



HIGH-PERFORMANCE FLOW REACTORS

Our VISION

To be a globally leading provider of innovative, cutting edge products & services, thus empowering clients to achieve enhanced efficiencies, sustainability and technological advancement.



50+

Years of Experience



250+

Expert Team



2500+

Customers Globally



10,000+

Successful Installations



100,000

Sq.ft.

Manufacturing and R&D facility



Our USP

- Expertise of Mechanical, Chemical, Instrumentation Engineering, and Chemistry Under One Roof
- Seamless Scale-Up from Lab to Commercial Scale
- Custom-Built Flow Reactors Tailored for Various Chemistries

Thinking Flow? Think Amar!

Your one-stop-shop for flow technology from concept to commercialization

Overview

- 1 mL to 1000 L flow reactors with throughput up to 10 ton/hr
- In SS316, Hastelloy C, Alloy 20, Incoloy, Titanium, Tantalum-lined, Glass, Silicon Carbide
- Very high heat and mass transfer coefficients
- Lab-to-plant-scale turnkey solutions with pumps, utilities, flow control, safety devices with automation & SCADA software
- Flow chemistry lab for process development

Applications

Homogeneous reactions

Neutralization, amination, dehydration, condensation, dimerization, etc.

Gas-liquid reactions (G-L)

Oxidation, ozonolysis, halogenation, bromination, carbonylation, sulfonation

Liquid-liquid reactions (L-L)

Nitration, diazotization, esterification, amination, sulfoxidation

Gas-liquid-solid reactions (G-L-S)

Aldol condensation, hydrogenation, epoxidation, crystallization, carbonylation

Flow Reactors & Services



MicroFLO™ Reactor	04
MicroFLO™ SiC Reactor	05
CorFLO® Reactor	06
PinchFLO™ Reactor	07
SlurryFLO® Reactor	08
MACFLO™ Reactor	09
Continuous Stirred Tank Reactor (CSTR)	10
PhotoFLO® Reactor	11
OsciFLO™ - Oscillatory Baffled Flow Reactor	12
ElectroFLO - Electrochemical Flow Reactor	13
Continuous L-L Separator and Extractor	14
Agitated Nutsche Filter Dryer (ANFD)	15
Thermostats	16
CogniFLO™: Auto-Optimizer System	17
Scaled-up Flow Reactor Systems	18
Fixed Bed Reactor System	20
Fluidized Bed Reactors	23
Flow Chemistry Process Development Lab	24
Processes Developed	25
Clientele	26

MicroFLO™ Reactor

High-surface-area microreactors: Unmatched thermal control and mass transfer for multiphase exothermic reactions.



Features

- Available in 3D printed as well as plate-type arrangement
- **Volume:** 5 mL to 500 mL
- **Flow Rates:** Up to 100 LPH
- **Pressures:** Up to 100 bar
- **Temperature:** Up to 500°C
- **Material:** SS316, Hastelloy, Titanium, etc.
- Modular design with seamless scale-up
- Suitable for **GMP** manufacturing applications demo

Applications

- Nitration
- Sulfonation
- Diazotization
- Oxidation
- Lithiation
- Grignard reaction
- Turbo-Grignard
- Carbonylation
- Ozonolysis
- Acetylation
- Dehydration
- Amination
- Dimerization
- Esterification

MicroFLO™ SiC Reactor

The MicroFLO™ Silicon Carbide Reactor system is a skid-mounted, plug-and-play unit built with Silicon Carbide to handle highly corrosive chemistries beyond SS316 & Hastelloy C276, with integrated pumps, temperature control, and back-pressure regulation.



Technical Specifications

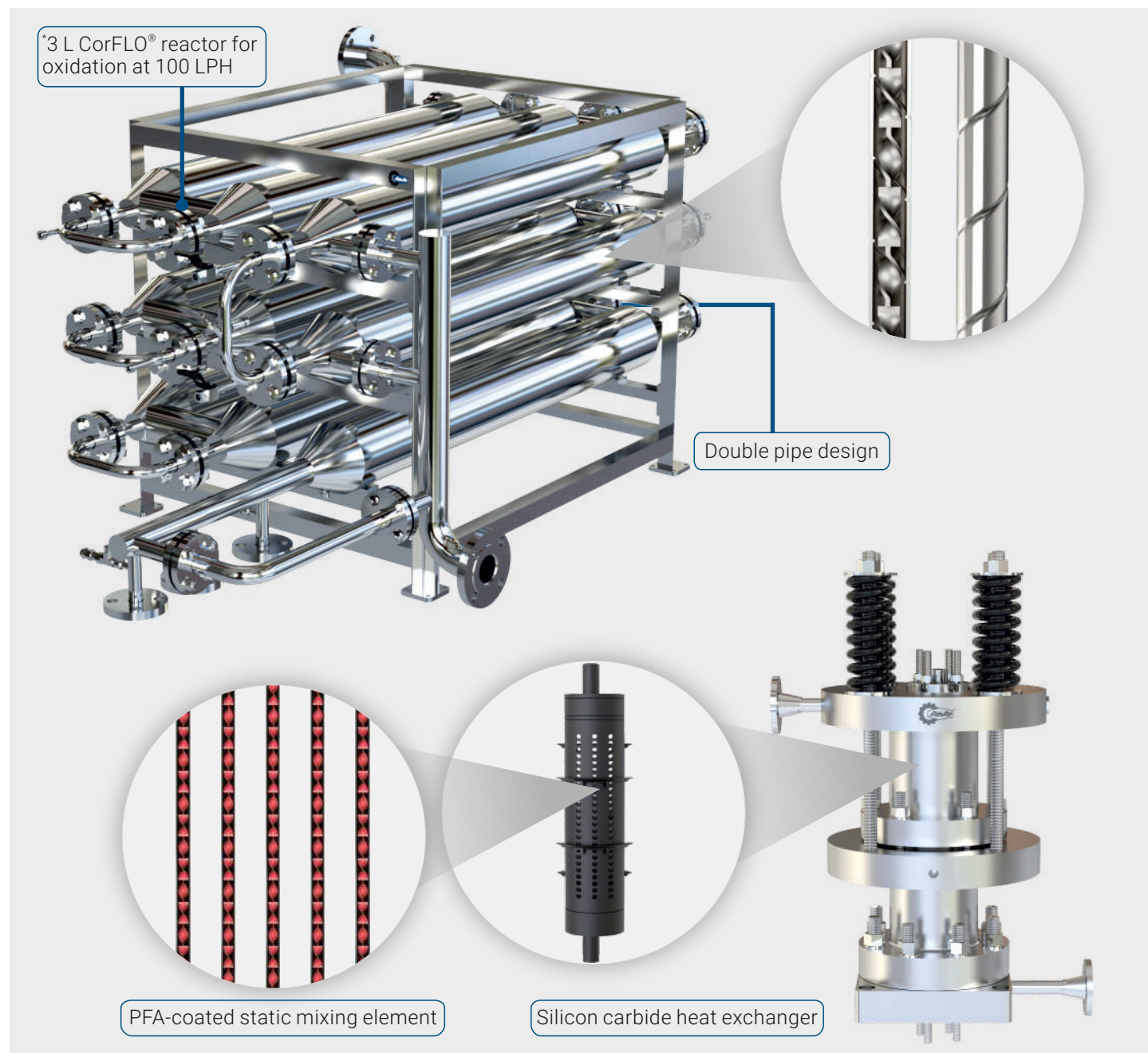
- Plate Volume: 10 mL, 20 mL, 100 mL, 500 mL
- Pressure: Up to 18 bar
- Temperature: -60°C to 200°C
- Reactor Configuration: Modular plate-type assembly designed for numbering-up and ease of maintenance
- **cGMP** compliance

Applications

- HF-mediated reactions
- Chlorinations
- Bromination (liquid & gas-liquid)
- Iodination and iodination variants
- Sulfonation (conc. H_2SO_4 & oleum)
- Mixed-acid nitration ($\text{HNO}_3/\text{H}_2\text{SO}_4$)
- Nitric acid oxidations
- Hypochlorite ($\text{NaOCl}/\text{NaOBr}$) oxidations
- High-temp acid-catalyzed dehydration
- Acid-catalyzed esterification
- Halogenation-based aromatic substitution
- Continuous quench & neutralization of corrosive streams

CorFLO[®] Reactor

Features a static mixer inside a corrugated tube, ensuring efficient mixing, enhanced heat transfer, and a narrow residence time distribution. Suitable for large-scale viscous & mixing-intensive processes.



