AM Technology
Engineering Chemistry

The Coflore® RTR: Technical Note

AM Technology

AM Technology was founded in 2000. The company specialises in innovative continuous flow reactor solutions for the chemical and pharmaceutical industries.

Chemical reactors—batch or flow ?

Batch and flow process techniques each have their own benefits and disadvantages depending on the particular chemical processes involved.

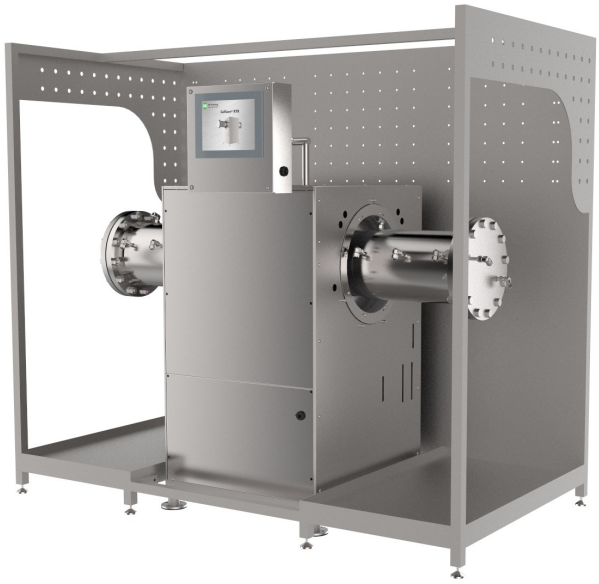
It is widely considered that batch processes offer high-throughput and scalability with a versatility that permits a relatively easy switch from one chemical process to another. Flow reactors are considered more efficient than batch, often offering higher yields and purities, finer temperature control, leaner reaction mixtures, shorter reaction times, reduced equipment footprint, lower capital costs, reduced energy costs and a lower hazard risk. The characteristics of flow are very important factors when considering a particular chemical process but often come at the expense of productivity.

Currently, it is batch technology that is predominantly used for production within the chemical and pharmaceutical industries as high productivity is often considered an essential attribute. The many desirable advantages of flow are therefore often not considered and a flow process may be overlooked for a production facility that has high production requirements.

Commercial developments in flow technology to date have largely focused on small yet high-performance flow reactors for use in smaller laboratory-scale processes. A single flow reactor that can offer the productivity and performance attributes of both batch and flow combined, with few of the disadvantages associated with either technique, is a logical evolutionary step in the design of the next generation of chemical reactors.

Productivity, scalability and versatility of batch combined with the efficiencies of flow

AM Technology has many years experience in designing and building flow reactors. Our latest development, the Coflore® RTR, opens the door to all of the desirable benefits of flow, whilst incorporating vast improvements in throughput, scalability and versatility normally associated with batch processing.



The Coflore® RTR Continuous Flow Reactor (100 L)

The Coflore® RTR operates as a ten-stage, actively-mixed continuous flow reactor with a 100 L capacity that is capable of processing theoretically limitless reactor volumes without interruption. Depending on the chemical process, a single Coflore® RTR reactor can operate non-stop for up to 12 months, matching for the first time the production capability of any batch reactor. Furthermore, an easy route from laboratory to production and a high level of versatility have also been established, whilst offering the very desirable advantages of flow technology.

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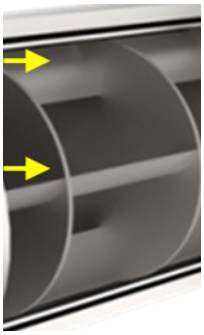
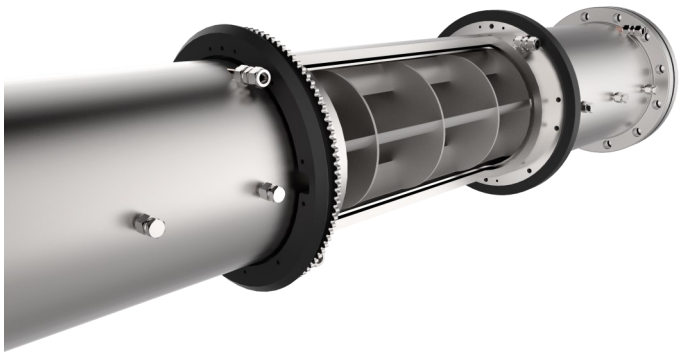
Optimal radial mixing with plug-flow and excellent heat-transfer characteristics

The Coflore® RTR employs inertia-generated radial mixing that gives high performance mixing without the need for rotating drive shafts, mechanical seals or wall-mounted baffles. Such advancements overcome difficulties in mixing that can be present in flow designs when processing higher volumes and throughputs.



A close-up of radial baffles and mixing assembly (arrows)

Axial blades rotate in reciprocating cycles to give self-baffling and radial mixing. Maximum turbulence and shear conditions exist at the very outer region of the tube to optimise multi-phase handling characteristics. This delivers short mixing times, excellent mass-transfer conditions and optimum heat-transfer, whilst minimising back-mixing to maintain plug-flow independent of residence time.



Inside the Coflore® RTR showing radial baffles and mixing assembly

The three zone jacket delivers excellent heat-transfer performance with the option of tuning the heating and cooling conditions to suit the reaction kinetics. The three zones can be heated or cooled independently of each other.

Easy to clean and sterilise

The reactor unit is easily disassembled and reassembled to facilitate efficient cleaning and sterilisation of all wetted components.

The Coflore® RTR: the best of both worlds

The inertia mixing and efficient heat-transfer performance of the Coflore® RTR enable it to effectively process liquid-liquid, liquid-gas, liquid-solid and liquid-solid-gas reaction mixtures, as well as perform extractions (co-current and counter-current) and crystallisations at a productivity, scalability and versatility comparable to those of batch with the performance of flow. All within a single flow reactor.

RTR Technical Specifications	
Reactor Tube Specification	
Reactor volume	100 L
Reactor tube ID	264 mm
Tube length	1800 mm
Heat transfer area	1.5 m^2
Material options	SS316, Hastelloy C
Design pressure	FV/10 bar
Design temp	-30/170 ^{0}C
Heat Transfer Zones	2
Footprint Specifications	
Height	1940 mm
Width	2250 mm
Depth	1200 mm
Total Mass (Empty)	530 Kg
Control System Specifications	
Drive Motor	3.3 kW
Power Supply	3ph+E+N
Control System	Schneider PLC & HMI
ATEX	ATEX Zone II option available