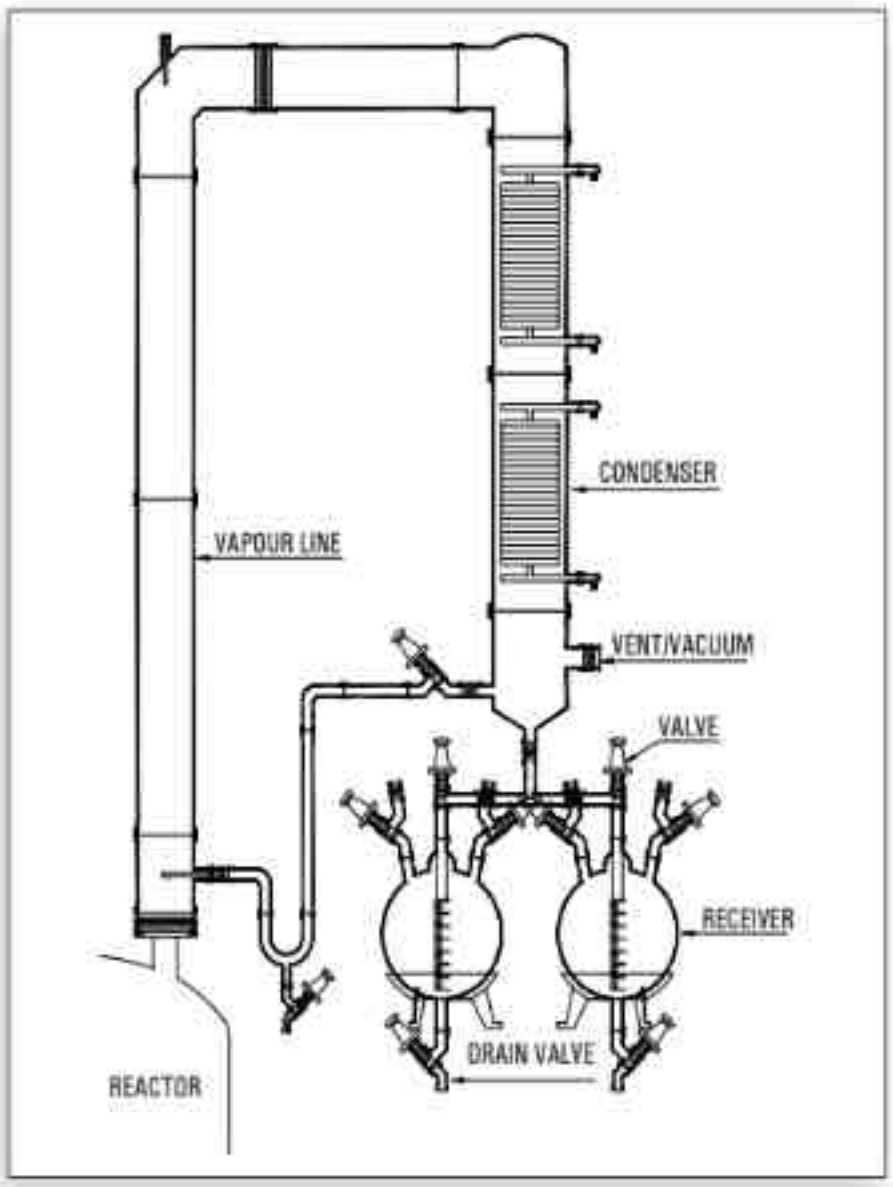
STANDARD UNITS

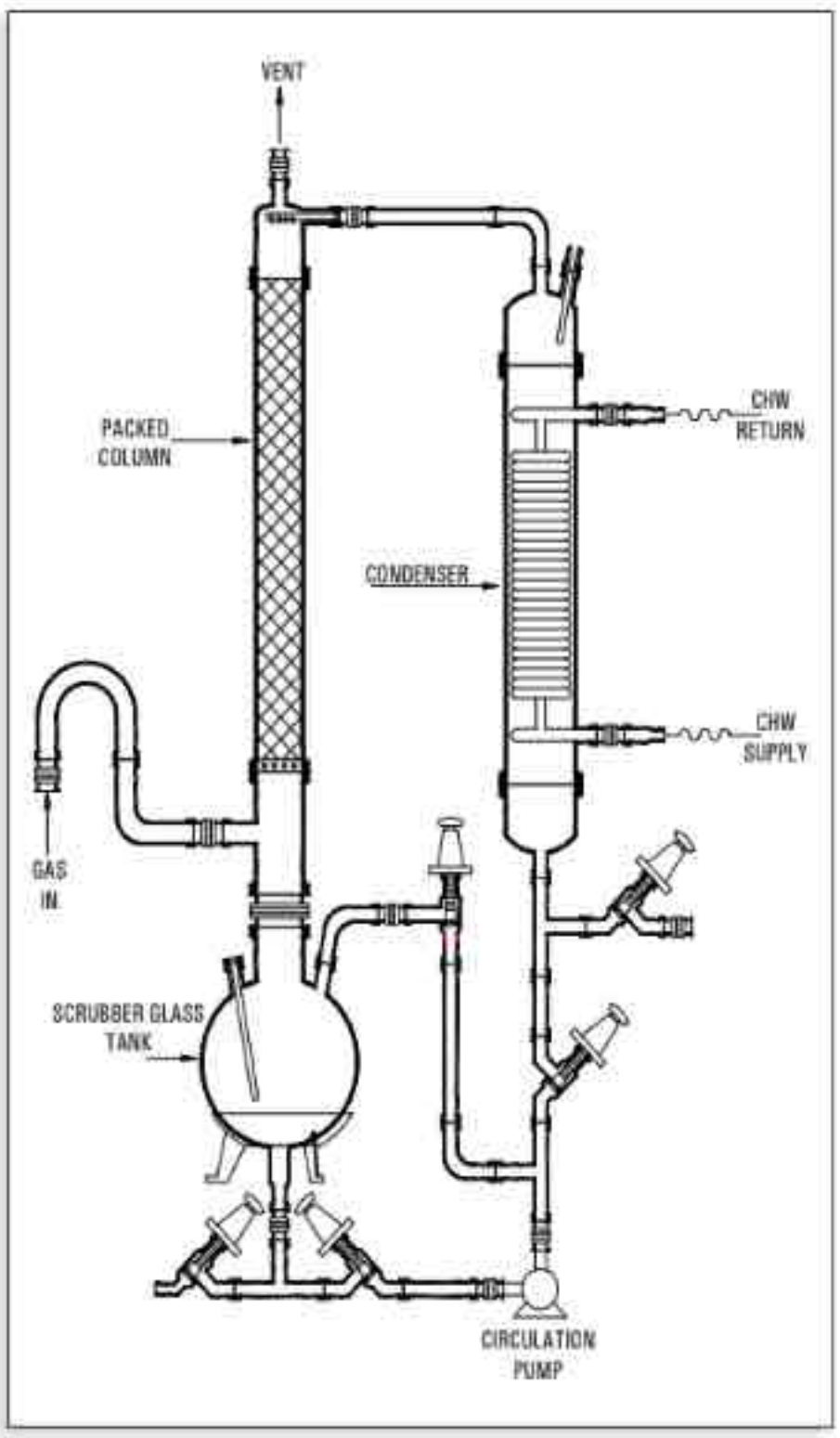
ASSEMBLIES OVER GLASS LINED REACTOR



Glass Lined Reactors are used instead of glass reactors specially when scale of operation is large and relatively high pressure steam is to be used as heating media. Quite often assemblies like Simple Distillation Unit, Reaction Distillation Unit, Fractional Distillation Unit etc. are installed above glass lined reactors. The basic features of these assemblies remain the same but glass shell and tube heat exchanger is preferred due to large scale of operation. A typical fractional distillation unit type assembly over GLR is shown in adjacent figure.

Cat.Ref.	Reactor Cap.	Vapour column	Condenser HTA M^2
GRU 250	250 L	80mmX1.5m	1.5X2