Features

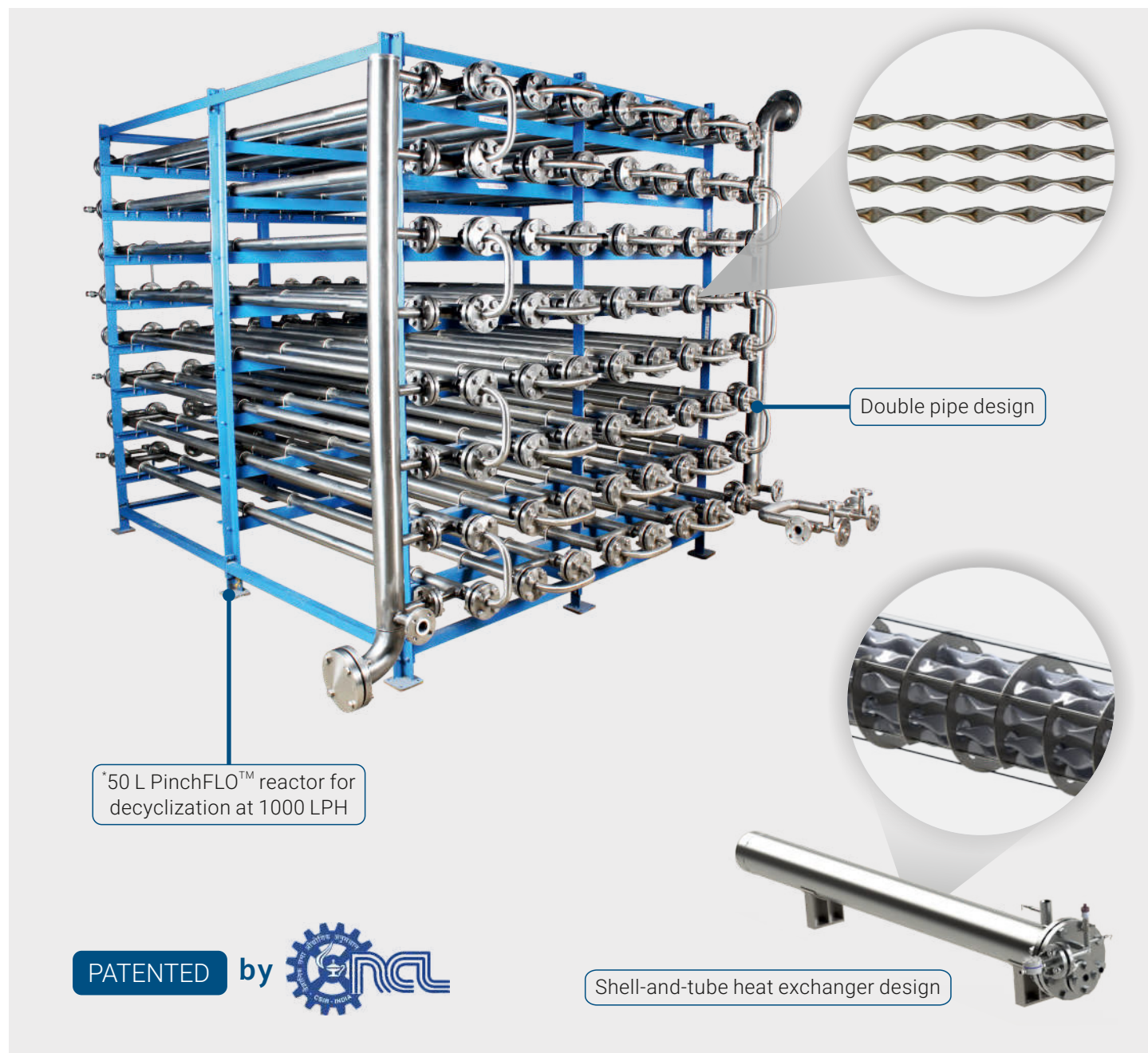
- Volume: 50 mL to 1000 L
- Flow Rates: Up to 10,000 LPH
- Pressure: Up to 100 bar
- Temperature: Up to 500°C
- Material: SS316, Hastelloy, Titanium, Tantalum-lined, etc.
- Modular design with seamless scale-up
- Suitable for **GMP** manufacturing applications
- Available in SiC heat-exchanger design

Applications

- Carbonylation
- Ozonolysis
- Acetylation
- Dehydration
- Amination
- Nitration
- Sulfonation
- Diazotization
- Grignard reaction
- Turbo-Grignard
- Dimerization
- Esterification
- Blending
- Oxidation
- Lithiation

PinchFLO™ Reactor

Scalable reactor with pinched-tube design to enhance mixing, heat transfer, and residence time control for efficient continuous flow reactions.



Features

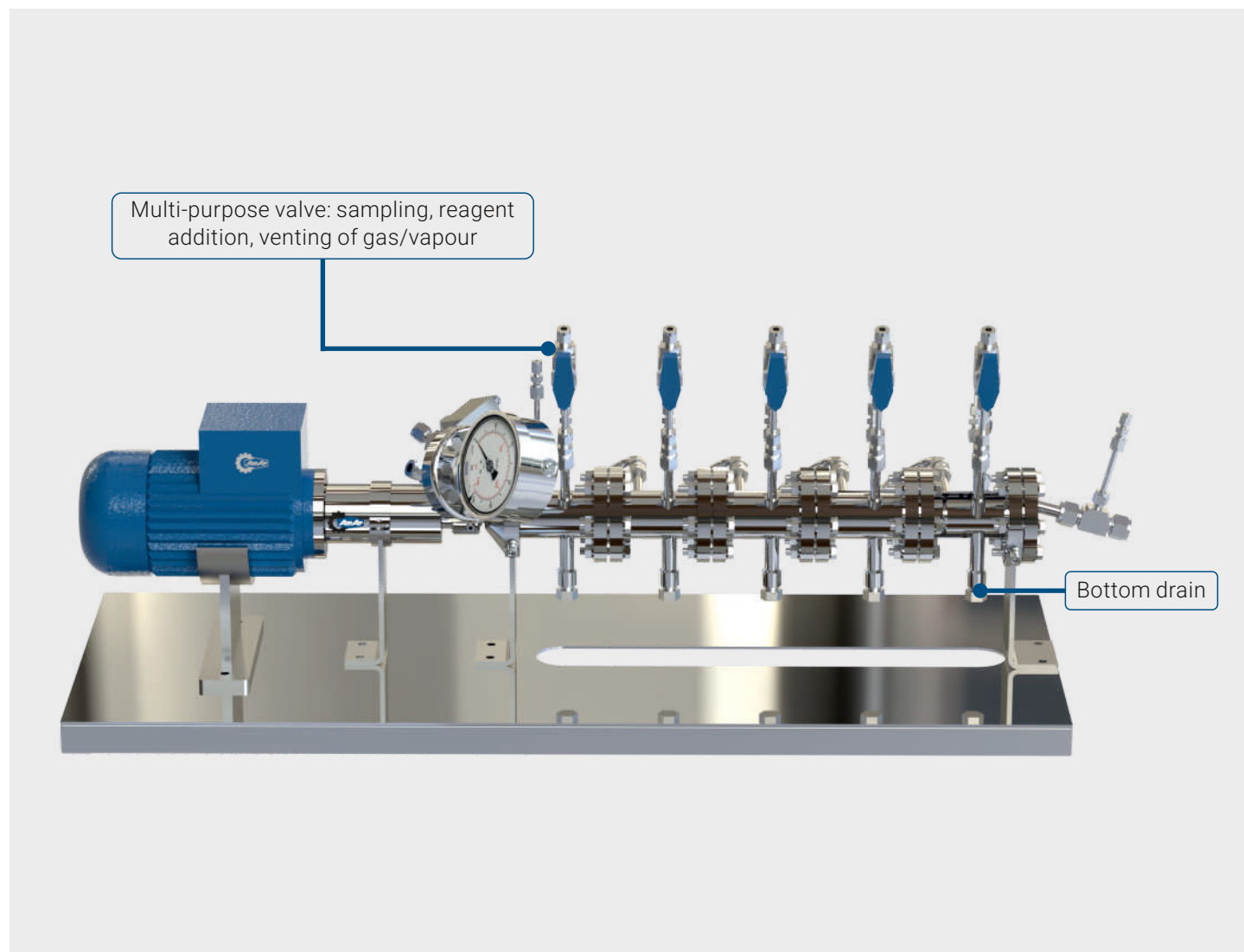
- Volume: 50 mL to 1000 L
- Flow Rates: Up to 10,000 LPH
- Pressure: Up to 100 bar
- Temperature: Up to 500°C
- Material: SS316, Hastelloy, Titanium, etc.
- Modular design with seamless scale-up

Applications

- | | | |
|-----------------|-----------------|---------------------|
| • Nitration | • Carbonylation | • Grignard reaction |
| • Sulfonation | • Ozonolysis | • Turbo-Grignard |
| • Diazotization | • Acetylation | • Dimerization |
| • Oxidation | • Dehydration | • Esterification |
| • Lithiation | • Amination | • Condensation |

SlurryFLO[®] Reactor

Designed for efficient slurry-based reactions where each cell has multiple impellers for uniform media dispersion, efficient slurry mixing, uniform heat distribution. Performs like 20 ideal CSTRs in series giving near plug flow behaviour.



