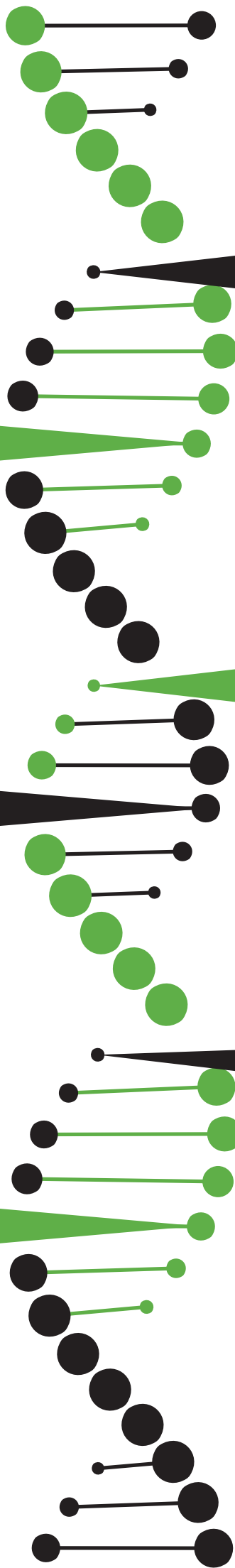




# BIOPROCESS ENGINEERING



**BIOREACTORS**

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**FERMENTERS**

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**TANGENTIAL  
FLOW FILTRATION SYSTEM**

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**PROCESS VESSELS**

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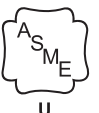
**FILTRATION SKIDS**

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**CIP/SIP SYSTEMS**

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**BIOKILL SYSTEMS**







# BIOREACTOR

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Bioreactors are designed to meet all process requirements for culture of mammalian cells for production of vaccines, biosimilars and other biopharmaceutical products.

- Designed for batch, fed batch and continuous mode of operation.
- Capacity range of 10L to 10,000L.
- Fixed Bed Bioreactors with Integrated Media Feed Vessels for anchor dependent cells, with perfusion.
- Fully automated or semi-automated models.
- Bottom or Top driven Agitator (Double Mechanical Seal or Magnetic Seal) with combination of Rushton Turbine and Segment Blade Impellers for best mixing and optimal gas transfer in a shear sensitive environment.
- Accurate control of process parameters like Temperature, Pressure, pH, DO, etc.
- Retractable sensors for pH and O<sub>2</sub>.
- Automated control loops for pH (by alkali/CO<sub>2</sub> addition), DO, Foam, Level and Back Pressure.
- Provision of Peristaltic Pumps for aseptic addition of reagents or through feed control valve for accurate transfer during perfusion.
- Resterilisable Sampling Valve and Flush Bottom Valve. Tandem design Flush Bottom Valve for sterile transfers.



