

# Process development

Implementing flow technology for production



## Process development

Flowid's expert services are focused on developing and optimising production processes using flow technology. A typical process development project starts with a feasibility study. During the pilot study it's scaled up after which a setup is implemented and starts producing. The economic feasibility is closely monitored during the development process progress using CashFlowid.

## Feasibility

Flowid's feasibility study can show whether continuous flow chemistry improves your process in means of efficiency, safety, controllability, and economics. The general procedure for a feasibility study consists of the following steps:

- ⑦ In-depth process analysis
- ⑦ Univariate screening of reaction parameters
- ⑦ Multivariate screening of prominent reaction parameters
- ⑦ Optimization of the reaction parameters
- ⑦ Convert test results into economic benefits using CashFlowid

Feasibility testing is performed in small micro reactors, requiring only a small amount of (expensive) reactants. When the results look promising, the next step is to scale up to pilot scale.

## Pilot scale

Pilot scale tests demonstrate that the feasibility results are applicable for production scale. Flowid designs and assembles fully operational pilot plants, including reactor, piping, sensors, pumps, controls and interfacing. A pilot scale setup can also be used as a small production unit, for instance for the production of initial product samples. For larger capacities the pilot scale is upgraded to meet the required production quantities.

## Production scale

The final product is implementation at production level. With respect to conventional methods (e.g. batch) flow processes are characterised by easy translation into production capacities. Flowid designs and assembles a fully operational production plant based upon the proven pilot scale plant. After implementation Flowid provides on-site support.

## Process development

Expert services for optimising production processes using continuous flow chemistry

Feasibility



Pilot scaleP



roduction scale



Customized reactor engineering

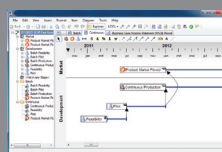


Support



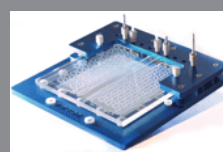
## CashFlowid

Expert service using propriety software to simulate the **economic performance** of a continuous process benchmarked to its conventional counterpart



## Skid

Customised **setups** for pilot and production purposes.

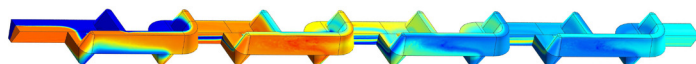


## Application Laboratory

Open microreactor laboratory for **demonstration** and **testing** purposes. Experience continuous flow chemistry from lab to production scale.

## Customised reactor engineering

As independent engineering company Flowid is able to select or develop the reactor set-up that fits best with the client's needs. If required we develop customised reactors, optimised for a specific reaction. A unique service in the field of flow technology.



Simulation of custom engineered micro mixing structure

## Support

For all challenges concerning flow chemistry Flowid provides expert support. Whether it is about selecting or engineering the hardware, implementation or trouble shooting.

Flowid is an engineering firm specialised in production scale implementation of continuous flow chemistry. In the field of chemical technology Flowid has been awarded several times for its innovative and groundbreaking work.

Leading companies like Alfa Laval, Bronkhorst, Fuji Techno, FutureChemistry, IMM, KSB, MicroNit and Mikroglas choose to cooperate with Flowid. For more information please visit [www.flowid.nl](http://www.flowid.nl)