Features

- Volume: 250 mL to 100 L
- Flow Rates: Up to 1200 LPH
- Pressure Range: Up to 100 bar
- Temperature Range: Up to 350°C
- Material: SS316, Hastelloy, etc.
- Slurry Content: 20% w/v (max. 150 µm)
- Suitable for **GMP** manufacturing applications

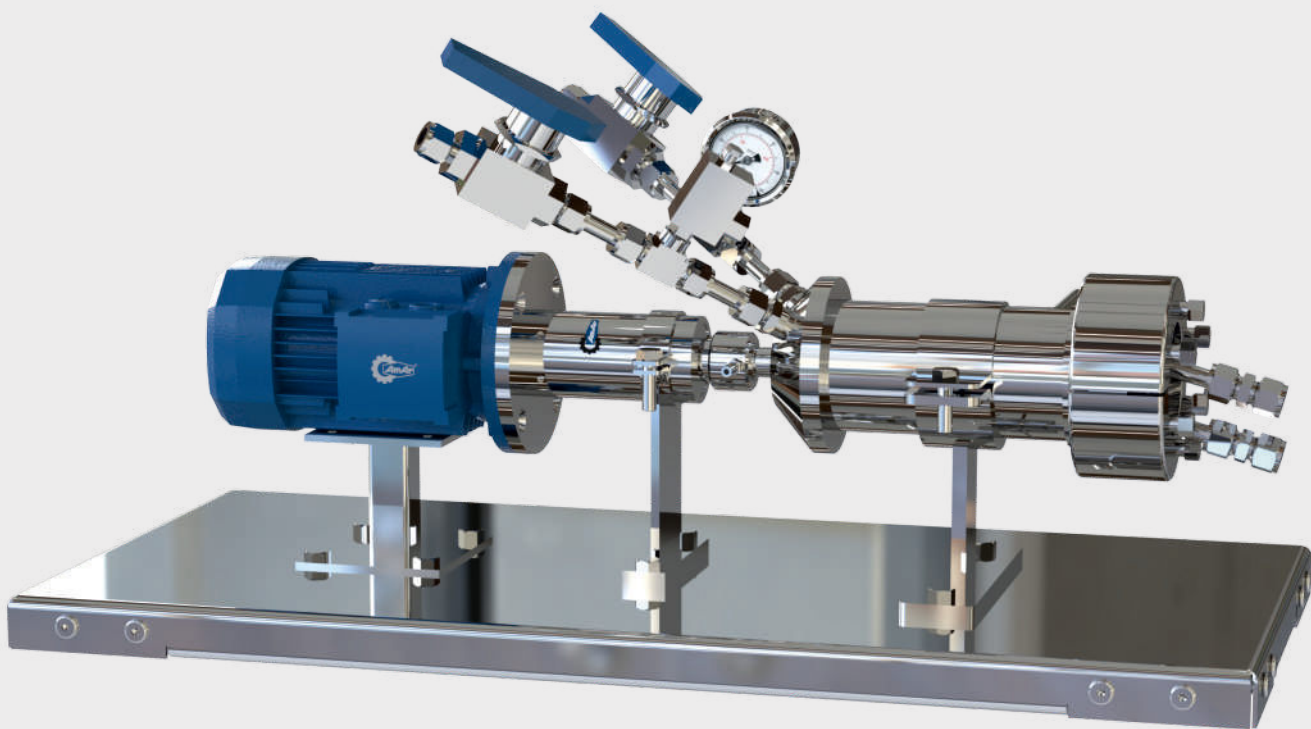
Applications

- | | | |
|---------------------------------------|-----------------------------|------------------------------|
| • Aldol Condensation | • Bio-oil Extraction | • Polymerization |
| • Claisen-Schmidt Condensation | • Hydrotreating | • Nucleophilic Substitutions |
| • Knoevenagel Condensation | • Carboxylation | • Wacker Oxidation |
| • Hydrogenation of Aromatic Compounds | • MPV Reduction | • Buchwald-Hartwig Coupling |
| • Dye Synthesis | • Sandmeyer Reaction | • Fischer-Indole Synthesis |
| • Esterification | • Baeyer-Villiger Oxidation | • Continuous Crystallization |

MACFLO™ Reactor

The MACFLO™ (Multiphasic-Agitated-Contactor) reactor handles complex flow chemistries, excelling in gas-liquid-solid and viscous systems. Its advanced agitation boosts mass & heat transfer, ensuring versatile performance. Performs like 10 ideal CSTRs in series giving near plug flow behaviour without any partition.

PATENTED



Features

- Volume: 250 mL to 100 L
- Flow Rates: Up to 1200 LPH
- Pressure: Up to 350 bar
- Temperature: Up to 500°C
- Material: SS316, Hastelloy, etc.
- Slurry Content: 35% w/v (max. 150 µm)
- Suitable for **GMP** manufacturing applications

Applications

- | | | | |
|--------------------------|----------------------|-----------------------|------------------------------|
| • Vegetable-oil Cracking | • Esterification | • Hydro-formylation | • Hydro-thermal Liquefaction |
| • Hydrogenation | • Carboxylation | • Epoxidation | • Oxidation |
| • Polymerization | • Amination | • Lubricant Synthesis | • Hydrotreating |
| • Melt-crystallization | • Bio-oil Extraction | • Bio-transformations | • Viscous Chemistries |

Continuous Stirred Tank Reactor (CSTR)

The CSTR is ideal for heterogeneous reactions requiring consistent mixing and precise temperature control, and uniform composition throughout continuous processing. Suitable for scale-up and kinetic studies.



Features

- **Volume:** 100 mL to 1000 L
- **Pressure:** Up to 350 bar
- **Temperature:** Up to 500°C
- **Material:** SS316, Hastelloy, Glass, etc.
- Custom-built turnkey solutions with automation

Applications

- | | | |
|---------------------------|-------------------------|---------------------------------------|
| • Catalytic Hydrogenation | • Esterification | • Aldol Condensation |
| • Polymerization | • Saponification | • Claisen-Schmidt Condensation |
| • Crystallization | • Wastewater Treatment | • Knoevenagel Condensation |
| • Fermentation | • Oxidation & Reduction | • Hydrogenation of Aromatic Compounds |
| • Esterification | • Dye Synthesis | |

PhotoFLO[®] Reactor

Designed for efficient gas-liquid and liquid-liquid photocatalytic reactions, utilizing the compact coiled design to maximize photon efficiency and optimize reaction performance.



Features

- **Volume:** 10 mL to 200 mL volume reactors
- **Flow Rates:** Up to 10 LPH
- **Pressure:** Up to 20 bar
- **Temperature:** Up to 200°C
- **Material:** PFA, Glass
- LED illumination array (20-32W)
- Variable wavelengths (365, 385, 405, 415 nm)

Applications

- Photo-halogenations
- Photo-alkylation
- Photo-oxidation
- Photolysis
- Photo-Fries Rearrangements
- Photocatalytic Degradation of Dyes
- Photocatalytic Polymerization
- Photocatalytic Isomerization

OsciFLO™ - Oscillatory Baffled Flow Reactor

Oscillatory baffled reactors (OBR) decouple mixing from net flow, using controlled vortices to achieve near-plug-flow behavior and narrow residence time distributions—even in laminar conditions.



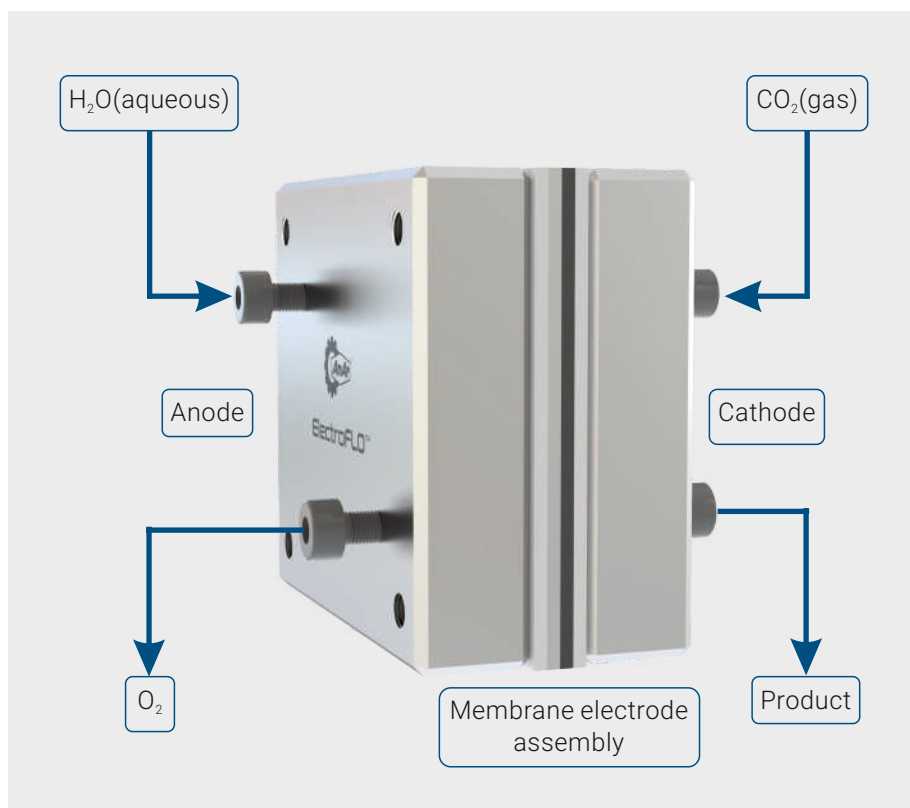
Features

- Volume: 1 L to 100 L
- Pressure: Up to 10 bar
- Temperature: -30°C to 200°C
- Throughput: Up to 4000 LPH
- Adjustable oscillation speed (2-50 Hz) for improved mixing

