



AmArTM
FLOW LABORATORY



**EMPOWERING THE FUTURE OF
FLOW TECHNOLOGY**

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



7500+

Successful Installations



50,000

Sq.ft.
Manufacturing 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, Titanium & Tantalum-lined
- Very high heat and mass transfer coefficients
- Lab to plant scale turnkey solutions with pumps, utilities, flow control, safety device 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, transfer hydrogenation, sulfoxidation, amination

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

Aldol condensation, hydrogenation, epoxidation, esterification, crystallization



Flow Reactors & Services

LabFLO [®] Reactor	04
MicroFLO [™] Reactor	05
CorFLO [®] Reactor	06
PinchFLO [™] Reactor	07
SlurryFLO [®] Reactor	08
MACFLO [™] Reactor	09
Continuous Stirred Tank Reactor	10
Fixed & Fluidized Bed Reactor System	11
PhotoFLO [®] Reactor	12
CogniFLO [™] : Auto-Optimizer	13
Downstreaming Equipment	14
Continuous Pumps	16
Thermostats & Accessories	17
Flow Chemistry Process Development Lab	18
Flow Chemistry Services	18
Processes Developed	19
Scaled-up Flow Reactor Systems	20
Clients	22

LabFLO[®] Reactor

A compact 1 mL microreactor with enhanced heat & mass transfer that can be used for proof-of-concept and rapid screening of reactions.



Features

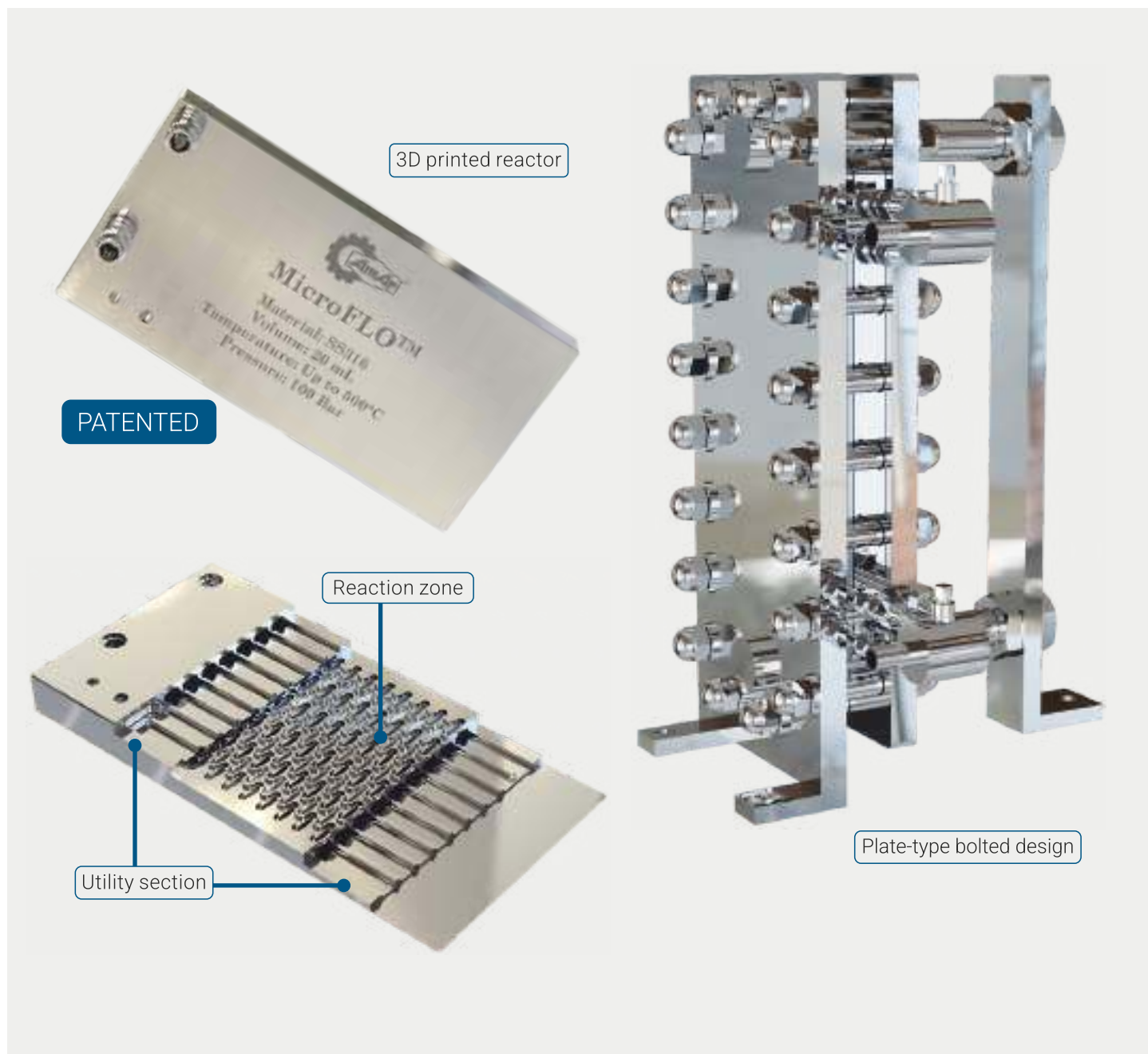
- **Volume:** 1 mL micromixer & 10 mL residence coil
- **Flow Rates:** Up to 6 LPH
- **Pressure:** Up to 50 bar
- **Temperature:** Up to 250°C
- **Material:** SS316, Hastelloy, etc.

Applications

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

MicroFLO™ Reactor

Microreactor with high mass transfer, high surface area-to-volume ratio, and superior heat transfer, ideal for gas-liquid and liquid-liquid exothermic reactions.