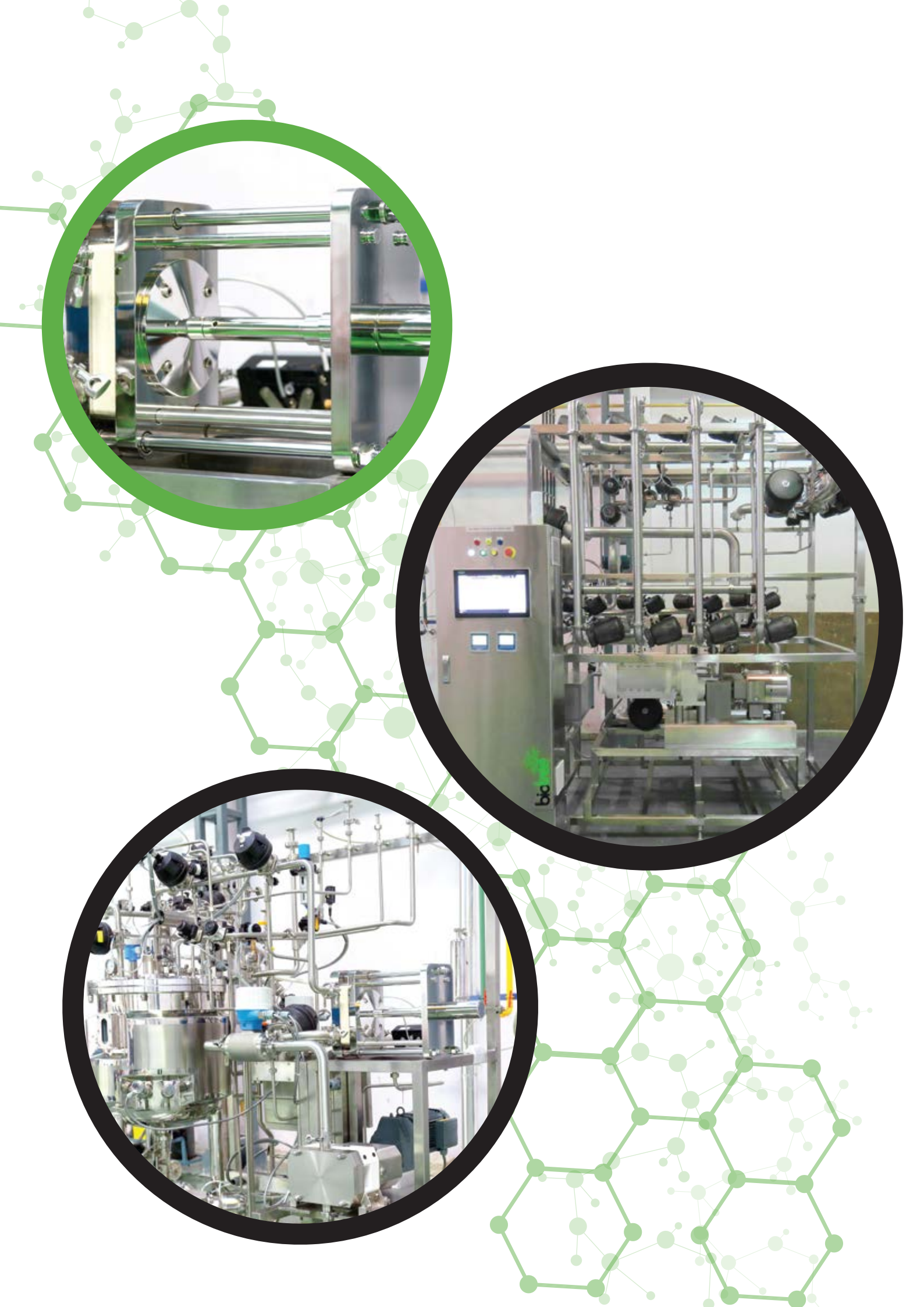


# FERMENTER

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Fermenters are designed to meet all process requirements for culture of microorganisms to achieve maximum growth and productivity.

- Designed for batch, fed batch and continuous mode of operation.
- Capacity range of 10L to 10,000L.
- Fully automated or semi-automated models.
- All critical lines and points are monitored during sterilization.
- Bottom or Top driven Agitator (Double Mechanical Seal or Magnetic Seal) with Rushton Turbine Impellers for high tip speeds and better KLa.
- Accurate control of process parameters like Temperature, Pressure, pH, DO, etc.
- Retractable sensors for pH and O<sub>2</sub>.
- Automated control loops for pH (by acid/alkali addition), DO, Foam, Level and Back Pressure.
- DO control through air, oxygen, agitator and nutrient feed.
- Feed addition through precise flow control valves for accuracy of feeding.
- Resterilisable zero dead leg valves for Sampling and Flush Bottom Valve. Flush Bottom Valve with tandem design.





# TANGENTIAL FLOW FILTRATION SYSTEMS

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The TFF systems are designed for cassette type or hollow fibre membrane filters. Typically used for concentration and diafiltration, they are designed to take filters of various reputed manufacturers. The system can also be designed to fit special filters if required. Systems are available with or without vessel and in both fully automated and semi-automated versions.

- Fluid engineering at its best to protect sensitive proteins.
- Suitable Rotary Lobe Pumps or Diaphragm Pumps to meet exact flow velocity and CIP requirements for the membranes.
- Inbuilt CIP and SIP programs (with or without TFF membranes in place).
- Sensors for process parameters like Pressure, Temperature, Conductivity and Flow Rate for continuous monitoring and control.
- Automatic TMP maintenance throughout via Proportionate Control Valves and Feed pump.
- Special block valve on recovery line to prevent any loss of concentrated product.
- Tulip bottom for high level of concentration.
- Permeate and Retentate lines provided with Proportional Control Valves.
- Conductivity Sensors in mS range for monitoring of process conductivity and  $\mu$ S range for monitoring of conductivity during process and CIP.
- Mass and Magnetic Flow Meters provided depending on requirement.
- Requirements based sensors like pH Sensor, UV Sensor and Turbidity Sensors for continuous monitoring.