Applications

- | | | |
|-----------------------------------|----------------------------|-----------------------------|
| • Crystallization Processes | • Liquid-liquid Reactions | • Wastewater Treatment |
| • Bio-processing and Fermentation | • Gas-liquid Reactions | • Enzymatic Reactions |
| • Polymerization | • Nano-particle Synthesis | • Fine Chemical Synthesis |
| • Suspension Reactions | • Continuous Precipitation | • Shear-sensitive Processes |

ElectroFLO™ - Electrochemical Flow Reactor



Features

- Volume: 0.5 mL to 50 mL
- Pressure: Up to 350 bar
- Electrode: SS316, Graphite
- Programmable DC power supply
- Accessories: Alligator clip, electrode holder

Agitated Thin Film Reactor / Evaporator (ATFR / ATFE)

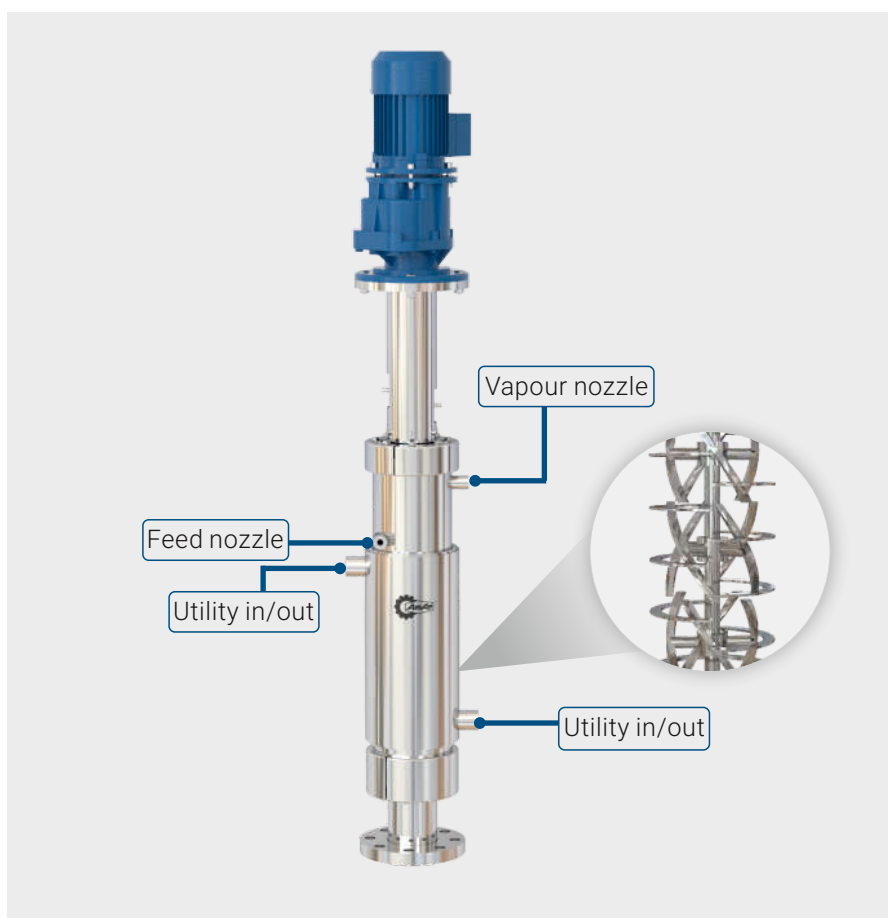
ATFRs use rotating wipers for rapid heat transfer & short residence times—ideal for concentrating heat-sensitive or viscous materials without degradation.

Features

- **Design Pressure:** -1 bar to 20 bar
- **Design Temperature:** -30°C to 200°C
- **Material:** SS316, Hastelloy, etc.
- Suitable for processing highly viscous, heat-sensitive, high-boiling products
- Continuous & efficient separation
- Short residence time, high turbulence, low pressure drop
- Available in lab, pilot & commercial scale

Applications

- Solvent Recovery and Evaporation
- Concentration of Heat-sensitive Products
- Distillation of High-boiling Compounds
- Processing of Viscous and Sticky Materials
- Polymer and Resin Concentration
- Pharmaceutical Intermediate Concentration
- API Solvent Stripping
- Fine Chemical Purification
- Waste Stream Volume Reduction
- Oil and Lubricant Processing
- Food and Nutraceutical Concentration
- Effluent Treatment and Solvent removal



Continuous Liquid-Liquid Membrane Separator (LLS)

Separation based on differences in wettability and pore size of the membrane



Features

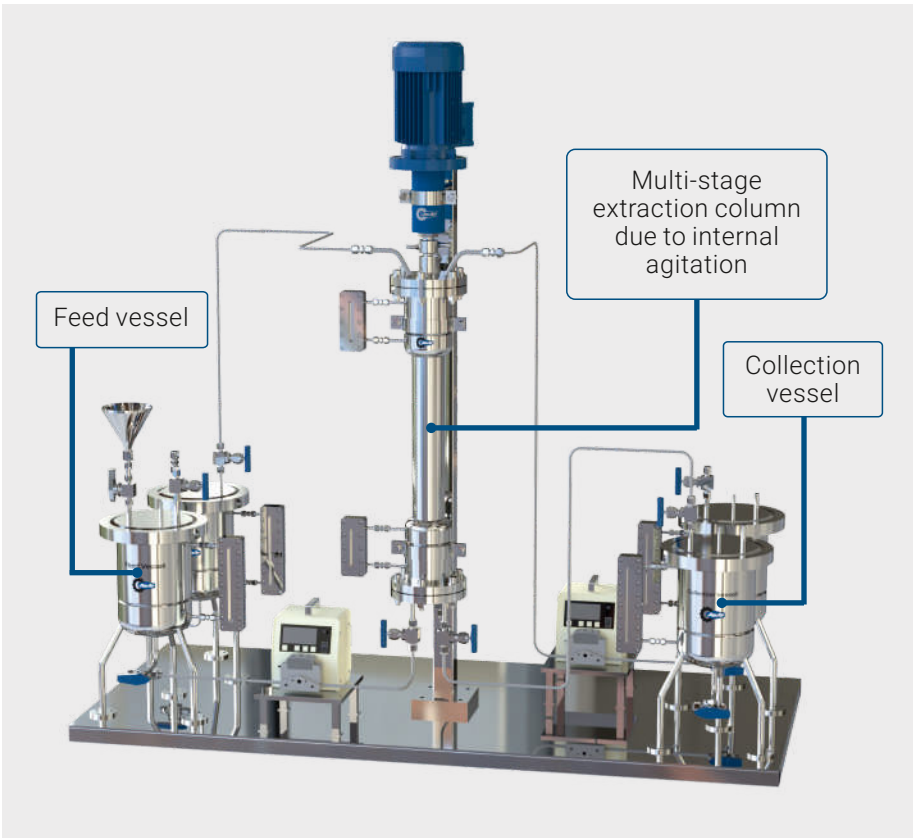
- Flow Rates: 10 mL/min to 500 mL/min
- Pressure: Up to 8 bar
- Temperature: Up to 100°C
- Material: SS316, wetted material PTFE
- Selective hydrophobic membrane

Continuous Liquid-Liquid Extractor (LLE)

