In the research initiative "Energy efficiency and process acceleration for the chemicals industry" new products shall be brought from the lab to production more quickly, such as in petrochemical industry (plant in the picture).

Chemical industry 29.10.2014

Chemical industry launches ENPRO initiative

Through the ENPRO research initiative, chemical corporations BASF, Bayer and Evonik hope to bring to the market new products much more quickly from the lab and establish more energy-efficient manufacturing processes in cooperation with other companies and universities. The initiative envisages the application of continuous production processes for small product volumes too in the special chemicals sector and the phasing out thereby of batch-based manufacture. In doing so, the partner institutions are seeking to develop new methods and system and equipment concepts.

The inaugural meeting of the “Energy efficiency and process acceleration for the chemical industry” research initiative, ENPRO for short, took place at the beginning of October in Jülich, Germany. Scientists of the participating institutions explained the underlying ideas, specific objectives and operational plans. The joint research project is set to run over three years and has a budget of 11.3 million euros. It is funded by the German Federal Ministry for Economic Affairs and Energy. The work is split into four technical sub-projects:

Processes and products developed faster

Products and processes are developed in the lab by chemicals experts, initially with small quantities of material. The individual synthesis stages are then carried over by the experts to larger “batches” in an often protracted pilot plant phase. It is at this stage that the manufacturing process becomes ready for large-scale production. The process is mostly intermittent in all development stages.
The KoPPonA project involves the testing of continuous production processes at the laboratory stage in such depth that these subsequently can be scaled up to industrial production without intermediate stages. In doing so, the researchers study new equipment concepts with micro-reactors that demonstrate virtually identical characteristics to production-scale plants. The KoPPonA project involves the “development and validation of an energy-optimised, resource-conserving general concept for accelerated product and process development for special polymers including reconditioning, beginning in the laboratory right through to production.”
The new concept is demonstrated by way of example in the manufacture of special polymers. After constructing a laboratory-scale plant, including inline process measurement system for response tracking, the project involves validating the results on a near-production scale in Ludwigshafen.

Efficient, continuous separation processes

At the end of a chemical production process, a mixture of substances is usually present that needs to be

separated for further processing. Substance separation therefore is one of the most important procedural stages. It often accounts for a large proportion of investment and operating costs in production plants. Pilot-scale process development too uses up large quantities of valuable raw and input materials. These resource requirements can be drastically reduced if it is possible to scale up laboratory-scale test models to full productions plants. Miniplants such as these are being developed by researchers as part of the SMekT “Smart miniplant for energy-efficient continuous separation processes” sub-project. The research focuses on non-invasive measurement techniques, automation, the simulation of energy and material-efficient processes and evaluation methods for energy and material consumption. The researchers hope to demonstrate the procedure based on the practical example of crystallisation and solids separation.

Modularisation – key components off the shelf

The modularisation sub-project aims at creating a framework for reusing engineering services that previously have been applied, where similar issues arise. The researchers hope to achieve this based on a modular system comprising frequently used standardised key components, such as columns or pumps for instance. Module-based engineering software helps in selecting individual components with a specific system plan in place and supports the overall design process from early lab-based process development to 3D plant modelling. The process is supplemented by an evaluation tool for energy efficiency.

Information barriers eliminated

The construction of a production plant involves numerous planning stages from the definition of requirements through to the finished system. During each of these stages, information barriers such as inadequately integrated software tools risk inhibiting optimal implementation or delaying the progress of operations. For energy-efficient plant operation and maintenance too, access to planning data from all development phases is essential.

In the “data integration” sub-project, the researchers hope to develop a phase-spanning information model and to specify the interfaces for software tools. This is intended to facilitate integrated software support across the life-cycle of a plant. The model, for instance, is intended to make clear the criteria underpinning the specific component design and selection in the case of plant overhaul or expansion.

ENPRO-Connect sharing platform

The four technical ENPRO projects are to be supported in future by the ENPRO-Connect platform. The platform is intended to facilitate cross-project communication, simple data comparison at the interfaces between the individual projects, the various project participants and the scientific analysis of results and further processing of the overall plan. Supplementation with further research and development projects of benefit focussed on e.g. process synthesis, standardisation, operational organisation and change management is thereby envisaged.

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