GRU 500	500 L	100mmX2m	1.5X2
GRU 1000	1000 L	100mmX2m	2.5X2
GRU 2000	2000 L	150mmX3m	2.5X3
GRU 3000	3000 L	150mmX2m	4.0X2

GAS SCRUBBER



Goel offer Pilot Plant Gas Scrubber for various gases likes HCl, Cl2, SO2, Br2, HBr, NOx etc or any other corrosive gases. These scrubbers use the media as water / Aq. NaOH / any other suitable solvent which can neutralise the exhaust gases. Our Pilot plant scrubber are ranging from 20L vessel capacity to 500L vessel capacity and scrubber diameter from 80DN to 300DN.

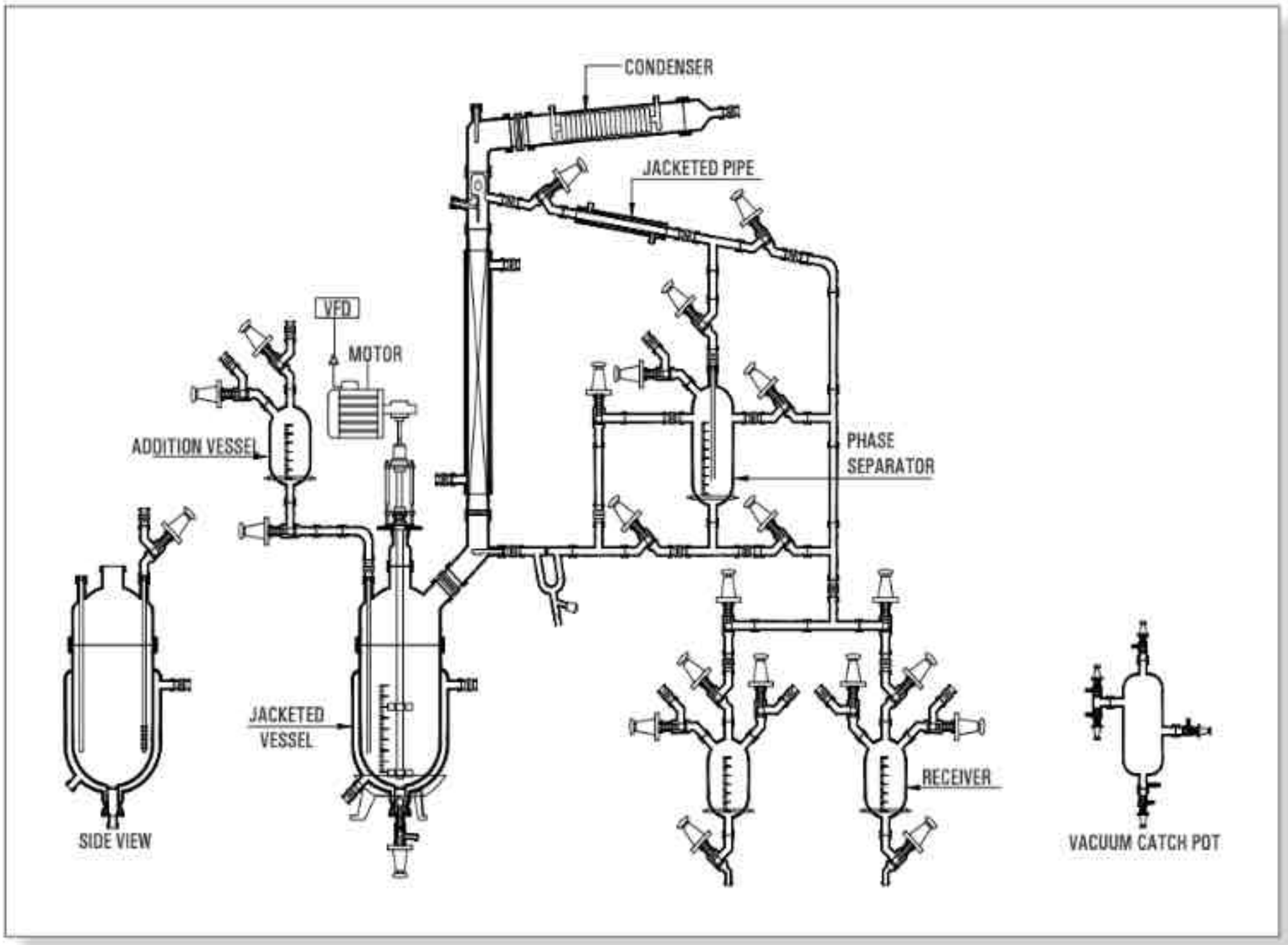
We can also design and offer big size scrubber in Glass up to 800DN (i.e. 400/450/600/800DN). Our scrubber will be having inbuilt Cooler to remove the heat of absorption. We also offer mini Blower of PP/FRP on request along with the Pilot Plant Scrubber.