To extract solute from one immiscible phase to another

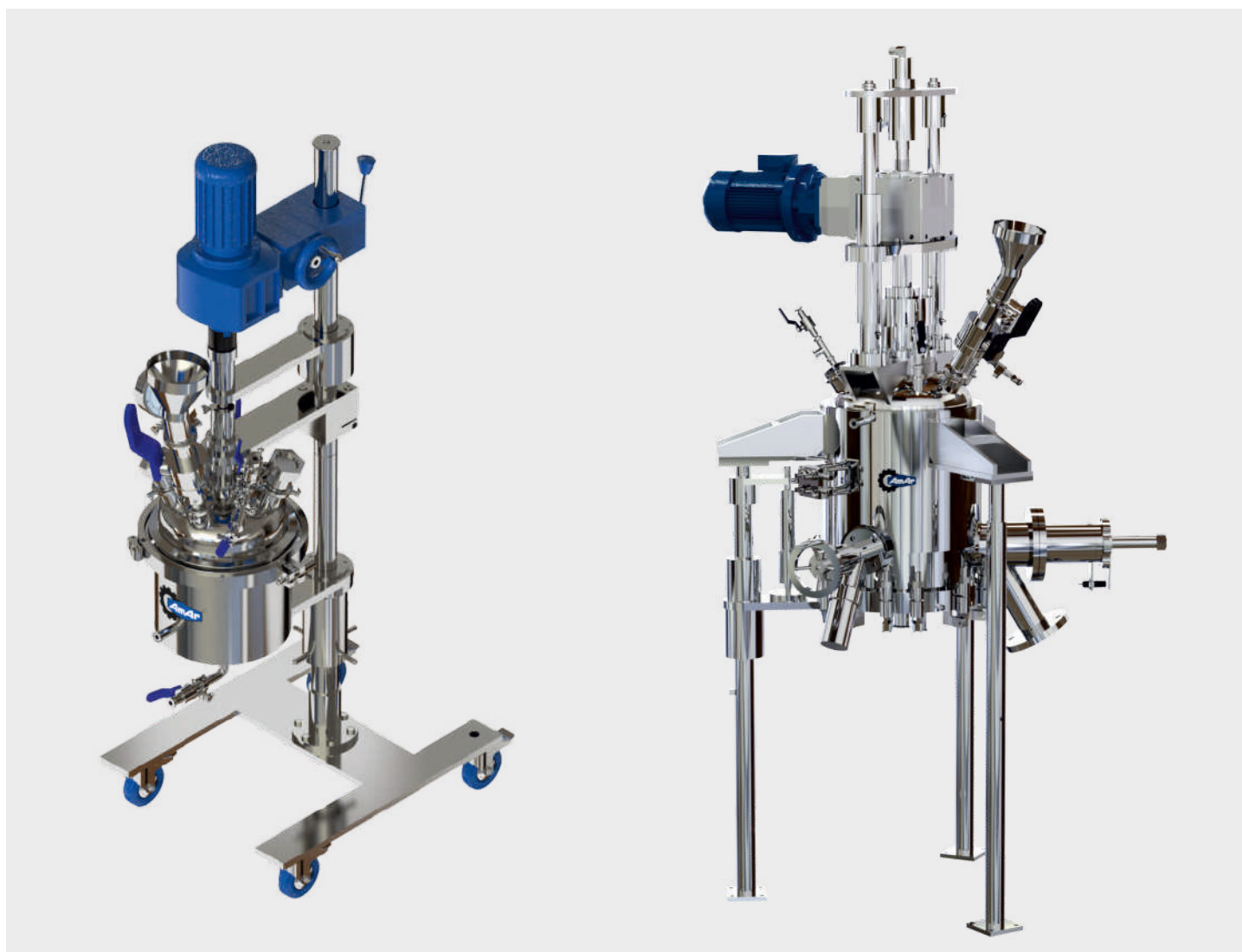
Features

- Flow Rates: As per specification
- Volume: According to throughput
- Pressure: Up to 100 bar
- Temperature: Up to 200°C
- Material: SS316, Hastelloy, etc.
- Best suitable for multi-stage extraction
- High efficiency due to internal agitation
- Great turndown capability due to shear decoupled from flow



Agitated Nutsche Filter Dryer (ANFD)

Lab-to-pilot-scale **GMP** models with motorized raising lowering



Features

- Volume: 1 L to 100 L slurry volume
- Filtration Area: 0.005 m² to 0.2 m²
- Design Pressure: -1 to 4 bar
- Design Temperature: -20°C to 150°C
- Materials: SS316, Hastelloy, etc.
- Filtration & drying in the same equipment with automation optional for continuous applications

Applications

- Pharmaceutical Intermediates
- Food, Flavors & Fragrance Industry
- Edible oil Deodorization & Deacidification
- Fine & Specialty Chemicals
- Polymer Devolatilization
- Hazardous Materials Filtration
- Moisture Removal & Solvent recovery
- Precious Metal & Other Catalyst Recovery
- Microsphere Separation & Purification

Thermostats



Features

- Closed Loop Thermostats: -90°C to 250°C
- Open Bath Thermostats: -70°C to 175°C
- High Temperature Thermostats: Ambient to 350°C
- Recirculating Chillers: Up to -15°C
- CE-marked units & **NATURAL** refrigerant optional
- With an accurate programmable temperature controller & touch panel

High Pressure Continuous Syringe Pump



- Flow Rates: 0.625 μ L/min to 60 mL/min
- Pressure: Up to 20 bar
- Material: Glass with PTFE plunger
- Applications: Grignard chemistry, Lithiation reactions, other Organometallic reactions, etc.

Back Pressure Regulators



- For Gas / Liquid
- Up to 413 bar / 6000 psi
- SS316, Hastelloy
- Manual or Automated

CogniFLO™ - Auto Optimizer System

CogniFLO™ is a next-generation automation platform designed to revolutionize reaction optimization in flow chemistry.



The CogniFLO™ is configured with:

- 3 nos. Continuous syringe pumps
- Interchangeable MicroFLO™ / PinchFLO™ / CorFLO® reactor modules
- Pre-heater / cooler units
- Manual back pressure regulator
- Process optimization software

Optional Accessories:

- Automatic back pressure regulator
- PAT tool (eg UV/Vis / FTIR, Raman, NMR)
- Fraction collector

Applications:

Reaction screening and optimization, Kinetic studies, Continuous process development, Scale-up studies, Grignard reaction, Solvent screening, Crystallization studies, Multi-step reaction optimization, Design of Experiments (DoE) campaigns, Lithiation chemistry

Amar Biosystems Pvt. Ltd.

India's first automated microfluidic platform for precise, reproducible LNP formulation and drug delivery research.

Features

- Fully automated operation
- Multi-use microfluidic chip
- Wide range of flow rates on single platform
- 3 configurable precursor pumps
- Built-in washing program
- Interchangeable microfluidic chips
- Easily replaceable 2 mL, 15 mL, & 50 mL sample collection attachments

Specifications

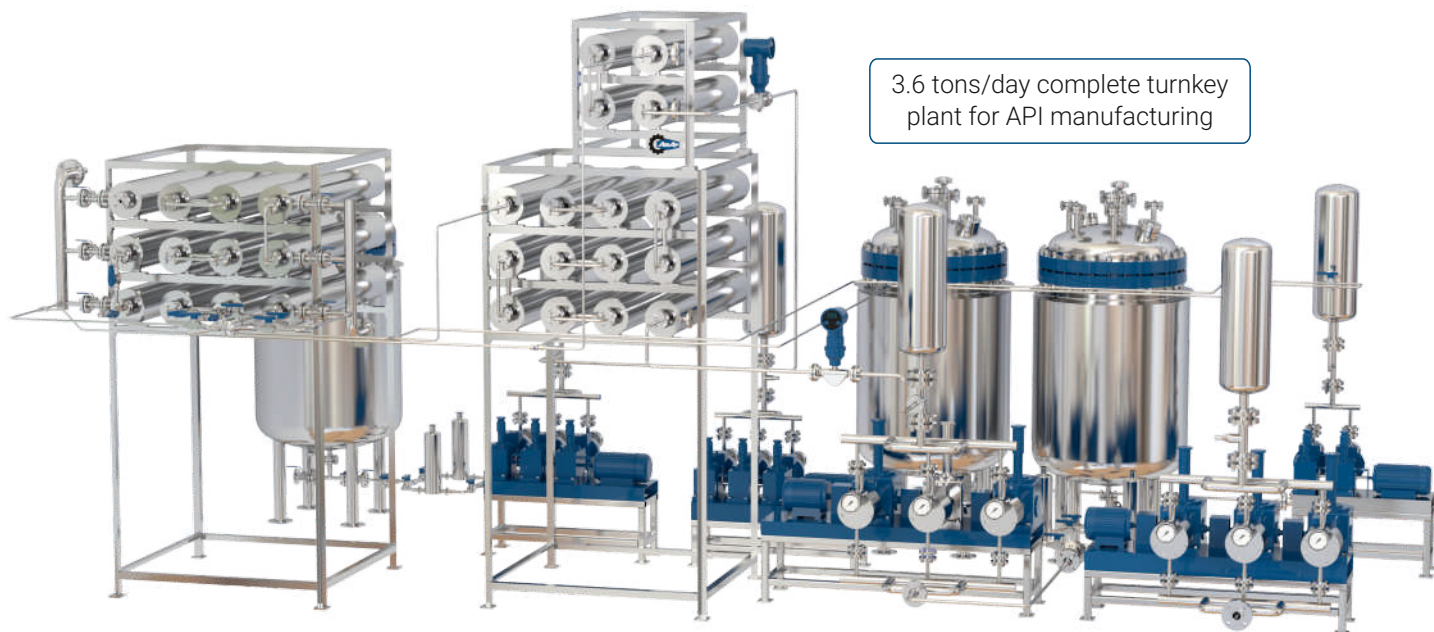
- Flow Rates: 100 μ L/min to 50 mL/min
- No. of Pumps (precursor): 3
- Syringe Sizes: 500 μ L, 1, 2.5, 5, and 10 mL
- Microreactor: Multi-use microreactor
- Nanomaterial Synthesis: Lipids, polymers, emulsions
- Controls: Total flow rate, flow ratio, sample volume, in-line dilution