Features

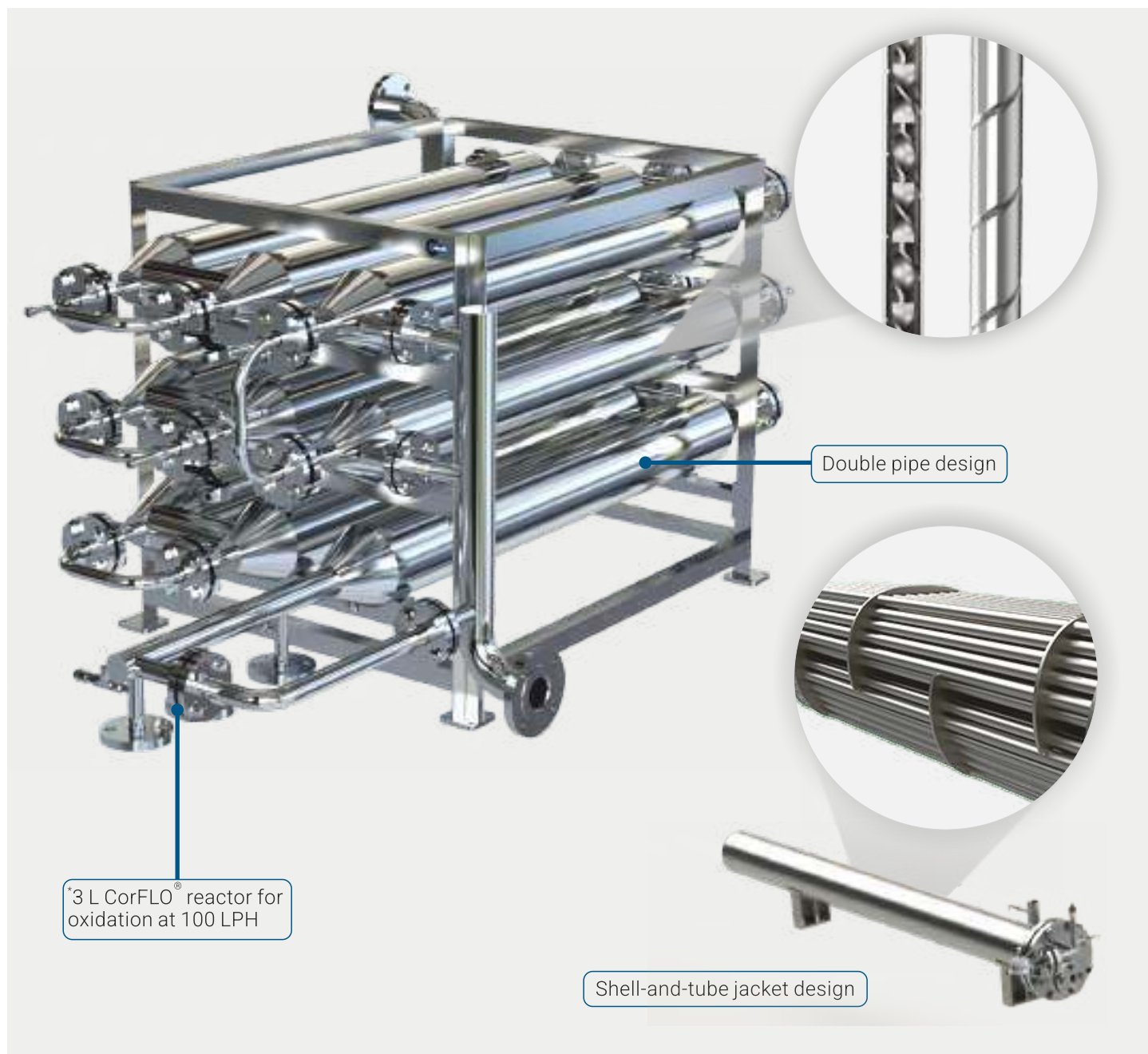
- Available in 3D printed as well as plate-type arrangement
- **Volume:** 5 mL to 2 L
- **Flow Rates:** Up to 100 LPH
- **Pressures:** Up to 100 bar
- **Temperature:** Up to 500°C
- **Material:** SS316, Hastelloy, titanium, etc.
- Modular design with seamless scale-up
- Suitable for **GMP** manufacturing applications

