Down Flow Gas Contactor

Presentation by Jyoti Palekar

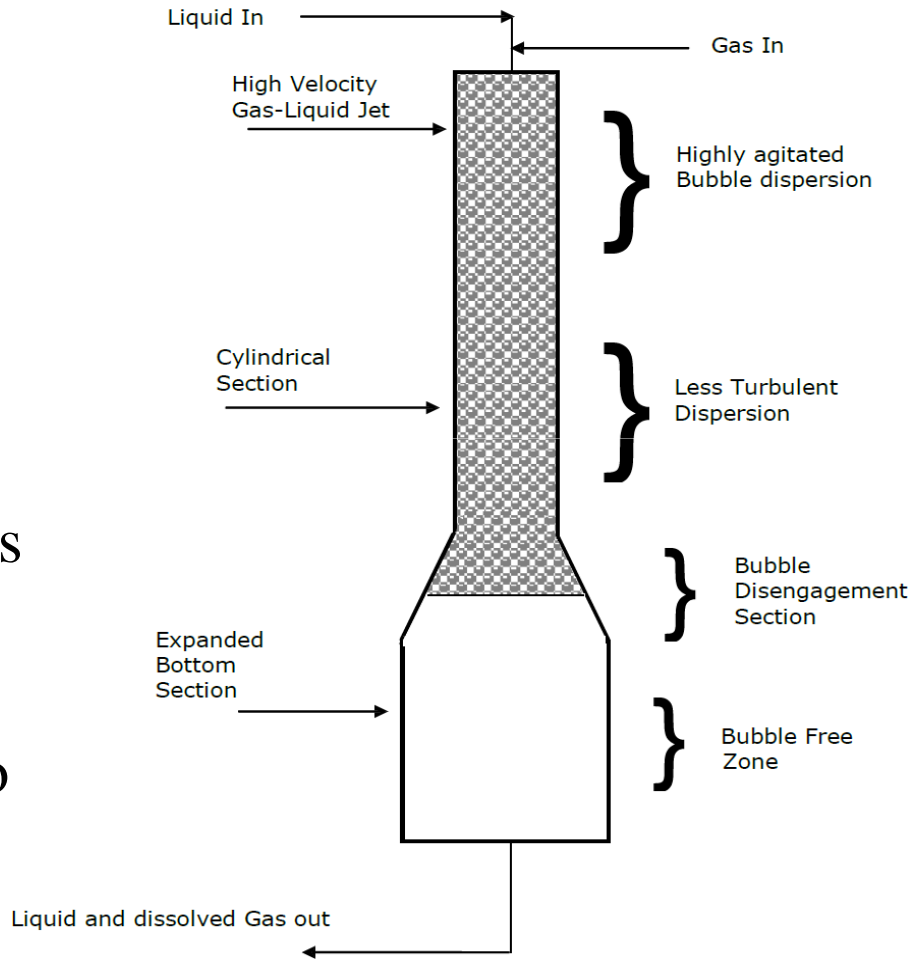
Why DGC ?

What is DGC ?

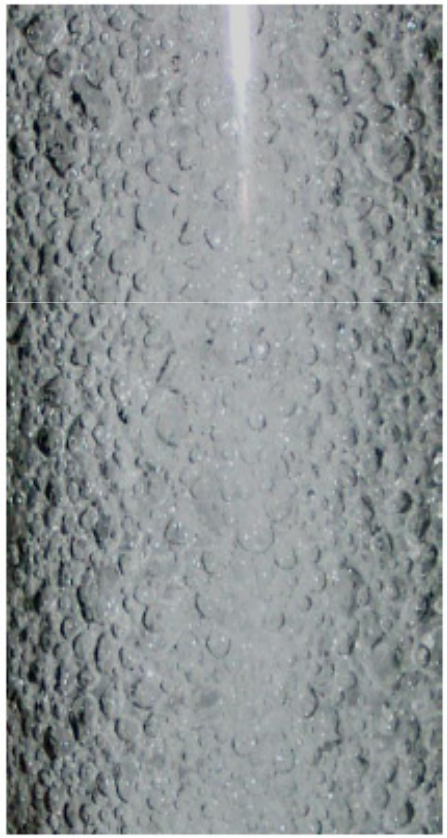
DGC is a Co-current Down flow Reactor providing the most efficient Mass Transfer System for Gas Liquid Contact

Downflow Gas Contact Reactor

- Consists of Column Reactor.
- Downward Co-current flow of Gas and Liquid – through specially designed entry section.
- Shear created at interface provides effective gas-liquid mixing: allows mass transfer operations to approach equilibrium in very short contact time.