Pilot Plant Gas scrubber are mainly used in pharmaceutical, chemical, refinery & other industries. Glass scrubber offer process visibility as well as excellent corrosion resistance. Being a Glass Scrubber pressure drop across the scrubber will be minimized.

Cat.Ref.	Size	Vessel	Condenser (M^2)
PGS3	80DN	20 L	0.5
PGS4	100DN	50 L	1.5
PGS6	150DN	100 L	2.5
PGS8	200DN	200 L	5
PGS12	300DN	300 L	8

STANDARD UNITS

MULTI PURPOSE UNIT



G Goel Offer multipurpose pilot plant for chemical and pharmaceutical industries for process development, scale-up, process simulation and kilo-scale cGMP production in batch and semi-batch operation. The pilot plant used for chemical processing includes solid charging, liquid charging, reaction, heating / cooling, rectification, auto / manual reflux arrangement, layer separation, product cooler, vacuum catch pot, vacuum header etc.

G The multipurpose pilot plant designed in such a way that we can modify the same easily as per process requirement.

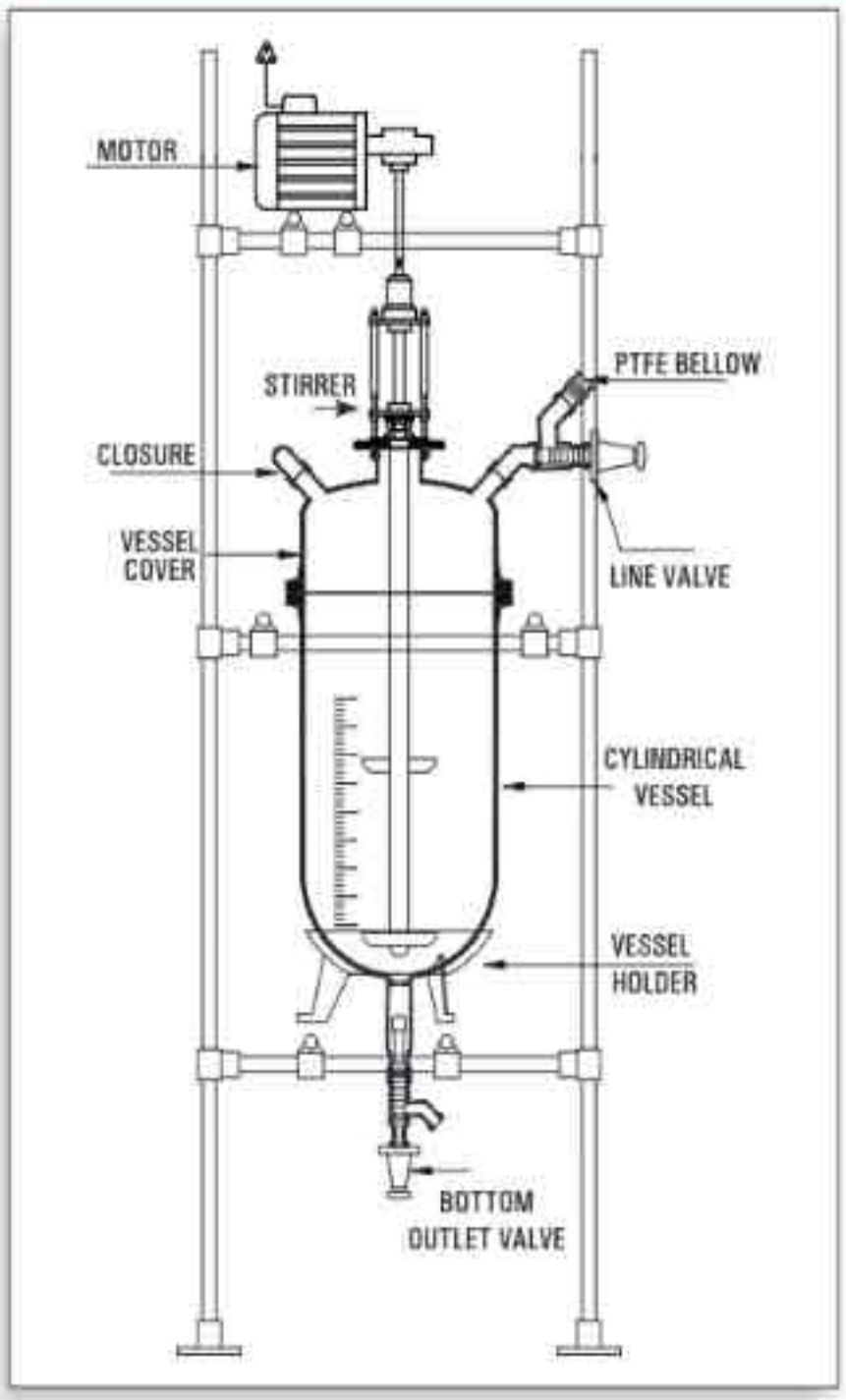
Available with

G Jacketed full glass reactor/ Cylindrical full glass reactor with Oil heating cooling bath / Spherical full glass reactor with Oil heating cooling bath
G Multipurpose glass distillation overhead
G Stainless steel / MS epoxy coated / MS painted frame supporting
G Flame proof / Non flame proof / cGMP / non GMP models available
G Excellent corrosion resistant.
G Temp. Controller.
G Gas purging, solid charging / multi liquid addition.
G Vacuum / exhaust piping
G Additional feeders / receivers
G Solid feeding

Unit Cat. Ref.	Reaction Capacity	Bath KW	Addition Vessel	Vapour Line	Condenser HTA (M^2)	Cooler HTA (M^2)	Receiver Size
MPU 20	20 L	4.0	2 L	80 DN	0.35	0.10	2L, 5L
MPU 50	50 L	6.0	5 L	100 DN	0.50	0.20	5L, 10L
MPU 100	100 L	9.0	10 L	150 DN	1.50	0.35	10L, 20L
MPU 200	200 L	12.0	20 L	150 DN	1.50	0.35	10L, 20L
MPU 300	300 L	18.0	20 L	225 DN	2.50	0.50	20L, 20L
MPU 500	500 L	24.0	50 L	300 DN	4.00	0.70	50L, 50L