Applications

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

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

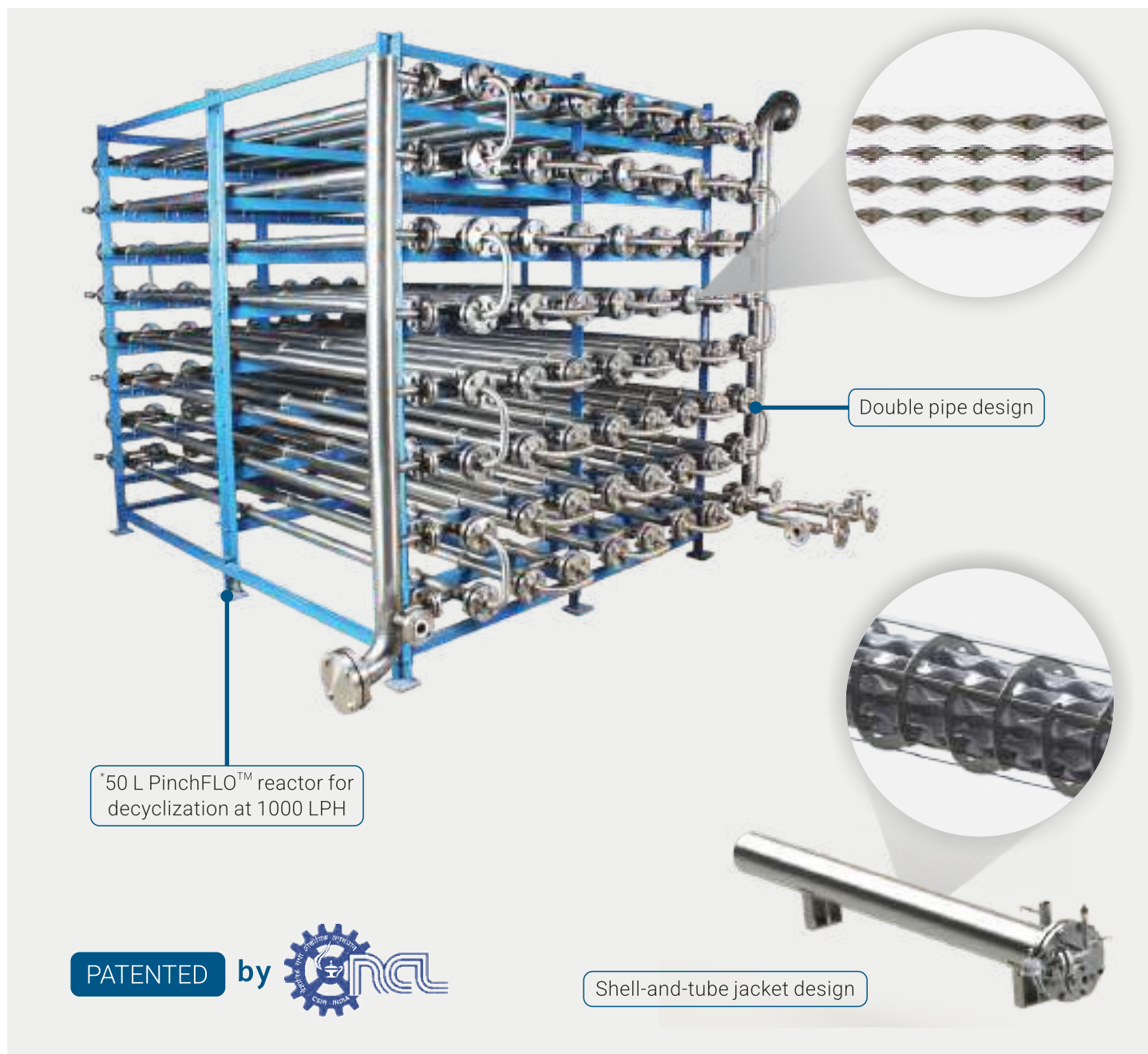
- Volume: 50 mL to 1000 L
- Flow Rates: Up to 10,000 LPH
- Pressure: Up to 100 bar
- Temperature: Up to 500°C
- Material: SS316, Hastelloy, titanium, tantalum lined, etc.
- Modular design with seamless scale-up
- Suitable for **GMP** manufacturing applications

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

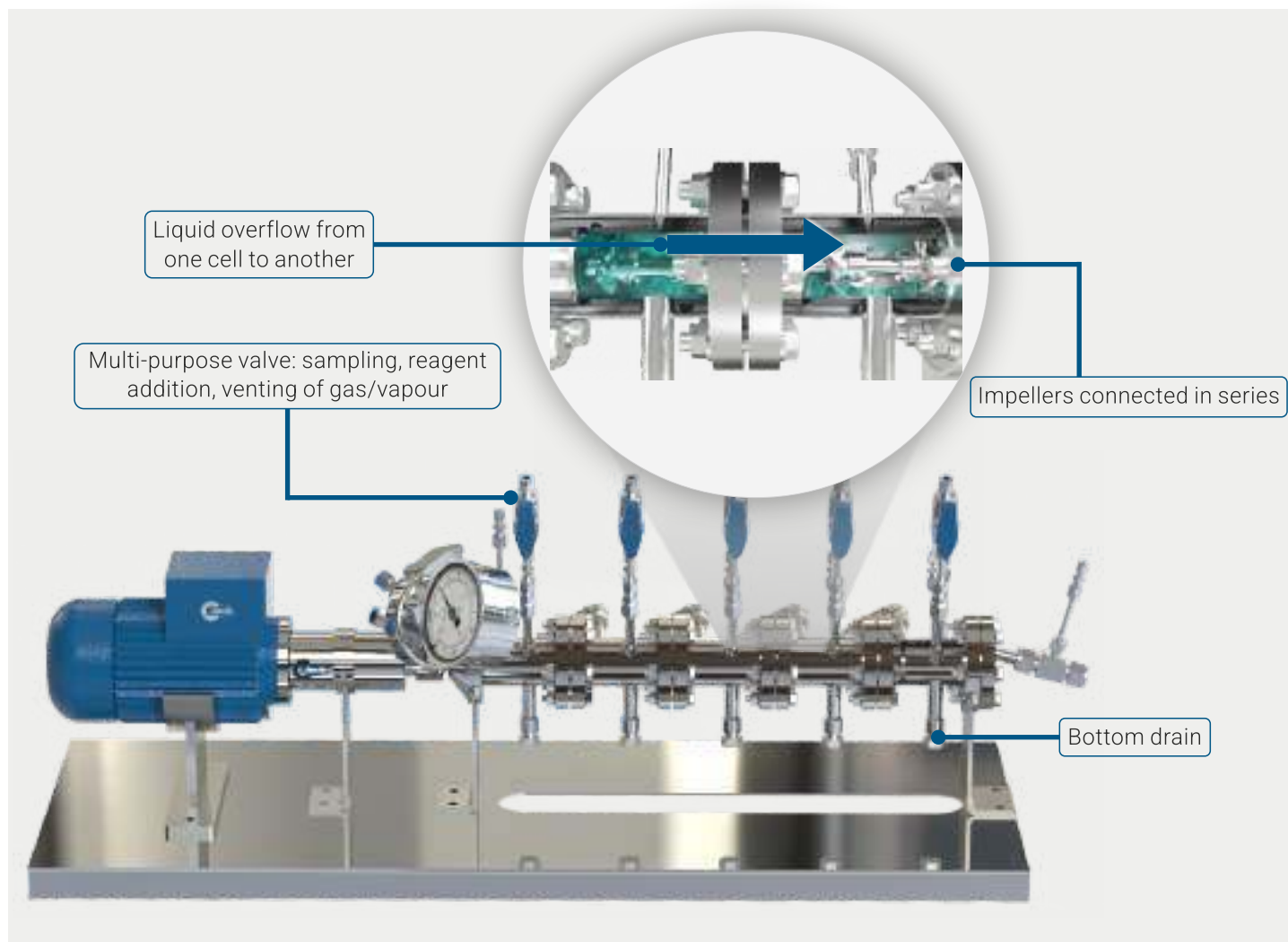
- Volume: 50 mL to 1000 L
- Flow Rates: Up to 10,000 LPH
- Pressure: Up to 100 bar
- Temperature: Up to 500°C
- Material: SS316, Hastelloy, titanium, etc.
- Modular design with seamless scale-up