Bubble Dispersion in DGC



DGC Reactor – A snapshot	
Gas Utilisation	Close to 100%
Gas/liquid mass transfer area	1000 – 6000 m2/m3
Volumetric Mass Transfer Coefficient	0.2 – 12 kLa
Internal Moving parts	Absent
Scale-up (without loss in efficiency)	Easy
Engineering and Fabrication costs	Low as the system can be fabricated in India. Only top nozzle of DGC will be imported
Design	Simple/ Compact /Flexibility
Environmental Applications	Gas absorption (Biogas enhancement, EO treatment, Air Stripping of VOCs/ Solvents etc) Waste water treatment DGC for Wet air oxidation process- effluent / sludges Activated sludge treatment Fermentation
Operation Mode	Batch/continuous mode
Operating volume	Smaller
Tolerance to particulates	high solid content
Modifications	Can be modified to incorporate UV, Ozone, O_2/ UV/ TiO_2 etc.

Industrial Applications

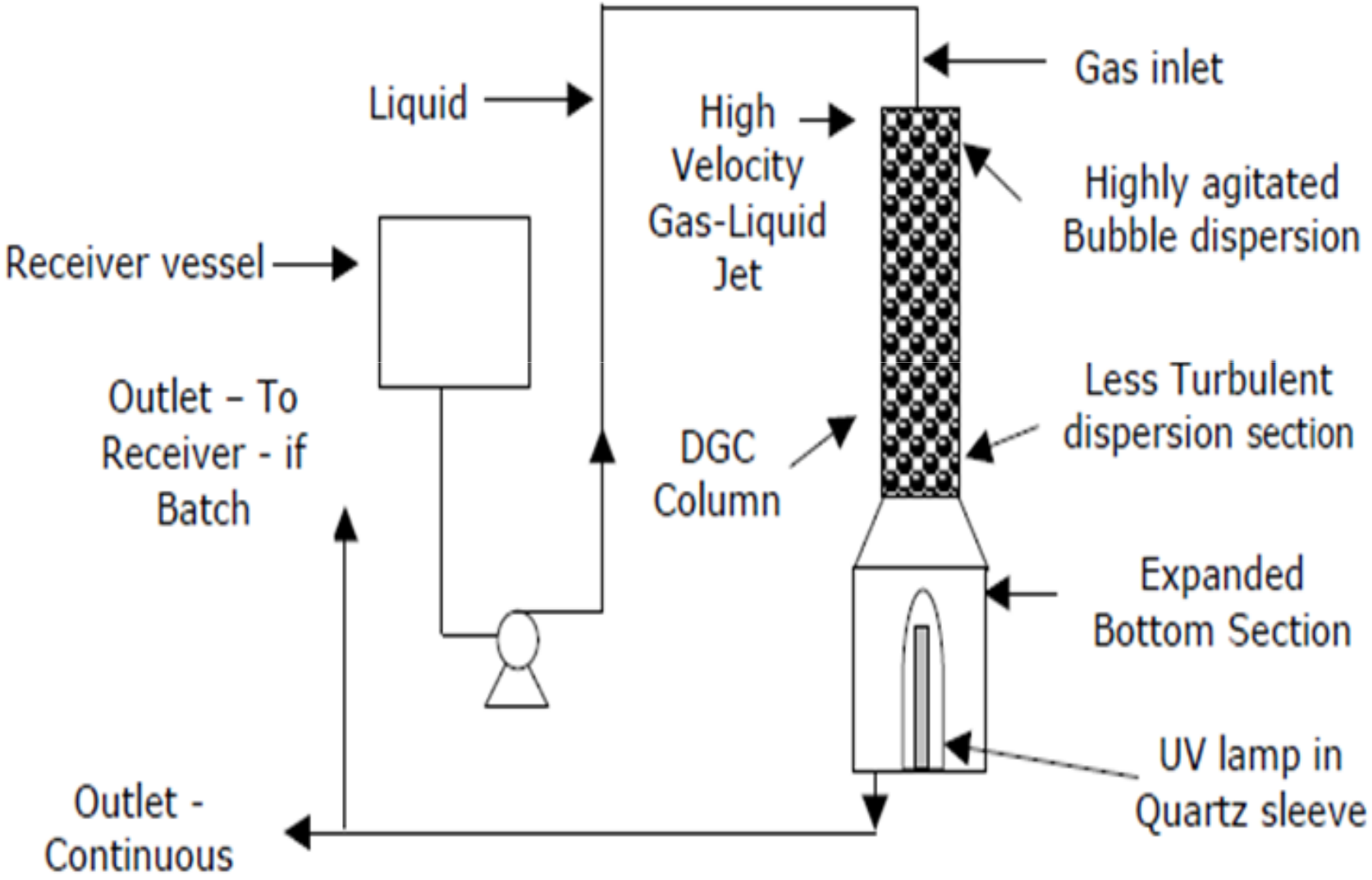
- GAS ABSORPTION
- EFFLUENT TREATMENT
- CHEMICAL REACTIONS