STANDARD UNITS

MOBILE'MIXING SYSTEM

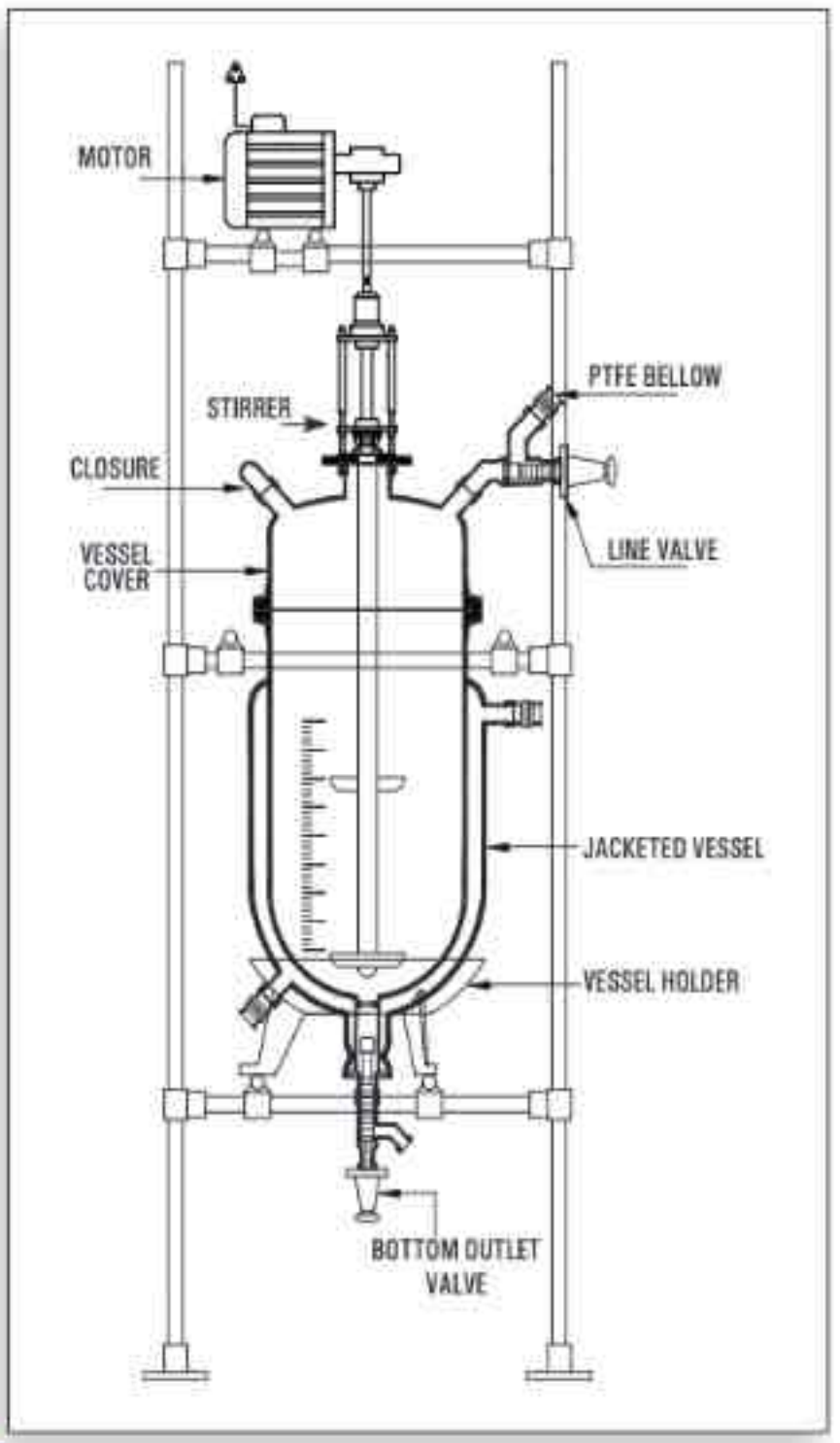


Cylindrical Miixng Reactor

Glass Reactors are ideally used for wide applications in laboratory, pilot plant & for small-scale production. They reduce the need for investment in permanent installations & also reduce the pressure & temperature losses resulting from pipeline installation.

These reactors are available with spherical shape & in cylindrical shape. These reactors are also available in cylindrical jacketed form.

Cat.Ref.	Vessel Ref.	Nominal Cap.(l)
CGR 20	VZ 20/12	20
CGR 50	VZ 50/16	50
CGR 100	VZ 100/18	100
CGR 150	VZ 100/18	150
CGR 200	VZ 200/18	200
CGR 300	VZ 300/24	300



Jacketed Mixing Reactor

The systems are available with different options, depending upon their size & their utility. Our Technical Department will glad to assist you in finding a suitable solution for your process requirement.

1. Stirrer Drive: Non-Flameproof or Flameproof Motor, 192 RPM with speed regulator.