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

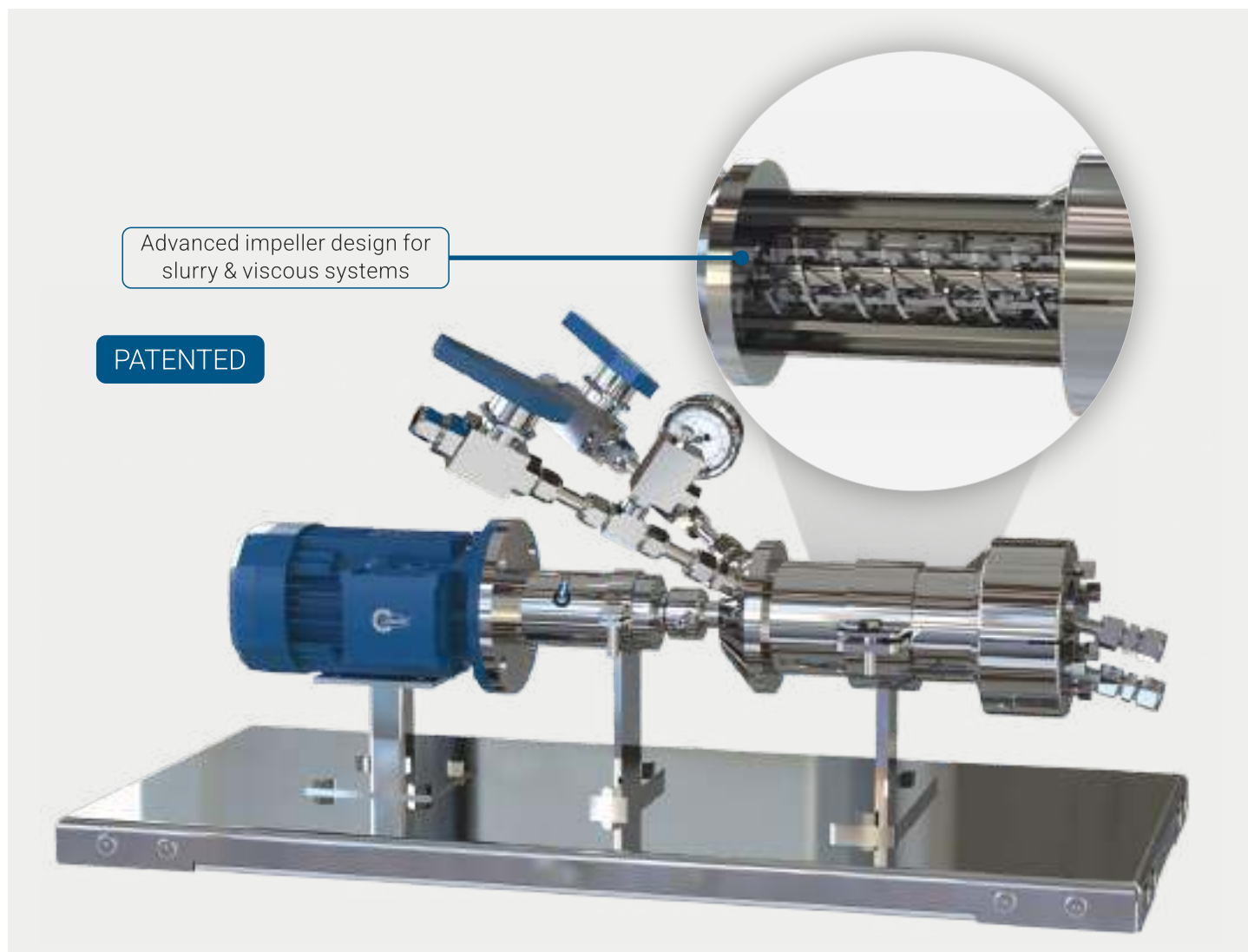
- Volume: 250 mL to 100 L
- Flow Rates: Up to 1200 LPH
- Pressure Range: Up to 100 bar
- Temperature Range: Up to 500°C
- Material: SS316, Hastelloy, etc.
- Slurry Content: 20% w/v (max 150 µm)
- Suitable for **GMP** manufacturing applications

Applications

- | | | |
|---|---|--|
| <ul style="list-style-type: none">• Aldol condensation• Claisen-Schmidt condensation• Knoevenagel condensation• Hydrogenation of aromatic compounds• Dye synthesis• Esterification | <ul style="list-style-type: none">• Bio-oil extraction• Hydrotreating• Carboxylation• MPV reduction• Sandmeyer Reaction• Baeyer-Villiger Oxidation | <ul style="list-style-type: none">• Polymerization• Nucleophilic substitutions• Wacker oxidation• Buchwald-Hartwig coupling• Fischer-Indole synthesis• 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.