# PROCESS VESSELS

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Process vessels are designed for various functions such as media or buffer preparation, inactivation, PEGylation, emulsification, or any other requirement. Instrumentation and automation are provided as per requirement of the process chain. Our tailor-made process vessels are user-oriented and reliable.

- Cleanable- and Sterilizable- In Place.
- Bottom driven magnetic mixer with variable speed control.
- Automatic speed control to prevent dry run of magnetic agitators.
- Accurate level control with staged WFI addition through pilot valve.
- Vessels maybe fixed or mobile with provision of castor wheels.
- Provision of Hoppers for addition of powders for Media Preparation.
- Agitator control for minimum batch mixing volume.
- Resterilisable Sampling and Harvest Valve.





# FILTRATION SKIDS

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Filtration skids are designed for various filtration needs – cell removal, sterile filtration of media, buffer, or process fluid.

- Design permits sterilization of filter and sterile piping independently.
- Provision for cleaning of filter bell during CIP.
- Designed with provision for wetting and integrity testing of filters.
- Special design for vacuum break and cooling with sterile air, post sterilization.
- Code 25 adapters enabling use of any standard filters.
- Can be easily integrated with any process equipment.
- Made of SS 316 L for corrosion free.
- Sterile filtration skids comprise of pre-filter (pore size 0.45um) and final filter (pore size 0.2um).
- Filter Skids range in size from 1Rx6” to 12Rx30”.
- The system is equipped with integrity connectors.
- The system is provided with temperature sensors at drain for monitoring sterilization of filtration skids.





# CIP/SIP SYSTEMS

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We build CIP & SIP stations of high quality and excellent compatibility with engineering standards, to meet the cleansing and sterilising requirements of the process equipment

- System stores the requirements of various process vessels in its memory and activates the specific recipe on demand.
- Available as a combined skid or independent equipment.
- Available with and without return pump. Also available with remote pump.
- Accurate dosing of cleaning agents and temperature control.
- Variable speed pump to ensure cleaning fluid velocity.
- Easy to integrate with other equipment.
- Also available for small mobile vessels, with integrated SIP Stations.
- SIP station fully automated for hands-free SIP of mobile vessels.
- Provision for heating through jacket with plant steam along with an automated temperature control loop.
- Centrifugal Pumps provided for supply of CIP Solution.
- Provision of Flow switch for pump protection.
- Provision of conductivity sensor for controlling the concentration of CIP solution.