nanomake-L™

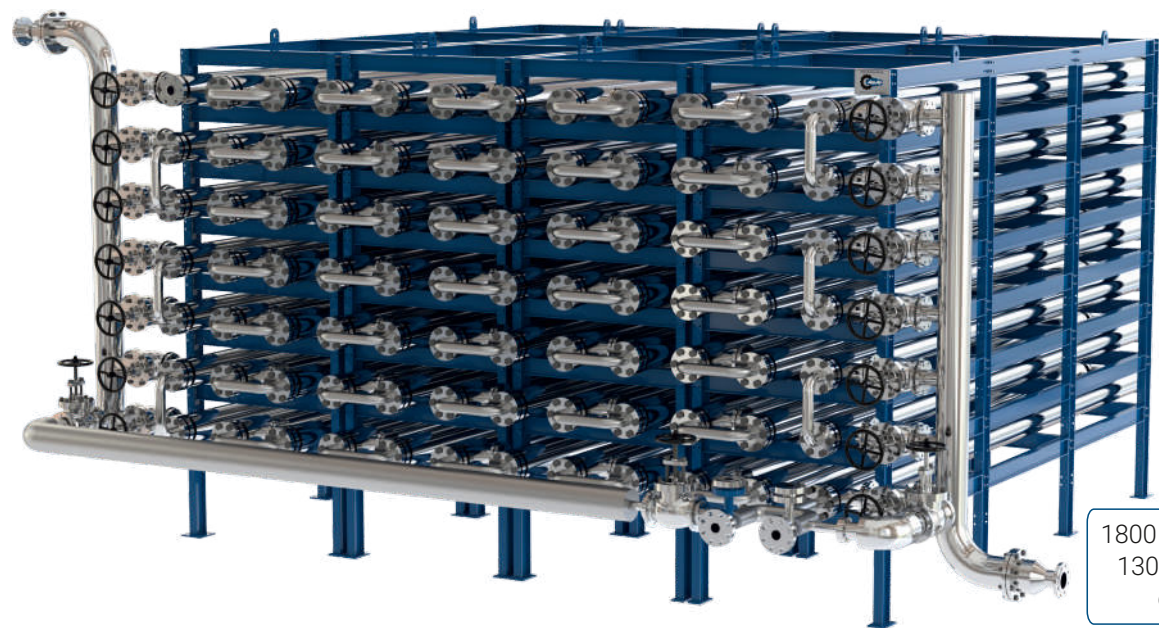


Scaled-up Flow Reactor Systems

Amar has expertise to design, manufacture & integrate a commercial flow reactor system with pumps, accessories, utilities, and automation on a common skid up to 10,000 LPH for various applications.

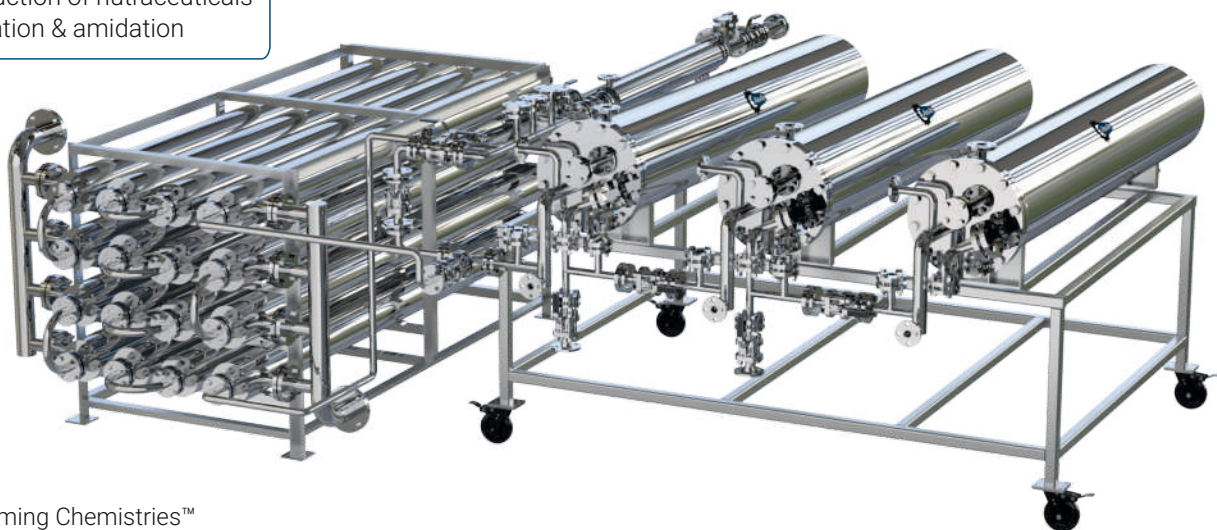


3.6 tons/day complete turnkey plant for API manufacturing



1800 L PinchFLO™ reactor for 1300 tons/day commodity chemical synthesis

5 L pinched tube reactor for 3.6 tons/day production of nutraceuticals via oxidation & amidation



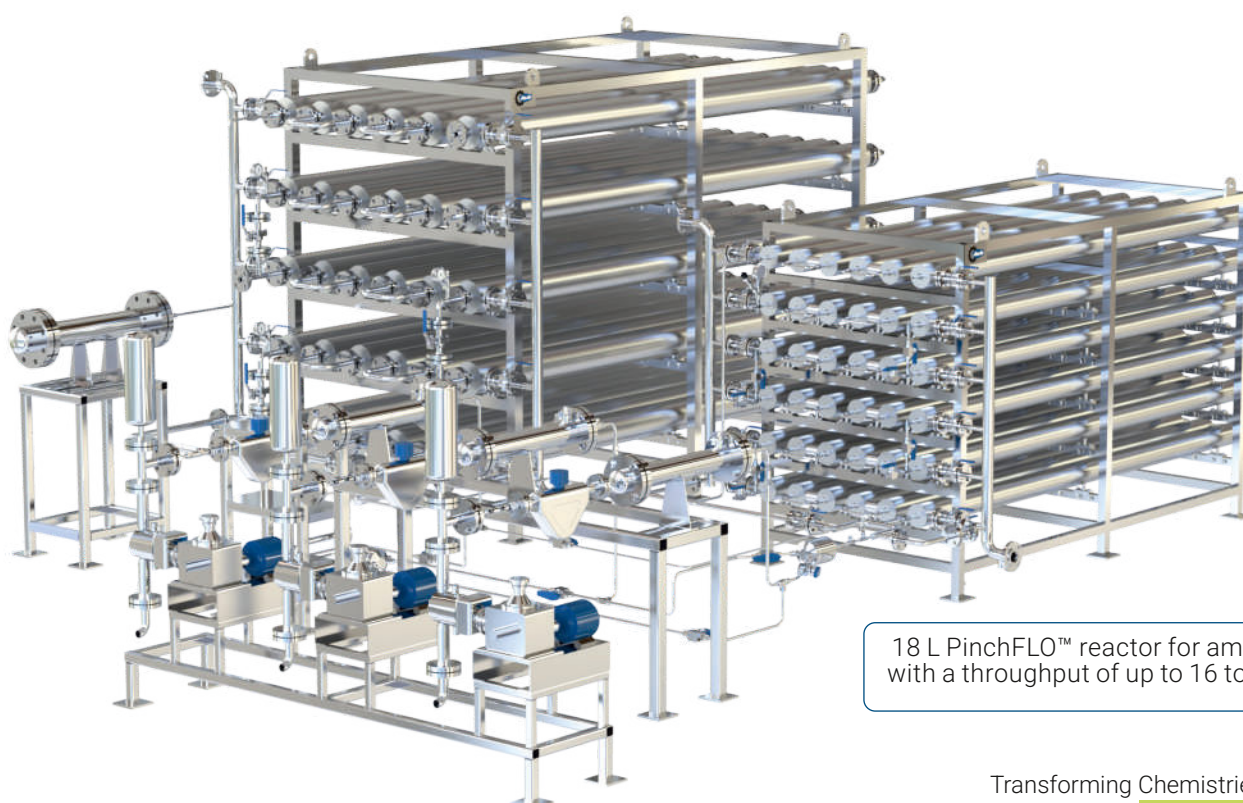
Scaled-up Flow Reactor Systems

100 L PinchFLO™ reactor with throughput up to 72 tons/day for liquid-liquid extraction



Hybrid pilot-scale setup of MACFLO™ & PinchFLO™ (2.5 L each) for saponification with a throughput of 2 tons/day