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

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

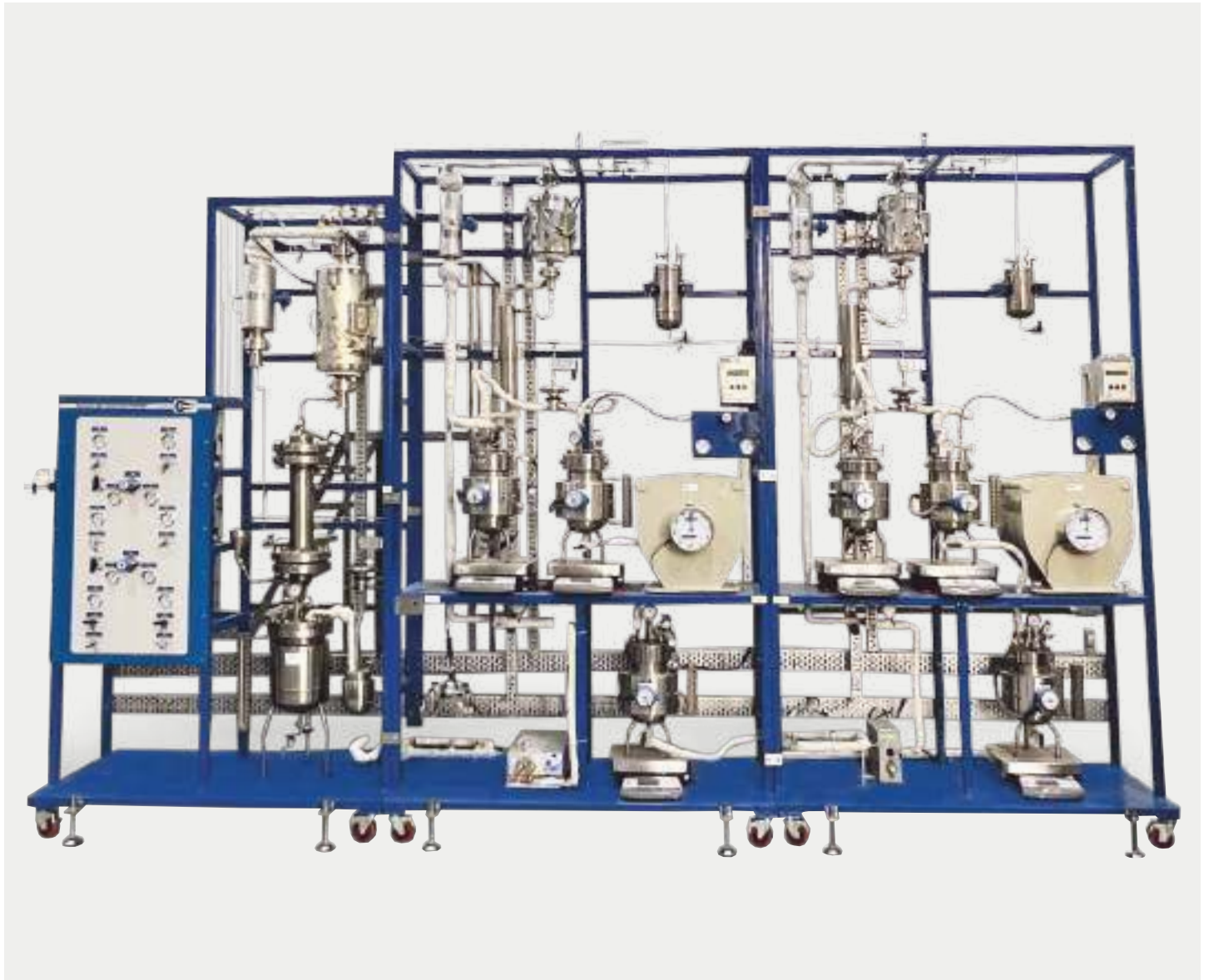
- Volume: 100 mL to 1000 L
- Pressure: Up to 350 bar
- Temperature: Up to 500°C
- Material: SS316, Hastelloy, etc.
- Custom-built turnkey solutions with automation

Applications

- Catalytic hydrogenation
- Polymerization
- Crystallization
- Fermentation
- Esterification
- Saponification
- Wastewater treatment
- Oxidation & reduction

Fixed & Fluidized Bed Reactor

The Fixed & Fluidized Bed Reactors are custom-built pilot skid solutions designed for heterogeneous reactions involving solid-phase catalysts. They are ideal for high-pressure and high-temperature processes.



Features

- Volume: 10 mL to 300 L
- Pressure: Up to 350 bar
- Temperature: Up to 1100°C
- Material: SS316, Hastelloy, Inconel, and other special alloys

Applications

- | | | |
|---------------------------|-------------------------------|--|
| • Catalyst screening | • Nitration reaction | • Biomass gasification |
| • Hydro-cracking | • Catalytic & steam reforming | • Coal to syngas production |
| • Hydrogenation | • Sustainable aviation fuel | • Thermal catalytic cracking |
| • Pyrolysis reactions | • Vapour phase halogenation | • CO ₂ capture and conversion |
| • Fischer-Tropsch process | • Reduction of metal oxide | • Dry reforming of bio-gas |

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
- 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



Overview

- CogniFLO™ is a next-generation automation platform designed to revolutionize reaction optimization in flow chemistry.
- It integrates modular flow reactors, pumps, heating cooling circulator, automatic back pressure regulator, continuous liquid-liquid separator, real-time analytics, and optimization algorithms all in a single smart system.
- With minimal human intervention, CogniFLO™ accelerates process development while maximizing yield, conversion, and selectivity. Overall, it is a perfect platform for pharmaceutical, chemical and drug discovery research.