2. Stirrer material of construction: Glass or PTFE Lined.
3. Stirrer shape: Glass Impeller Stirrer with PTFE Blades, Vortex Stirrer, propeller stirrer & anchor stirrer.
4. Stirring Assembly: Stirring Assembly with bellow seal or with mechanical seal.
5. Supporting Structure : Carbon Steel, Epoxy coated Carbon Steel, Stainless Steel 304 & Stainless Steel 316. All structure are available in Trolley mounted form.
6. Closing Valve: Drain Valve or Flush Bottom Outlet Valve.

Cat.Ref.	Vessel Ref.	Nominal Cap.(l)
JGR 5	VZD 5/6	5
JGR 10	VZD 10/9	10
JGR 20	VZD 20/12	20
JGR 30	VZD 30/12	30
JGR 50	VZD 50/16	50

STANDARD UNITS

ESSENTIAL OIL DISTILLERS

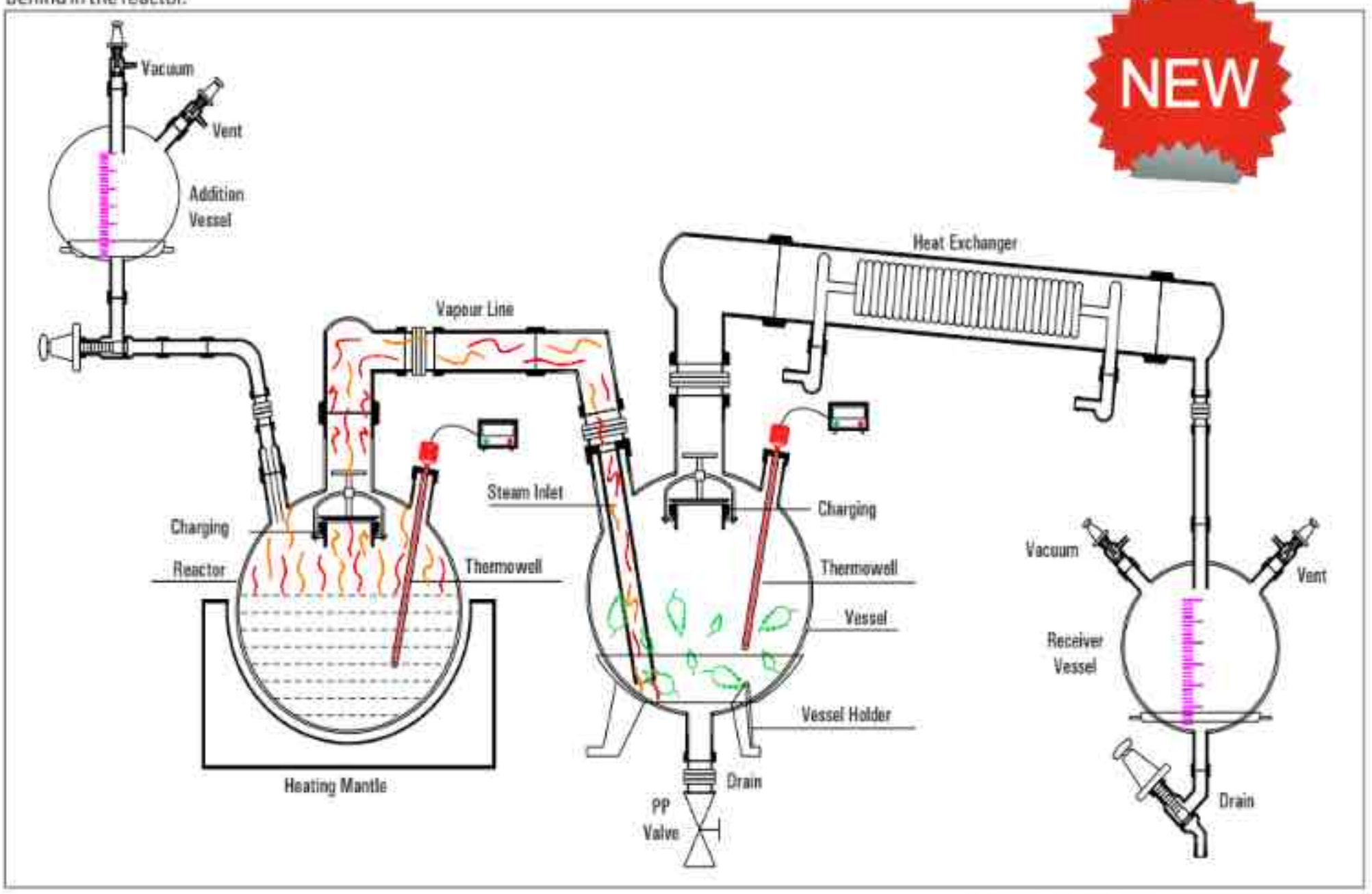
An essential oil is a concentrated hydrophobic liquid containing volatile (easily evaporated at normal temperatures) chemical compounds from plants. Essential oils are also known as volatile oils, ethereal oils, aetherolea, or simply as the oil of the plant from which they were extracted.