CO2-LIQUID PROBE
CO2-LIQ MONITOR
POWER CONTROL BOX
DGC-COLUMN REACTOR
CO2-GAS PROBE
PC
GLASS RECIEVER-ATMOSPHERIC
FLOWMETERS
DATA LOGGER
SS RECIEVER-PRESSURE
CO2 – GAS DATA LOGGERS
AIR COMPRESSOR
PUMP

Case Study - CO_2 Capture from Biogas

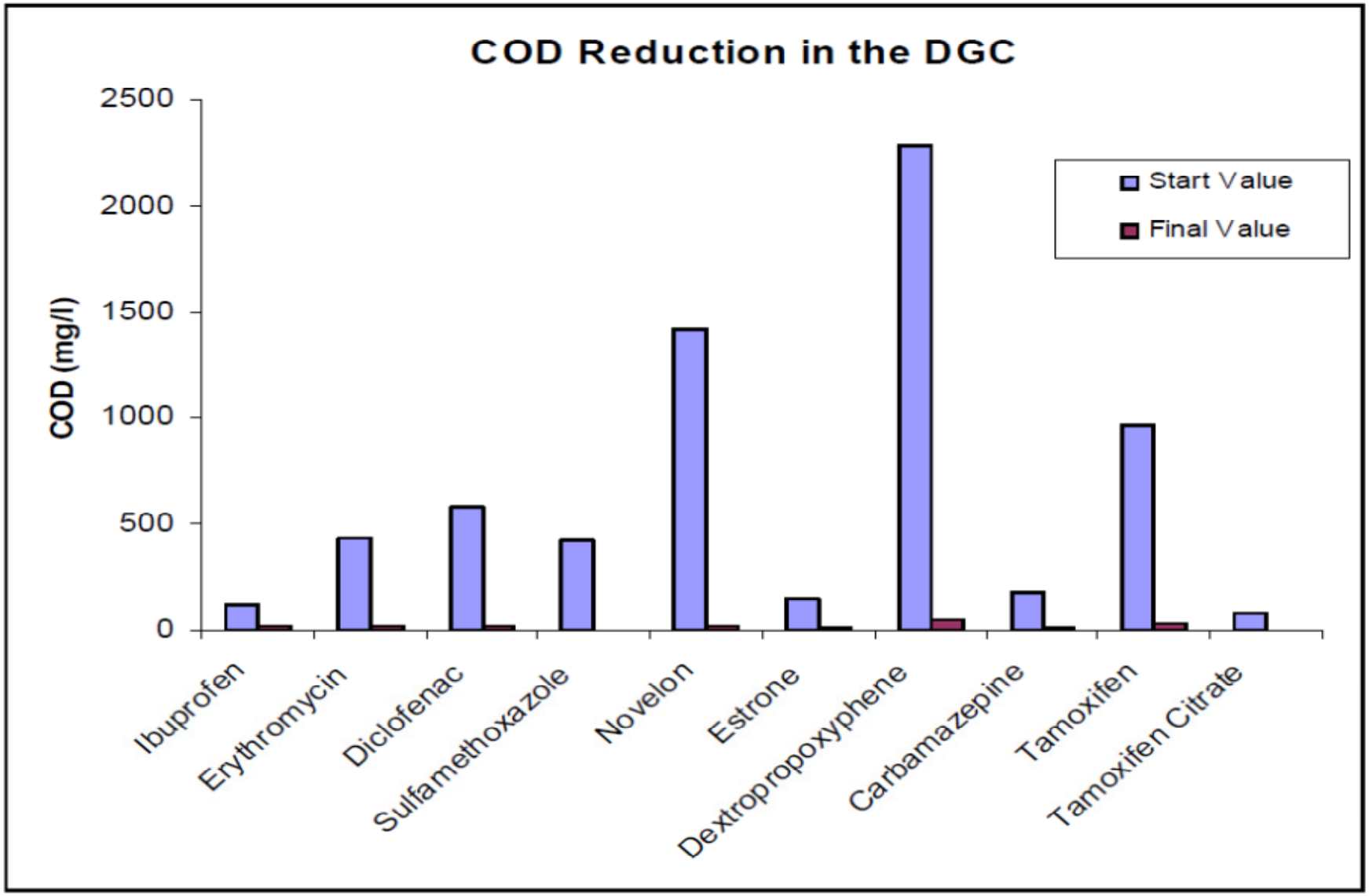
Media Composition	60% Biogas, 38% CO2, 2% H2S
Media Used	Sea salt NaOH + Water Na_2CO_3+Water+MethylEthylamine Sea water
Liquid Flow Rate	10-15 L/min
Gas Flow Rate	1-3 L/min
Pressure	1-4.5 bar
Inlet CO_2 in Air	38%
Outlet CO_2 in Air	2-8 %