Applications

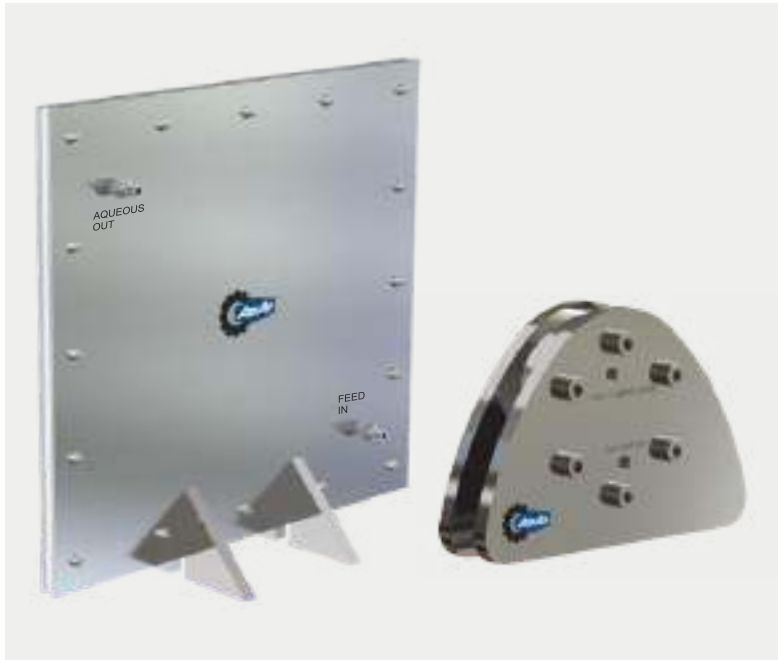
- Reaction screening and optimization
- Kinetic studies
- Continuous process development
- Scale-up studies
- Grignard reaction
- Solvent screening and solvent effect studies
- Crystallization studies
- Multi-step reaction optimization
- Design of Experiments (DoE) campaigns
- Lithiation chemistry

Continuous Liquid-liquid Separators

Designed for continuous separation of immiscible liquids

Membrane Separator

Separation based on differences in wettability and pore size of the immiscible liquids



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

Centrifugal Separator

Separation based on differences in densities of the immiscible liquids

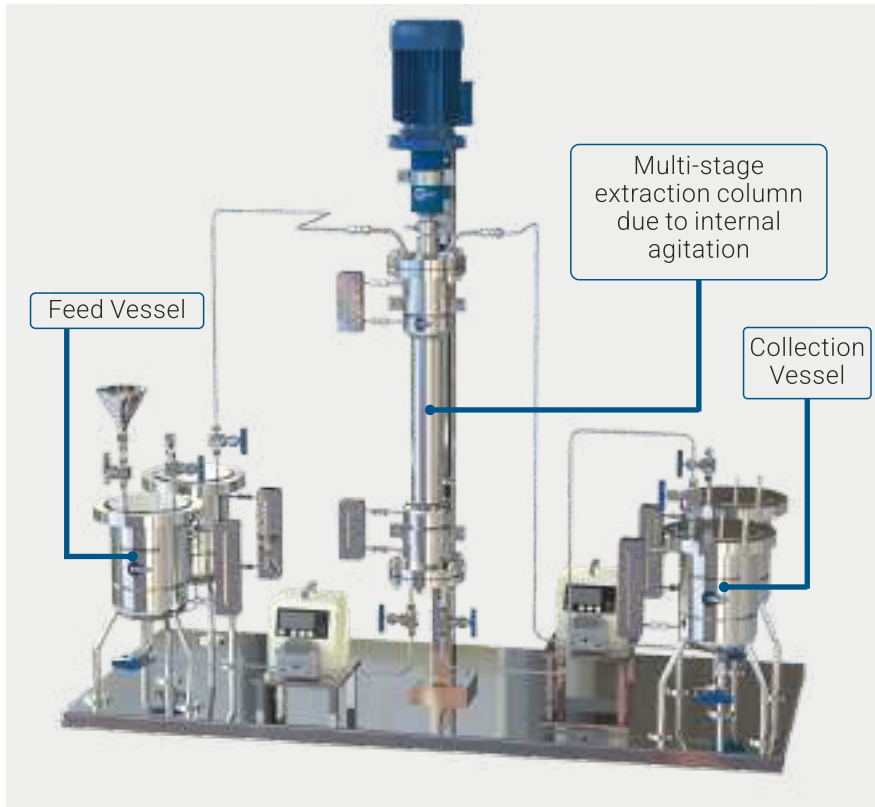
Features

- **Flow Rates:** 10 mL/min to 500 mL/min
- **Pressure:** Up to 100 bar
- **Temperature:** Up to 200°C
- **Material:** SS316, Hastelloy, etc.
- Uses high-speed rotation for separation



Continuous Liquid-liquid Extractor

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

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 same equipment with automation optional for continuous applications



High Pressure Continuous Syringe Pump

Features

- Flow Rates: 0.625 $\mu\text{L}/\text{min}$ to 60 mL/min
- Pressure: Up to 20 bar
- Material: Glass with PTFE plunger

Applications

- Grignard chemistry, lithiation reactions, other organometallic reactions, etc.



PascalFLO™ Slurry Pump

The patented PascalFLO™ pump by Amar Equipment enables controlled dosing of any liquid or slurry, regardless of temperature, rheology, or composition. It ensures accurate flow control without controllers on liquid lines and operates via controlled gas flow, eliminating the need for recalibration when switching fluids. Its design provides practically pulseless pumping, making it ideal for precise and consistent fluid handling.



Features

- Flow Rates: Range from 1 mL/min up to 100 LPH
- Pressure: Up to 100 bar
- Temperature: Up to 350°C
- Material: SS316, Hastelloy, etc.
- Slurry Content: 20% w/v (max 150 μm)

Applications

- Controlled pumping of thick slurries, emulsions, suspensions.
- Handling shear-sensitive fluids in drug formulation and bioprocessing.
- Delivery of high-viscosity lubricants, fuels, and specialty fluids.
- Metered flow of resins, pigments, and slurries in industrial coatings and polymer production
- Dosing of high temperature molten solids.