Essential oils are generally extracted by distillation, often by using steam. We provide two modes through which one can produce essential oils viz. Steam Distillation Unit & Vacuum Distillation Unit.

1. Steam Distillation Unit

The units are available in vessel sizes of 10, 20, 50, 100 & 200 L and is suitable for operation under atmospheric pressure and full vacuum.

Steam distillation as a whole is a separation process which consists of distilling water together with other volatile and non-volatile components. The water is heated up in the spherical vessel separately and the steam from the boiling water goes into the reactor where it reacts with the masses of trees and plants and further carries the vapor of the volatiles to a condenser, where both are cooled and return to the liquid or solid state; while the non-volatile residues remain behind in the reactor.



Unit Cat.Ref.	Reactor Capacity	Mantle KW	Addition Vessel	Condenser HTA (M^2)	Receiver Vessel
EOSD 10	10 L	1	5 L	0.35	5 L
EOSD 20	20 L	1.8	5 L	0.50	5 L
EOSD 50	50 L	3.6	20 L	1.50	20 L
EOSD 100	100 L	5.4	20 L	1.50	20 L
EOSD 200	200 L	8.1	50 L	2.25	50 L

2. Vacuum Distillation Unit

Vacuum distillation is a distillation performed under reduced pressure, which allows the purification of compounds not readily distilled at ambient pressures or simply to save time or energy. This technique separates compounds based on differences in boiling points. This technique is used when the boiling point of the desired compound is difficult to achieve or will cause the compound to decompose. A reduced pressure decreases the boiling point of compounds. The steam from the boiling water carries the vapor of the volatiles to a condenser, where both are cooled and return to the liquid or solid state; while the non-volatile residues remain behind in the boiling container.

Unit Cat.Ref.	Reactor Capacity	Mantle KW	Addition Vessel	Condenser HTA (M^2)	Receiver Vessel
EOVD 10	10 L	1	5 L	0.35	5 L
EOVD 20	20 L	1.8	5 L	0.50	5 L
EOVD 50	50 L	3.6	20 L	1.50	20 L
EOVD 100	100 L	5.4	20 L	1.50	20 L
EOVD 200	200 L	8.1	50 L	2.25	50 L

STANDARD UNITS

AGITATED GLASS NUTSCHE FILTER/ PEPTIDE SYNTHESIZER

Agitated Glass Nutsche Filter is a closed vessel designed to separate solid and liquid by filtration under vacuum. The closed system ensures odourless contamination free and non-polluting working conditions maintaining product purity and hygiene. Agitated Nutsche Filters are extensively used in Herbal products, Chemical product development, kilo lab operation,pharmaceutical manufacturing, agro chemical and the food industry.

GENERAL DESCRIPTION

A typical unit consists of a dish shape vessel vessel with a perforated plate. The entire vessel can be kept at the desired temperature by using a mixer / agitator and jacket.It's completely leak-proof for vacuum or pressure service. The base plate is having arrangement of bolting bar to hold the filter cloth. Suitable nozzles can be provided including Manhole and Side discharge nozzle. PTFE Lined Stirrersare used for Agitator shaft and solid PTFE blades are used to take high torque generation during solid discharge and re-slurring operation.Drive assembly consist of Motor with VFD, Mechanical Seal is provided for vacuum application. Borosilicate Glass Vessel with different nozzles, Manual/Hydraulic system is provided for movement of agitator as well as bottom plate. PTFE Filter Support Plate.

PROCESS STEPS OF AGITATED NUTSCHE FILTER WITH AGITATOR :

1) Filtration.
2) Washing of Filter cake.
3) Repeat mix or washing of the cake.
4) Convection drying of the cake.
5) Smoothing with compression of the cake
6) Discharge of the wet or dried cake.

