SIEMENS

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Process modelling and the digital twin

- Model-based technologies are the key to simulations and most optimization measures. In the model, the reality is described using mathematical equations.

- Advanced models are used in the process industry whenever decisions need to be made quickly, safely and efficiently in order to improve processes in the areas of formulation, product and process design or for system operation, and whenever the decision space needs to be explored quickly and effectively.

- A digital twin is the replica of a real system that is as precise as possible – with all components, their properties and functions.

- The transparent illustration of internal process states is not the only use for the digital twin. Since the model is not constrained by technical or safety restrictions, it can also be used to develop process optimizations in a safe virtual environment. Even time restrictions can be overcome with these simulations, making it possible to gain a concrete view of the future.

- The comprehensive use of a digital twin across the entire lifecycle of a process engineering plant maximizes its economic benefit, above all if the simulation models are not created from scratch for each step but are connected or fed into one another.

- If the digital twin of a process plant is considered as a comprehensive concept, then in fact several digital twins are being used: the digital twin of the product, the digital twin of the production plant and the digital modelling of the performance of both product and production.

- Based on available system knowledge and the latest information from publications, an initial digital process twin can be created using simulation software. This digital twin is used for the design of the plant and its components (conceptual design). This includes, for example, the specification of the chemical reaction or the calculation of the optimal reactor size and wall thickness. All knowledge in this phase flows into the Process Flow Diagram (PFD), the basis of the digital process twin.

- Equation-based process modelling is the domain of the gPROMS ProcessBuilder, a modelling and solution environment which achieves higher modelling accuracy than many other flowsheet simulators.

- This technology was developed by Process Systems Enterprise (PSE, London) and has been integrated into the Siemens digitalization portfolio through the acquisition of PSE by Siemens. Process Systems Enterprise (PSE) is a leading global supplier of software and services for advanced process modelling.

- PSE offers model-based solutions for the entire plant lifecycle with a uniform and integrated range of tools, which complement the Siemens portfolio for applications in the process industry and which further strengthen the position of Siemens as a leading supplier in comprehensive plant management across the entire lifecycle.