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.
- With accurate programmable temperature controller & touch panel



Valves & Fittings



• Pressures: Up to 413 bar / 6000 psi • Temperatures: Up to 500°C • Materials: SS316, Hastelloy C

Back-Pressure Regulators



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

Gas Liquid Separators



- 500 mL to 100 L
- Up to 350 bar
- SS316, Hastelloy C

Heat Exchangers

Double pipe Coil in shell Shell & tube



- Area: 0.01 m² to 5 m²
- Straight & corrugated
- Up to 350 bar
- SS316, Hastelloy C & Inconel

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

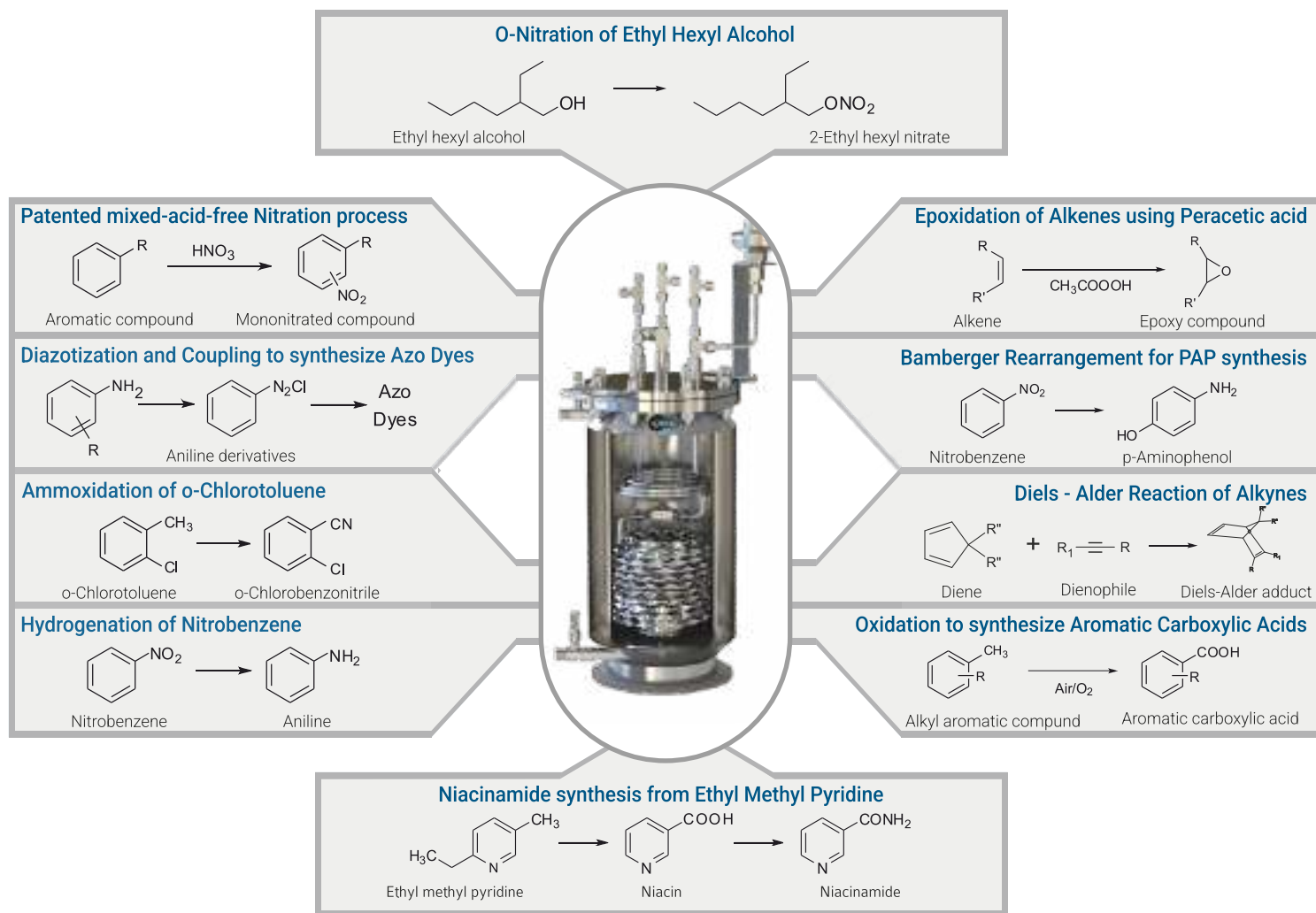
Engineering Lab



- 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

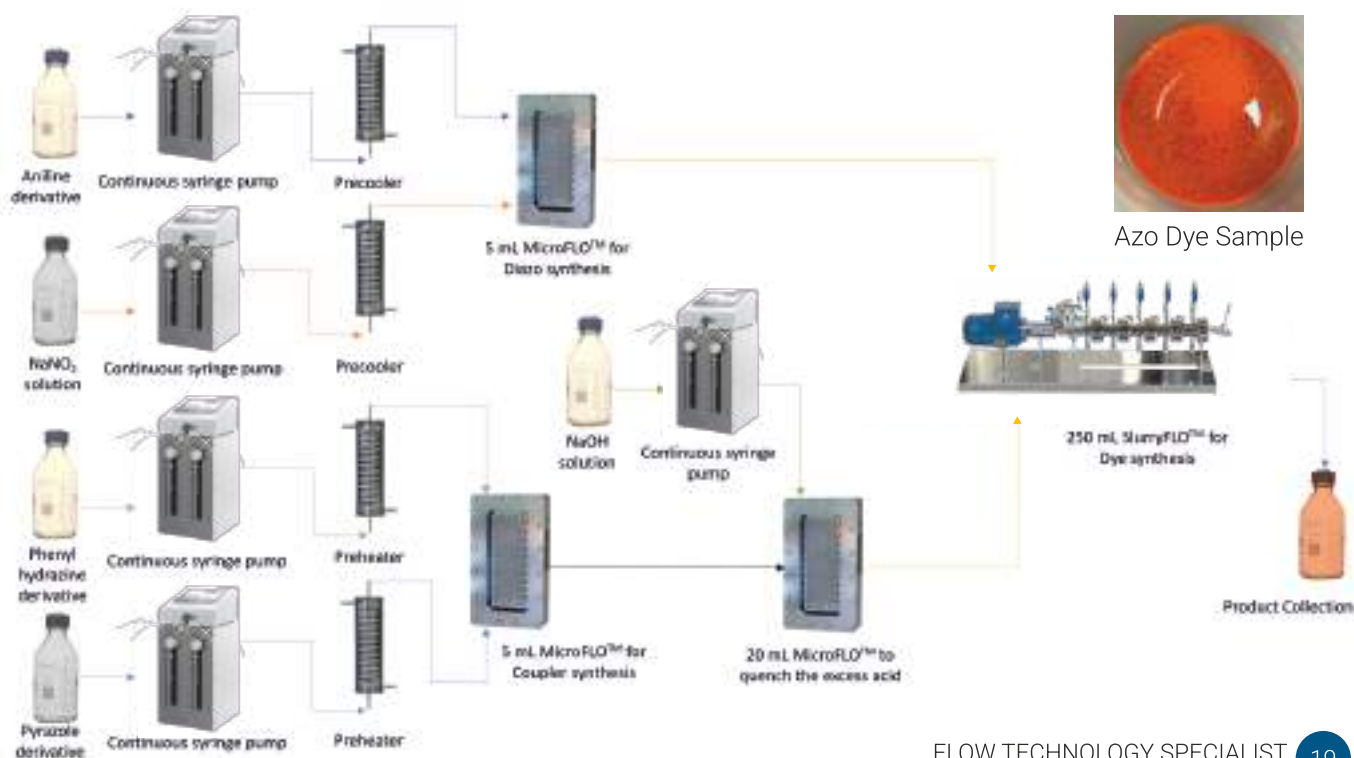
Processes Developed

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



Scaled-up Flow Reactor System

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

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

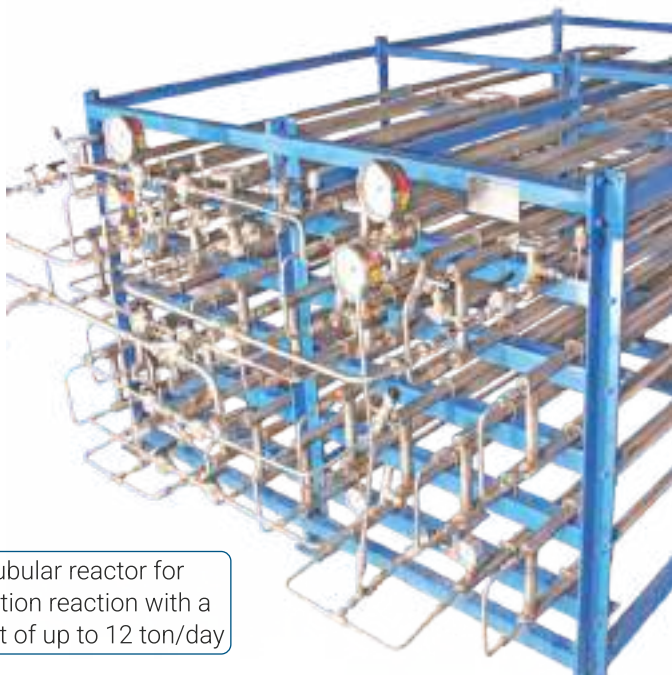
5L SlurryFLO® reactor for continuous crystallization with a throughput of 4 tons/day



4 L PinchFLO™ reactor for Nitration reaction with a throughput of up to 9 ton/day



10 L Tubular reactor for Diazotization reaction with a throughput of up to 12 ton/day



Flow Reactor Skids



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



Fluidized bed reactor for fluidization of alumina