ADVANTAGES OF GLASS NUTSCHE FILTER

- G Vacuum filtration possible.
- G Glass being transparent, offers visibility of processes.
- G Inert gas atmosphere can be maintained.
- G Minimal contamination of the cake.
- G Very high solvent recovery.
- G Solvents are closed systems, so no toxic vapors are let off in the atmosphere.
- G Personal safety is maintained, and heat transfer surfaces can be provided to maintain filtration temperature.

Goel offer Glass ANF from 2 L to 300 L for Kilo Lab Operations with and without jacket , with and without stirrer.

Cat. Ref.	Working Vol (ltr)	Filter area (m2)	Vessel Dia	Vessel height	Moter Capacity HP
ANFD10	10	0.03	225	300	0.25/0.5
ANFD20	20	0.06	360	325	0.5
ANFD50	50	0.12	400	450	0.5
ANFD100	100	0.16	450	700	0.5
ANFD200	200	0.31	600	775	1
ANFD300	300	0.31	600	1150	1

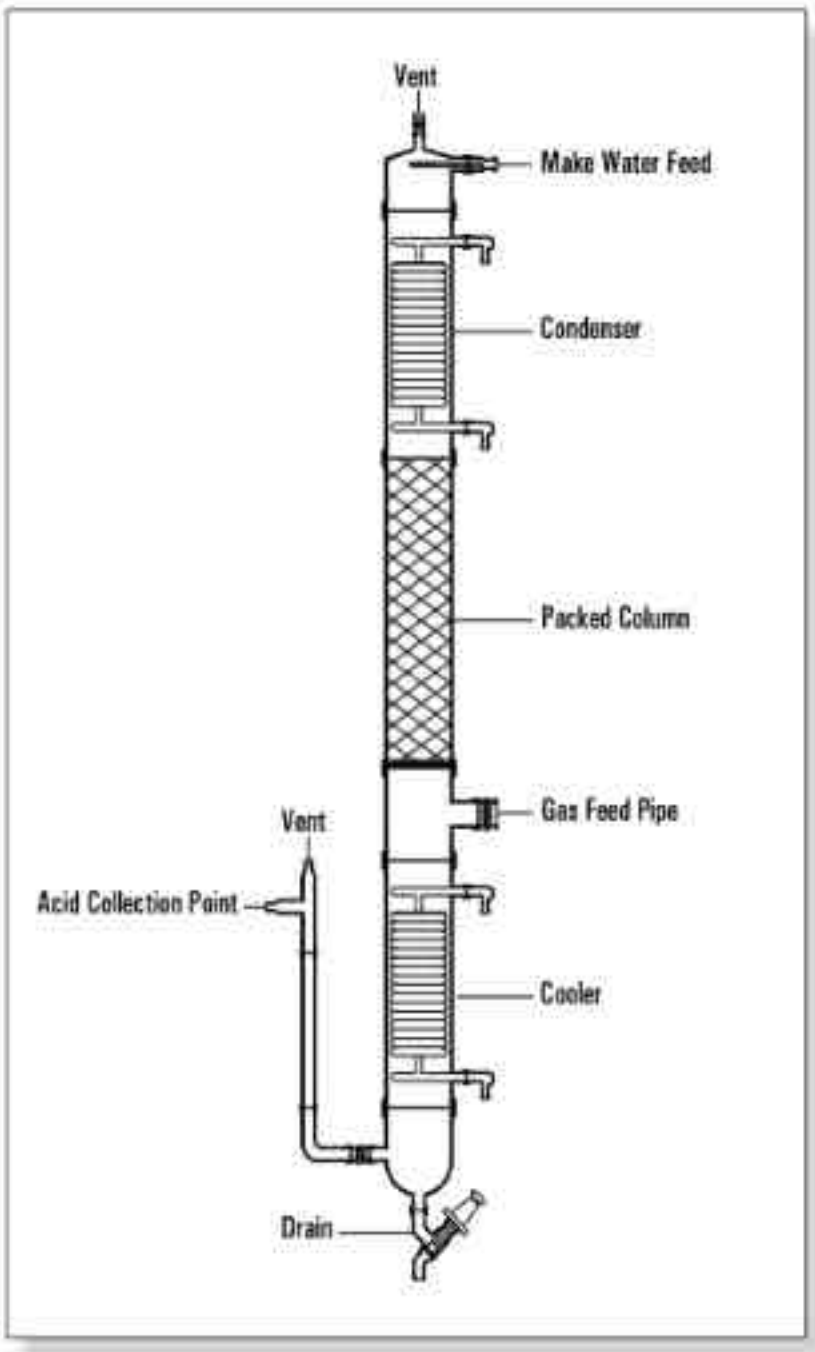
STANDARD UNITS

HCL ADIABATIC ABSORPTION

NEW

HCl absorption columns are used for absorption of Hydrochloric gas, which statutorily are not permitted to vent in to the atmosphere, and to produce the HCl acid. The column is constructed with a series of packed sections, a gas introduction point below that, a condenser on the top, and a cooler at the bottom. Make water is sprayed from the top and acid is collected from the bottom.

HCl absorption column are available in 80DN to 300DN diameter (for the gas rate 10Kgs/hr to 300Kg/hr approx..)



Unit Cat. Ref.	Packed Column	Condenser HTA M²	HCl Gas Rate
HCL3	80mm x 3mtr.	0.35 x 2	10 Kg / Hr.
HCL4	100mm x 4mtr.	0.5 x 2	20 Kg / Hr.
HCL6	150mm x 4mtr.	1.5 x 2	60 Kg / Hr.
HCL9	225mm x 4.5mtr.	2.5 x 2	150 Kg / Hr.
HCL12	300mm x 4.5mtr.	4.0 x 2	300 Kg / Hr

LAB GLASS REACTOR

We have a variety of vessel option to choose from our standard range. Beside the manufacturing of our Standard Vessels / Rectors, we specialize in producing reactors as per customer's requirement.

