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PRODUCTION LOGISTICS ANALYSIS WITH INOSIM PROFESSIONAL - A FRAMEWORK FOR OPTIMIZED PROCESS PERFORMANCE

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ABSTRACT

In chemical industries, batch processing is the process mode of choice for the production of most polymers, fine chemicals, and pharmaceuticals. Its main advantage is flexibility to react to market changes. However, this flexibility puts extreme pressure on production planning and logistics. On-time raw material orders, strategic allocation of shared equipment as well as efficient handling of limited storage capacities and resources become essential. The behavior of such complex (multi-product) batch plants can be analyzed and optimized effectively with INOSIM Professional, an event driven simulation tool, which allows material flow analyses of chemical processes including their supply chain. One example for the high potential of INOSIM Professional is a recently optimized multi-product polymer resin facility. Forecasts pronounced a huge increase in product demand. With help of INOSIM Professional, the planned doubling of production capacity could be realized at 30% less investment cost than originally estimated.

1 INOSIM PROFESSIONAL

INOSIM Professional is a simulation tool made for the material flow analysis of chemical processes. Besides the pure production process, all plant-specific restrictions and logistical side effects influencing plant design and production planning can be integrated and analyzed. Examples for such restrictions and side effects reach from failures and maintenance, over resource supply and stock holding to the transport of manufacturing goods to the costumers by truck, trains or ships. Therewith, a holistic view on the production plant becomes possible and the complete process and plant behavior can be analyzed.

The result is extended knowledge about the capacity reserves a plant might provide in case of extensions. Logistic chances and needs can be detected and be balanced instantly and furthermore. Bottlenecks caused by a lack of capacity or by suboptimal logistics can be identified, thus making it easier to find adapted solutions. Using this knowledge enables an optimized plant and operation design, offering a better position dealing with logistical contractors and giving more certainty for future strategic activities.

This kind of analysis is not restricted to the simulation of single plants. INOSIM even allows to uncover dependencies between several plants on one production site as well as on different production sites. Hereby the non-trivial interactive effects between different processes and sites can be identified offering an even bigger strategic impact.

2 EXEMPLARY CASE STUDY

Polymer resins are typically produced in large multi-product plants, handling up to several hundred resinous mixtures. The multi-step production processes with shared equipment and limited resources as well as the permanent need to adapt the product portfolio to market changes make plant design and production planning of polymer resin facilities a highly complex matter.

In one of our recent projects, the production capacity of an existing polymer resin facility had to be doubled. This capacity increase had to be integrated into the existing facility concept, which means that all existing restrictions, like personnel planning, infrastructure and logistics had to remain untouched.

Based on data of the plant layout, production recipes, material data, failure rates, maintenance strategies, personnel shift system and production control the simulation model was set up. Figure 1 shows the resulting multi-step flow sheet. After validation of the simulation model, simulation runs focused on bottleneck analyses, which were evaluated by statistical analysis and Gantt charts.

Therewith, a concept for the capacity increase could be developed, which clearly needed less equipment than originally estimated by the customer. It led to a saving of more than 30% of the capital costs. In addition, a so far unknown "troublemaker" in the logistic structure of the plant site could be identified, which would have led in case of certain failure combinations to a complete plant shutdown. This problem could also be directly improved during the rebuilding for capacity increase.

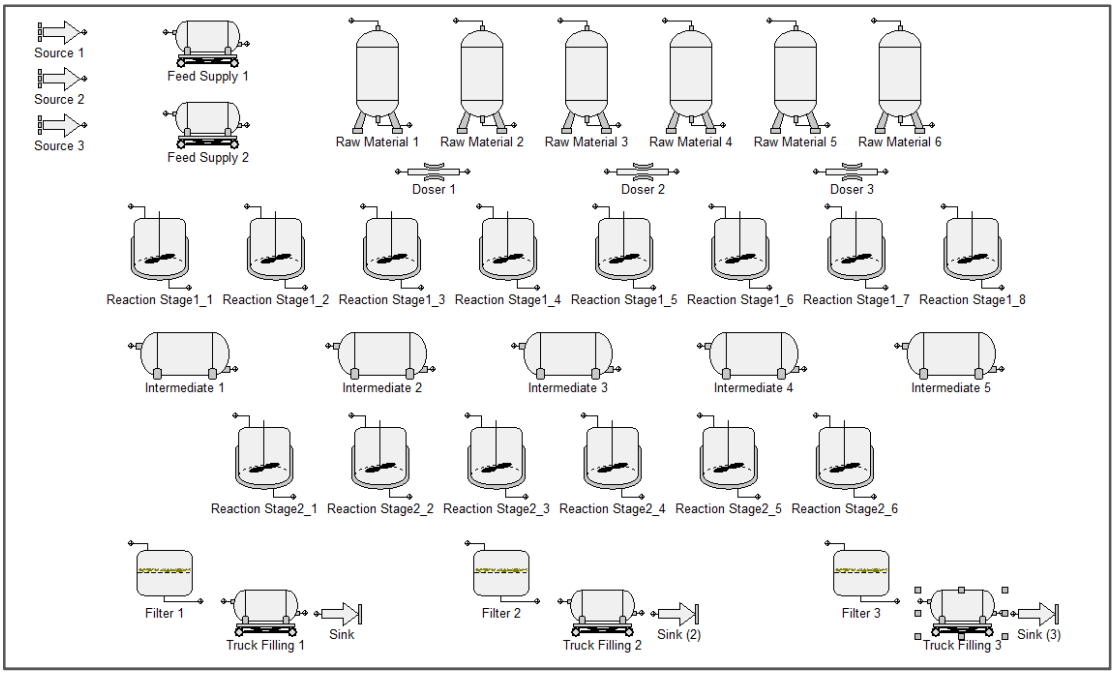

Figure 1: INOSIM Professional flow sheet of the simulated polymer resin facility

AUTHOR BIOGRAPHIES

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