High throughput multi-tube reactor system for catalyst screening

Our Valued Clientele



Our Valued Clientele

 Mylan	 NAVIN FLUORINE INTERNATIONAL LIMITED	 NEOGEN [®] CHEMICALS LTD.	 NOCIL	 OriGen Life Sciences Pvt. Ltd.
 Pfizer	 Health Sciences	 Pidilite	 Novopor advanced science...delivered	 praj
 RALLIS INDIA LIMITED A TATA Enterprise	 Reliance Industries Limited	 سابك sabik	 Sai make it better together	 SANMAR
 SENAI	 Shell	 SIBUR	 SRF MAKING OUR NATION PROUD	 SOIL [®] STAR ORCHEM INTERNATIONAL PVT.LTD.
 SUN PHARMACEUTICAL INDUSTRIES LTD.	 SYMBIOTEC	 Syngene Putting Science to Work	 syngenta	 SPPL
 TATA CHEMICALS LIMITED	 TATVA CHINTAN	 teva	 THEMIS MEDICARE	 THERMAX
 torrent PHARMA	 Transpek reactive Chemistry	 Irokan Imagine. Innovate	 TU/e EINDHOVEN UNIVERSITY OF TECHNOLOGY	 UNICHEM LABORATORIES LTD.
 UPL	 USV	 VINATI ORGANICS LIMITED	 Valiant Laboratories Limited	 Vipul Giving life a venue
 VIRUPAKSHA Choose Wisely. Choose Virupaksha	 WANBURY Towards Better Healthcare	 ZENFOLD Sustainable Technologies	 zoetis	 zydus Dedicated To Life

Client Testimonials

"Amar's Mumbai facility offers cost effective, high-quality components. Combining German precision with India's scalable production and digital innovation creates strong Indo-German industrial and 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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