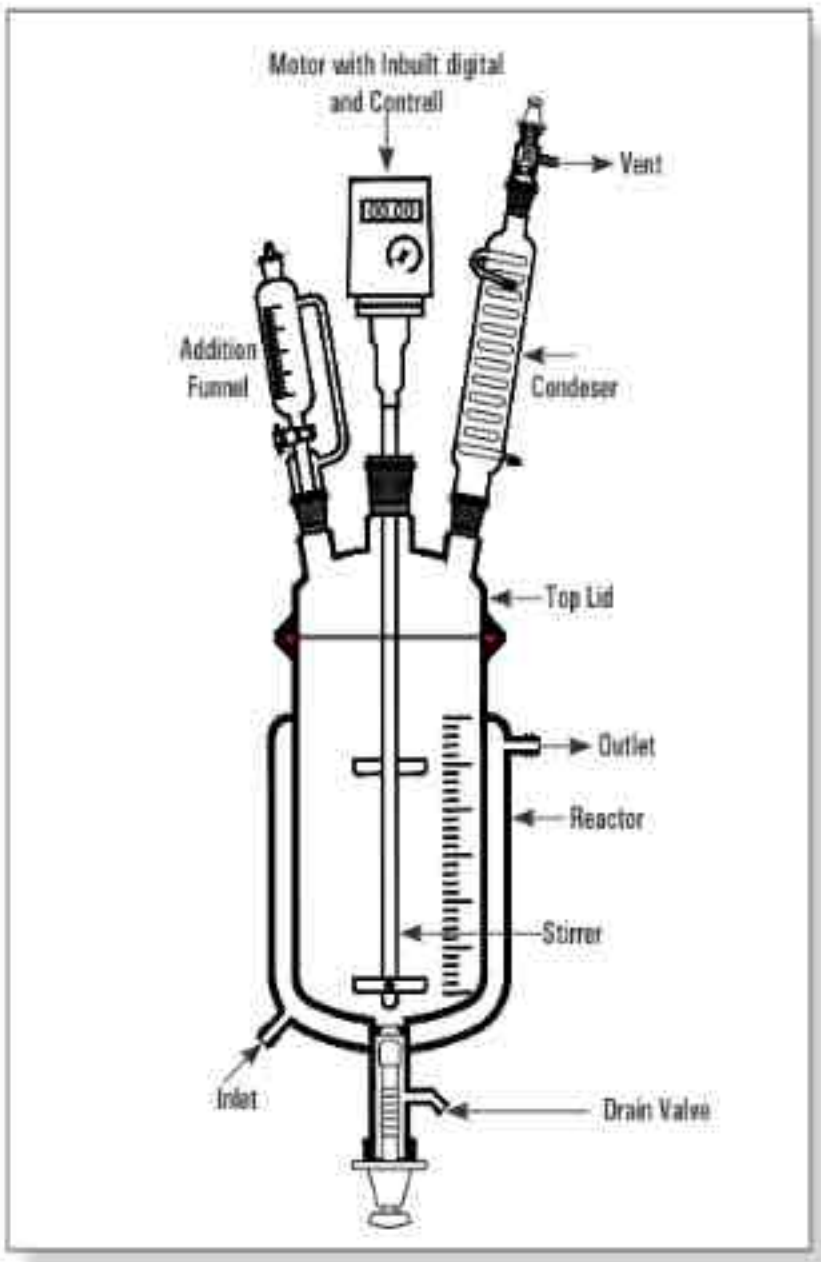
Reactor Options: Single Wall, Double wall or Triple Wall Glass Reactor

Operating Conditions :-
Temperature: -50°C up to 180°C
Pressure : Full vacuum up to 0.5 bar
Capacities : 100 ml L up to 10 L

Salient Features

- Glass Reactors made from Germany Raw Material.
- Lab Reactor system suitable for most benchtop fume hoods.
- Stirrer with suitable mechanical seal/stuffing box/magnetic seal.
- Skid Mounted and quick release clamp for easy installation & removable of glassware.
- Suitable for vacuum condition
- Flush bottom with minimum dead volume.
- Overhead Stirrer geared motor with built-in speed controller & display. Measurement Marking on the vessel.
- Interchangeable Stirrer anchor, propeller, turbine Digital temperature indicator.

Optional
Hot water/oil circulator, Chiller, heating /Cooling system ,Vacuum Pump, PH probe with transmitter, Pressure Gauge.



Unit Cat.Ref.	Reactor Cap(L)	Gear Motor with Inbuilt Digital Indicator	Addition Funnel	Condenser Length	L x B x H
LJR 1L	1 Ltr. (100DN)	Speed 40 - 400 RPM	250ml	200mm	250 x 250 x 900
LJR 2L	2 Ltr. (100DN)	Speed 40 - 400 RPM	500ml	300mm	250 x 250 x 1350
LJR 3L	3 Ltr. (100DN)	Speed 40 - 400 RPM	500ml	400mm	250 x 250 x 1450
LJR 5L	5 Ltr. (150DN)	Speed 40 - 400 RPM	1000ml	500mm	350 x 350 x 1450
LJR 10L	10 Ltr. (200DN)	Speed 40 - 400 RPM	2000ml	600mm	400 x 400 x 1700