5 L SlurryFLO® reactor for continuous crystallization with a throughput of 4 tons/day

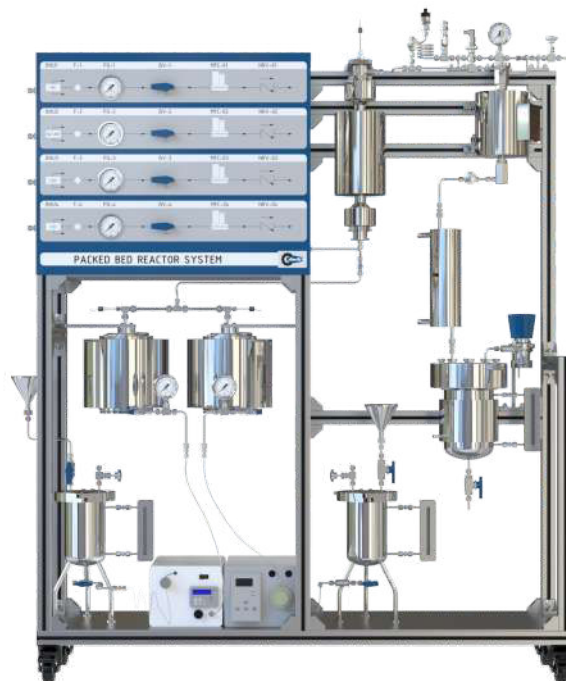


18 L PinchFLO™ reactor for amination with a throughput of up to 16 tons/day

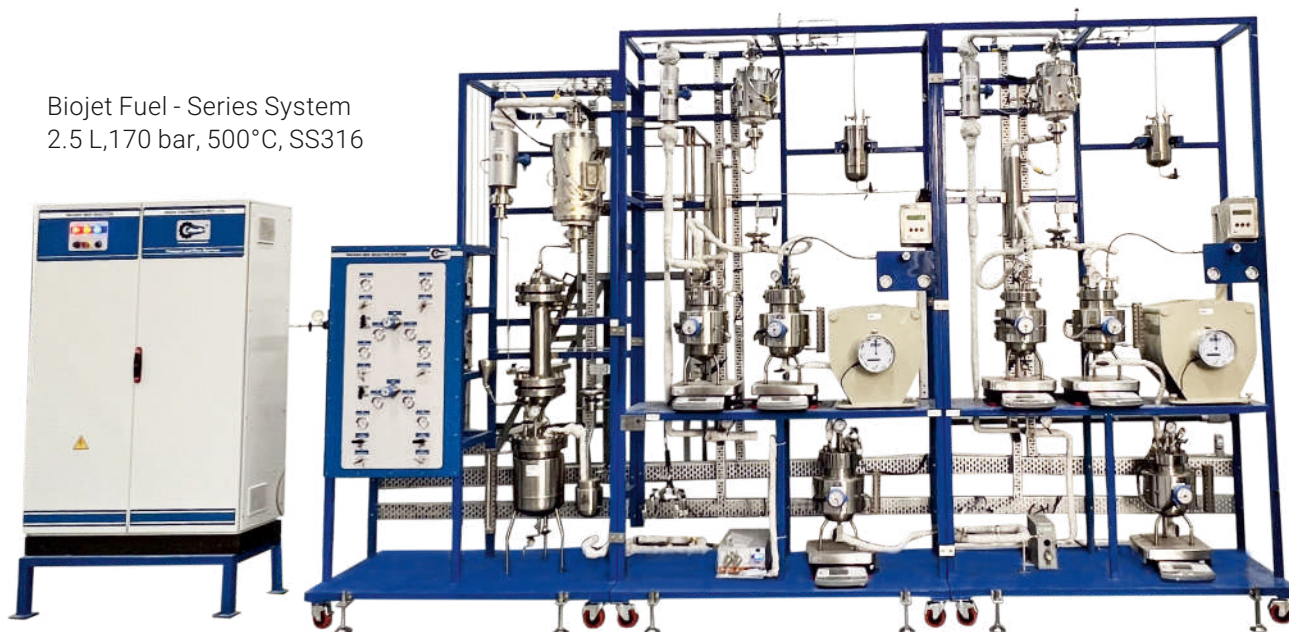
Fixed Bed Reactor Systems

Features

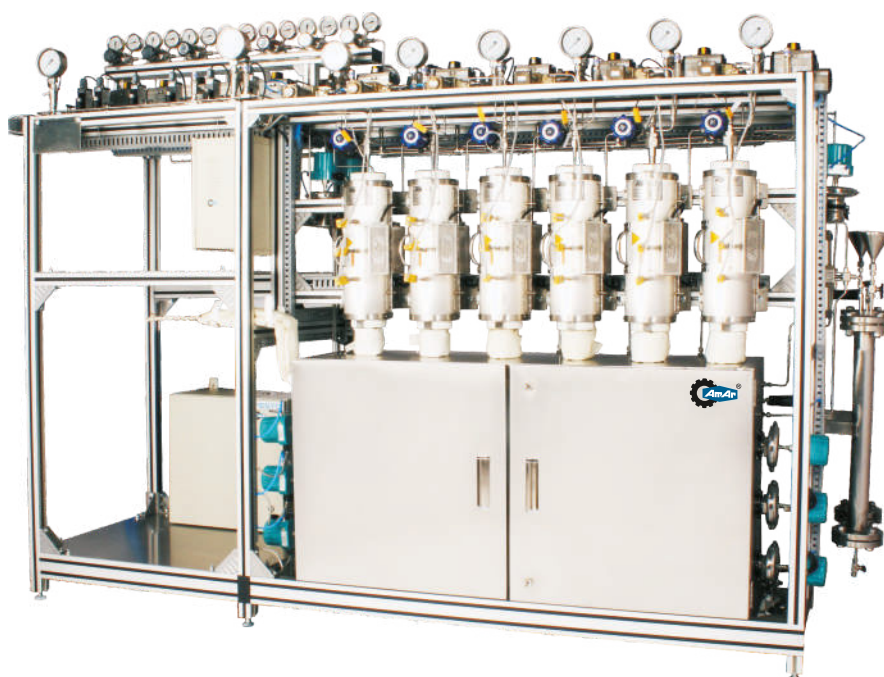
- Fixed, trickle bed designs offered
- **Volume:** 50 mL to 200 L
- Designed up to 350 bar & 1000°C
- **Material:** SS316, Inconel 625, Hastelloy C etc.
- Explosion proof plants for hazardous area
- Skid mounted plants
- Customisable Systems For Gas & Liquid Feed Combinations, Series or Parallel Reactors, Multi Zone Heating Furnaces etc. With Integrated Controls, High Level Of Safety, Automation And Scada Software
- **Applications:** Catalyst Screening, Hydrogenation, Fischer-tropsch Process, Hydro-cracking, Vapor Phase Reaction, etc.



Biojet Fuel - Series System
2.5 L, 170 bar, 500°C, SS316



High throughput multi-tube reactor
system for catalyst screening



Fixed Bed Reactor Systems

Fixed bed reactor for carbon capture
50 mL, 30 bar, 600°C, SS316



High pressure vapor phase hydrogenation system
100 mL, 200 bar, 700°C, SS316 skid with enclosure



Pilot Plant for Bio-fuel
• Reactor 1: 600 mL, 5 bar, 950°C, Inconel 625
• Reactor 2: 1700 mL, 60 bar, 480°C, Inconel 625
• Production of bio-oil & Fischer-Tropsch synthesis



Fixed bed plant - skid mounted nitrilation reaction lab setup for acetonitrile with two reactors in parallel configuration 5 L, 5 bar, 500°C, Inconel 625



Fixed Bed Reactor Systems

Flameproof system for vapor phase reaction
550 mL, 20 bar, 700°C, Hastelloy C

Twin reactor setup with parallel configuration

- Reactor 1: 500 mL, 5 bar, 1100°C, Hastelloy C
- Reactor 2: 500 mL, 60 bar, 650°C, Hastelloy C
- Steam reforming & Fischer-Tropsch reaction



Table Top Reactor System

Features

- Fixed & trickle bed designs offered
- **Volume:** 10 mL to 30 mL
- Up to 100 bar & 1000°C
- **Material:** SS316, Hastelloy, Inconel 625, etc.
- Table top system
- Customizable Systems For Gas & Liquid Feed Combinations, Series or Parallel Reactors, Multi-zone Heating Furnaces, etc. With Integrated Controls, High Level of Safety, Automation and Scada Software
- **Applications:** Catalyst Screening, Hydrogenation, Fischer-tropsch Process, Hydro-cracking, Vapor Phase Reaction, Coal To Syngas Production, etc.



Fluidized Bed Reactors

Features

- **Volume:** 500 mL to 200 L
- Up to 12 bar & 1050°C
- **Material:** SS316, Hastelloy C, Inconel 625, etc.
- **Solid Feed:** Batch/continuous
- Uniform particle mixing and temperature gradients
- Explosion-proof Plants for Hazardous Area
- Customizable Systems for Gas, Liquid and Solid Feed Combinations, Multi-zone Heating Furnaces, etc. With Integrated Controls, High Level Of Safety, Automation And Scada Software
- **Applications:** Conversion of Coal-derived Products, Syngas Generation, Pyrolysis Reactions, Biomass / Coal Gasification Reactions, Conversion of Gaseous Reactants Into Fuels, Liquefaction Reactions, etc.



Fluidized bed reactor for Fluidization of alumina
700 mL, 10 bar, 1100°C, Inconel 625



- **Process:** Air-blown Fluidized Bed Gasification
- **Gauge Pressure:** 10 kg/cm²
- **Design Temperature:** 1000°C - 1050°C
- **Gasification Rate:** 60 - 150 kg/hour
- Gasifier
- Coal Feeding System
- Gaseous Reactant Supply System
- Bottom Ash Extraction System
- Cyclone with Fly Ash Collection System
- Gas Cooling and Cleaning System
- Exhaust System and Flare Stack



Flow Chemistry Process Development Lab

- State-of-the-art flow chemistry process development lab with wide choice of indigenous flow reactors, pumps & utilities.
- PAT tools and in-house analytical facilities.
- From initial concept to turnkey solutions, our services encompass process design, engineering, and the delivery of state-of-the-art manufacturing equipment tailored to the fine chemical and pharmaceutical industries.
- Integrated continuous downstream processing, featuring membrane-based extractors and centrifugal separators for efficient in-line purification and phase separation.



Flow Chemistry Services



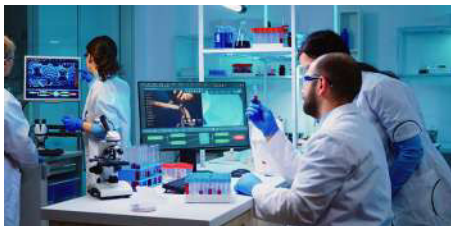
Proof-of-Concept (PoC) Studies

We conduct PoC studies to validate flow chemistry feasibility of your process in our reactors.