DGC for Waste water Treatment Application



CASE STUDY- PHARMACEUTICAL WASTEWATER TREATMENT

UV Lamp	2.0kw
Flow Rate	10 L/min
Gas Flow Rate (O_2 flow rate)	0.05 L/min
Temperature	33^0C
Pressure	0-8 bar
Operating Mode	Batch
Volume Of DGC Reactor	17 Litre
Batch Volume	15 Litre
Residence time in DGC	1.5 min
Contact time	O_2- 42 sec UV- 36 sec



COD reduction in DGC

DGC Advantages

- Lower power consumption
- Smaller operating volumes
- No foaming
- Close 100% Gas utilisation
- High and accurate control of interfacial areas
- Simple, compact and flexibility of design
- No internal moving parts
- Lower capital and operating costs
- Higher gas hold ups
- Tolerance to particulates
- Ease of scale-up with no loss of efficiency
- Ease of automation and control
- Low engineering and fabrication costs

Wide application of DGC technology in waste treatment will include:

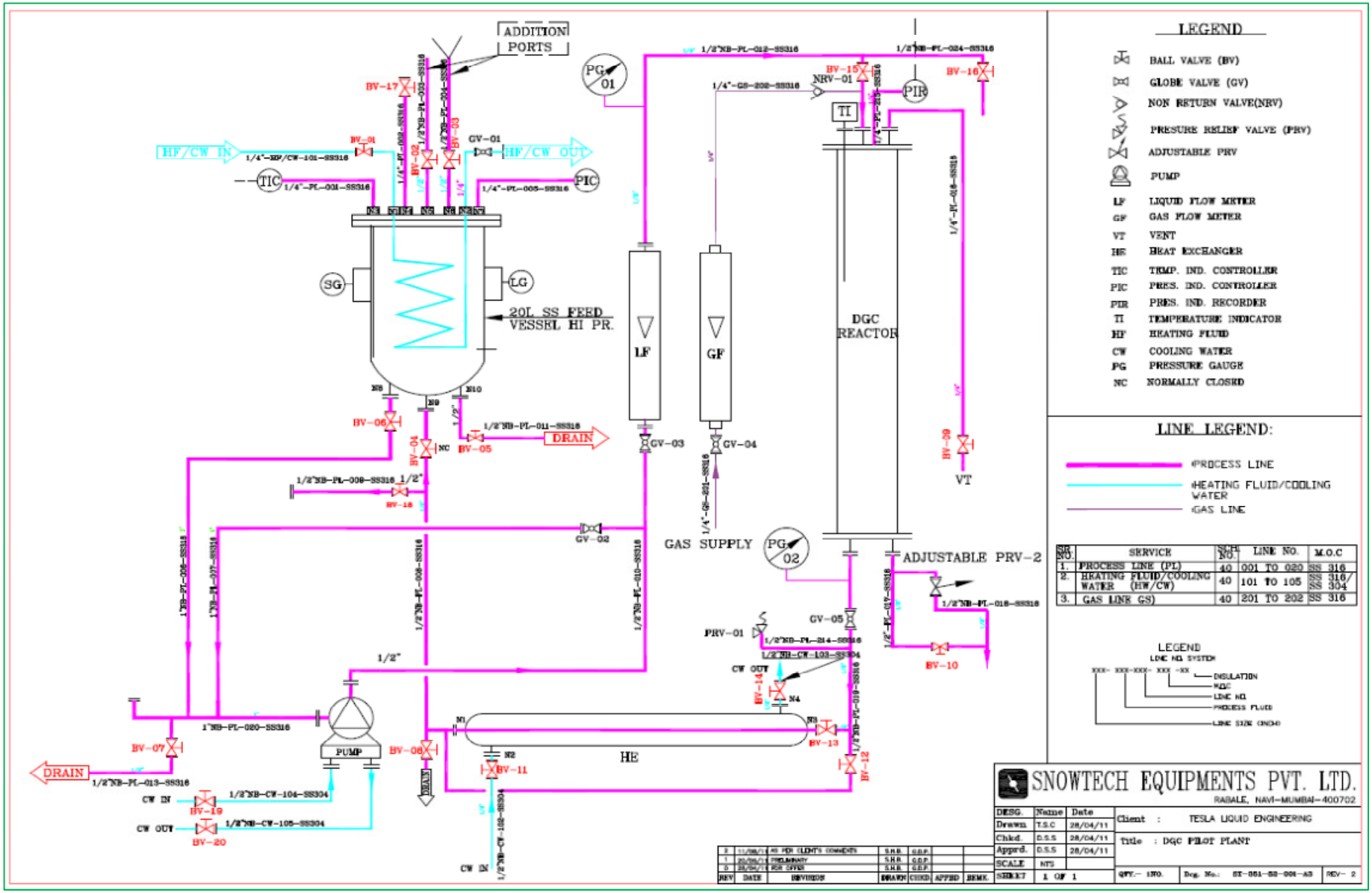
- Treatment of effluents from pulp and paper industry, Pharmaceutical effluents, spent caustic from refineries, pesticide effluents, dye industry and cyanide containing effluents eg. steel, electroplating industries.
- Treatment of landfill leachates
- DGC can be used for biological treatment process from achieving the effective transfer of oxygen.

- For biogas enhancement – increasing the methane content of biogas
- Reducing the carbon footprint by Carbon capture from flue gas- power plants, iron ore industry
- Capture and degradation of gaseous pollutants such as ethylene oxide without scrubbing and generating liquid effluents.
- Minimisation of sludge from wastewater treatment plant

GAS ABSORPTION

- Gas-Liquid contacting devices are widely used in the chemical industry for absorbing gases into liquids and solvents
- Conventional devices range from stirred vessels to packed beds and bubble columns
- Most devices employ up flow mode of gas flow with relatively low gas hold ups
- Problems with conventional technologies include gas disengagement, coalescence and back mixing problems
- Gas pockets are also formed causing safety problems

DGC Pilot Plant P&ID



Thank You