# BIOKILL SYSTEMS

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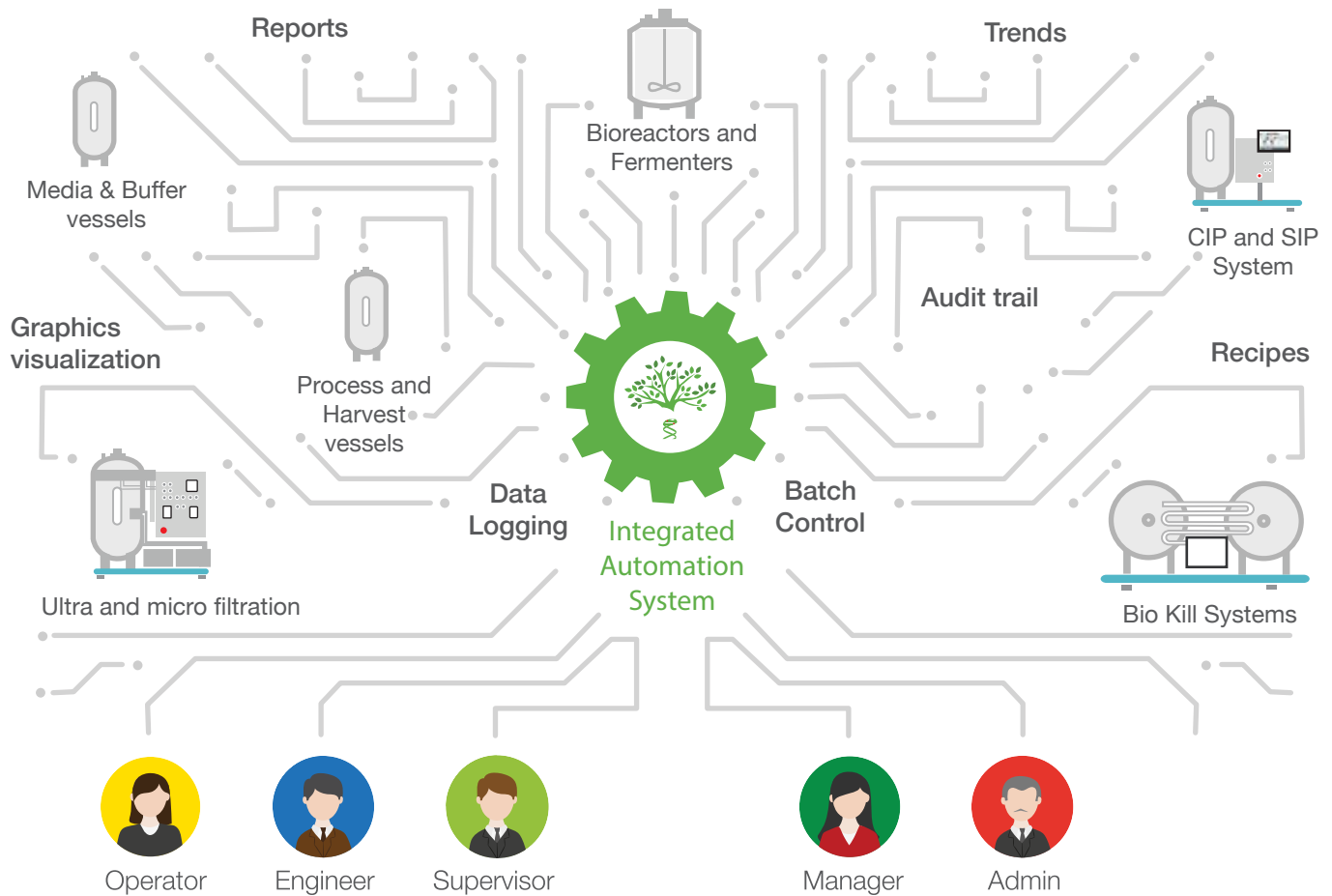
Environmental regulation demands that bio-waste originating from genetically modified organisms or infectious microorganisms must be inactivated by chemical or heat process before discharging into conventional effluent treatment systems. Our Inactivation Systems are equipped for Heat/Chemical Inactivation and can be designed for batch mode or continuous mode of operation.

- Compact system with vertical or horizontal collection tanks.
- Submersible pumps with standby for fail safe operation.
- Continuous Biokill System model available with spiral heat exchanges for energy saving.
- Two tank model recommended for Batch mode of operation.
- In-built CIP provided for Biokill Systems.



# AUTOMATION SOLUTION

We focus on operational flexibility and operator efficiency



- Control System Design
- Automation Architecture
- Software Development
- Installation Support
- Integration (Upstream & Downstream)
- Computer System Validation

## Features



Seamless  
Integration



Remote access  
and troubleshoot



Batch control  
and analyse



Online  
diagnostic



Optimized  
Design

# SERVICES

Biotree offers strategic solutions that is highly optimized and meet stringent industry product development regulations. We build the best bioprocess equipment and automate different processes that are economically and environmentally sustainable. This way we increase efficiency and create value for our clients. We work with some of the world's leading Biotechnology companies and are acknowledged for our creative designs.

## PROCESS CONSULTANCY



We provide expert advice and strategic solutions to turn bioprocess ideas into reality.

Conceptual Design | Basic Engineering  
Detailed Engineering | Automation Solution  
Validation Master Plan

We focus on operational flexibility and operator efficiency.

Control System Design | Automation Architecture  
Software Development | Installation Support | Integration  
(Upstream & Downstream) Computer System Validation



## AUTOMATION SOLUTION

## DESIGN BUILD



We believe in providing tailor-made, exclusive customized solutions to our clients.

Fermenter | Bioreactor | Process Vessel | Buffer & Media Vessel | CIP/SIP System | TFF System | Circulation Tanks  
Filtration Skids | Bio Kill System

We offer validation services to establish IQ, OQ and PQ for all bioprocess equipment.

Validation Master Plan | IQ and OQ Support  
Equipment Validation | Process Validation  
Cleaning Validation



## VALIDATION

## TRAINING



Biotree provides wide range of training and learning opportunities to students and industry personnel in the bioprocess industry.

# OUR GLOBAL FOOTPRINT



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