Project-Based Development

Ideal for companies looking for a turnkey solution for developing a product/process in flow.



Full-Time Equivalent (FTE) Model

Dedicated chemist(s) working exclusively on your project. Ideal for long-term R&D collaborations

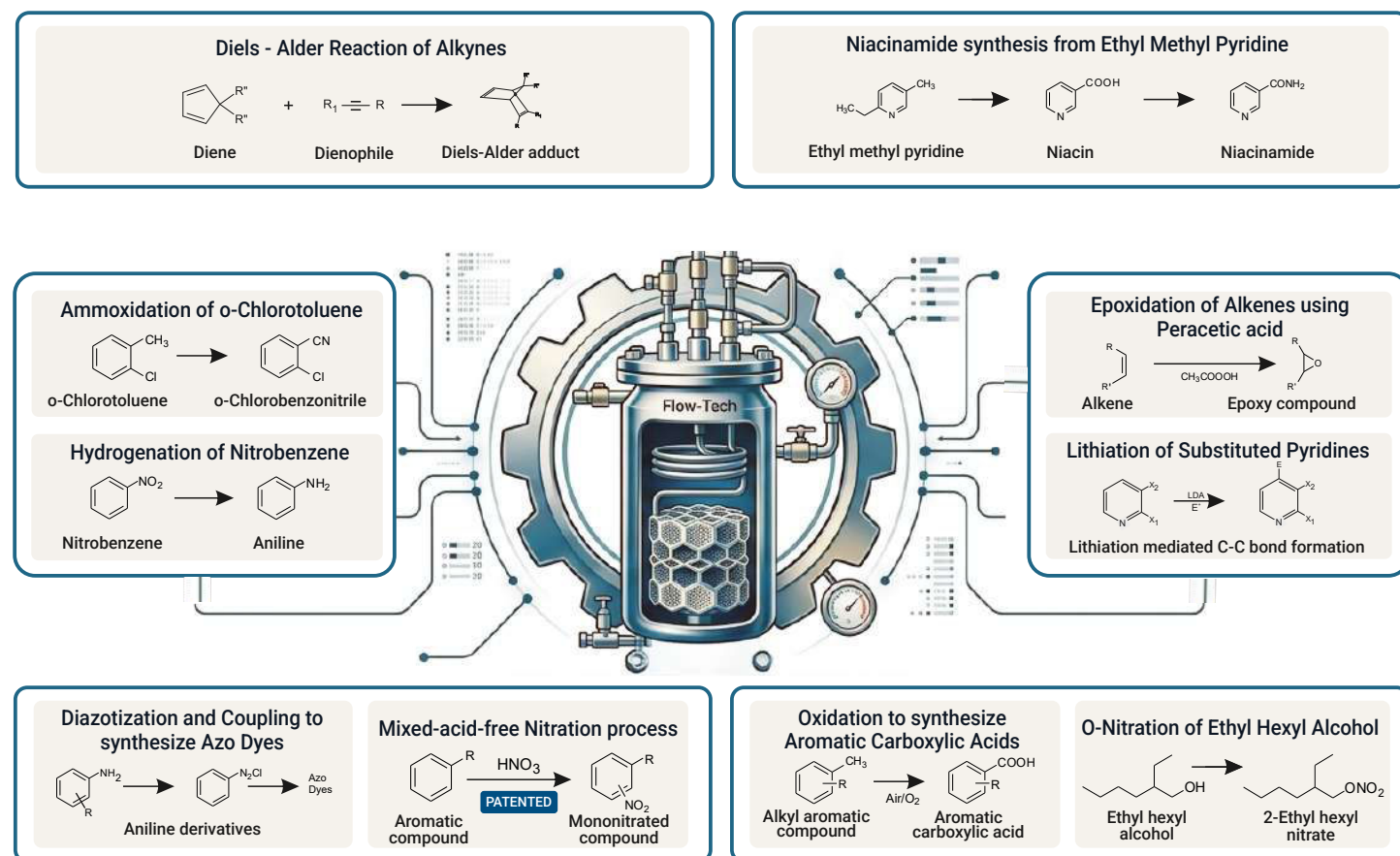
Engineering Lab



- Reactor design conceptualization based on the application
- Performing rigorous hydrodynamic studies on prototype reactors
- Complete characterization of the reactor: Heat and Mass Transfer, RTD studies, and Pressure drop
- Build and analyze CFD models of our reactors
- Use experimental and simulation data to design scale-up strategies from lab to pilot to plant scale

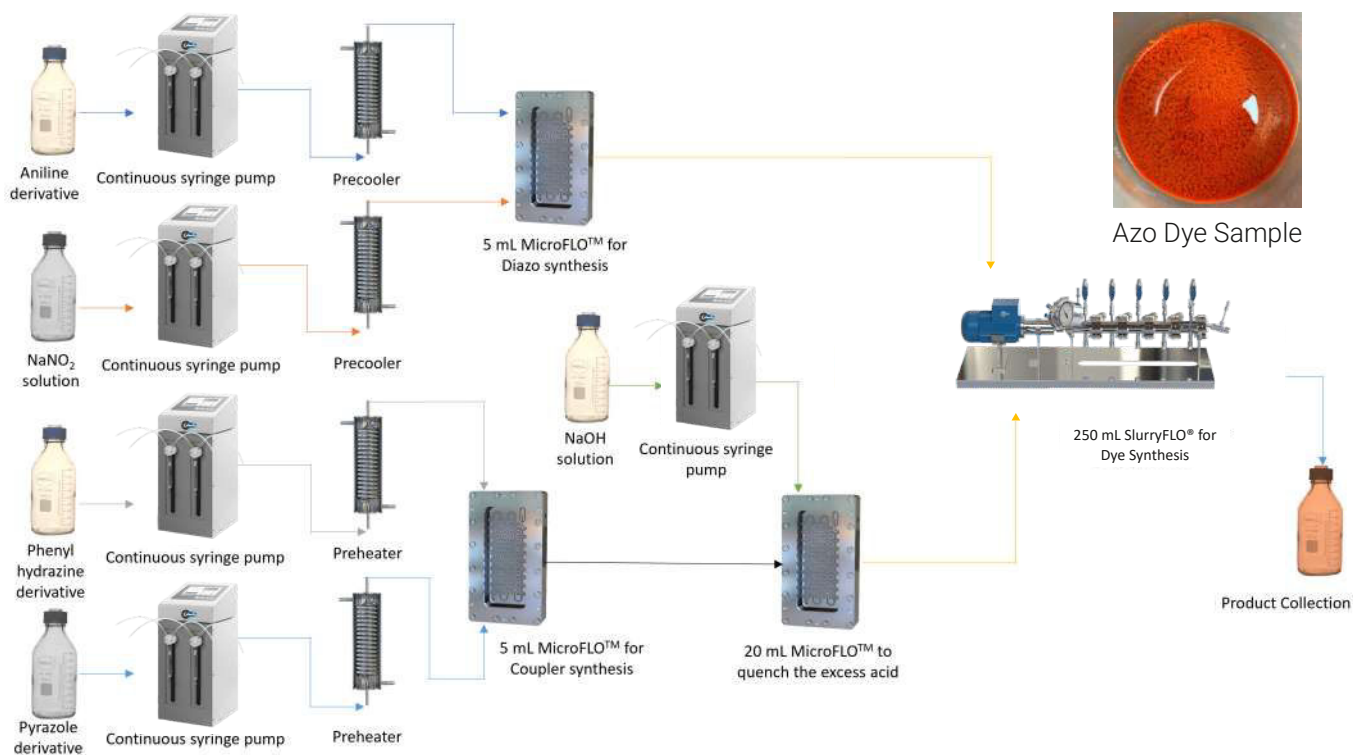
Processes Developed

We offer a portfolio of patented continuous process technologies available for licensing.



Telescopic Flow Synthesis of Azo Dyes

Continuous Diazotization in MicroFLO™ and coupling in SlurryFLO® reactor



Our Valued Clientele

Our Valued Clientele

Client Testimonials

"Amar's Mumbai facility offers cost-effective, high-quality components. Combining German precision with India's scalable production & digital innovation creates strong Indo-German industrial & academic synergies for the European market." Prof. Dr. -Ing. Jörg Fehr Institute of Engineering and Numerical Mechanics, University of Stuttgart, Germany	"What I like about Amar's flow reactors is their practicality and clear scalability. Their competitive pricing makes commercialization feasible. Unlike many lab-scale systems, Amar's reactors are well-suited for industrial-scale deployment of flow chemistry processes." Mr. Bhanu Kiran Vankayala, Process Engineering Lab Head, Aarti Industries	"I see great potential in process intensification through better mass transfer and innovative reactor designs, especially in sustainable fermentation. Amar stands out as a partner with strong technical capabilities and affordable pricing-crucial for innovation in cost-sensitive developing markets." Prof. Parimala Shivaprasad Asst. Professor of Chemical Engineering, University of Nottingham
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Amar Flow Laboratory LLP

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