



SIMULATION AS A KEY TO SUCCESSFUL CAPACITY EXPANSION

The pharmaceutical industry is under increasing pressure to expand production capacities quickly and efficiently – often while operations are ongoing. Brownfield projects, where existing facilities are extended or modified, are particularly demanding. ZETA addresses these challenges with an integrated engineering approach in which process simulation plays a central role.

SIMULATION CREATES CLARITY: FROM PLANNING TO OPTIMIZATION

Even in the early phases of a project, key questions arise: What capacities are realistically achievable? Where do bottlenecks occur? How can media consumption and equipment utilization be optimized? Answers are provided by the software INOSIM Insight, which ZETA uses as a simulation tool throughout all project phases.

By creating a digital twin of the production process – from the initial concept to a minute-by-minute representation of operations – a virtual model of the plant is generated. This enables well-informed decisions regarding storage capacities, staffing needs, shift planning, and automation strategies – long before the physical plant exists.

Even a small number of individually simple components can result in complex system behavior when combined. Process simulation allows for more targeted development and helps identify potential operational challenges at an early stage.

BEST PRACTICE: SIMULATION SAVES MILLIONS

A simulation project aimed at integrating a new production line into an existing site of a plasma-processing company resulted

in savings of over five million euros. ZETA provided the concept design and conducted simulation studies. In this brown-field environment, space for the new equipment was limited, and existing media systems needed to be utilized as efficiently as possible. A key question was whether the capacity of an existing WFI tank would be sufficient to supply the new line.

An initial bottleneck analysis was conducted. Based on the results, ZETA developed and optimized concepts for buffer supply, WFI distribution, and cleaning (CIP). Thanks to ZETA's integrated planning approach, the new production line could be designed despite spatial constraints. Specifically, a buffer preparation tank, a CIP skid, and a WFI tank were eliminated from the design – while the core process remained unchanged.

SIMULATION AS A TOOL FOR OPERATIONAL OPTIMIZATION

For existing facilities, simulation offers significant advantages. By mapping the current state and parameterizing relevant influencing factors, various scenarios can be tested – such as start-up, shutdown, product changeovers, or failed buffer preparations. This enables operators to identify optimal operating strategies, plan maintenance windows, and improve utilization.

The combination of empirical data, mathematical models, and stochastic methods allows for a robust assessment of production performance. Particularly valuable is the integration of workforce planning: How much staff is available, when, and for which tasks? Simulation provides reliable answers.

INFORMED DECISION-MAKING IN ENGINEERING

ZETA seamlessly integrates simulation into the EPCMV process. The digital twin accompanies the project from the initial idea through commissioning and beyond. This transforms simulation from an engineering tool into a comprehensive planning instrument that delivers both technical and economic benefits.

SIMULATE FIRST. ENGINEER SMARTER.

Simulation is no longer just an add-on in engineering – it is a key success factor in the planning, implementation, and optimization of pharmaceutical production facilities.

ZETA uses INOSIM Insight to make complex systems understandable, evaluate scenarios, and guide projects to success. Whether developing new facilities or optimizing existing processes: simulation creates clarity – and saves costs.

THE ADVANTAGES ARE CLEAR:

- ▶ Early identification of bottlenecks
- ▶ Optimization of media and resource usage
- ▶ Improved design accuracy
- ▶ Risk reduction
- ▶ Cost savings through data-driven decisions



ABOUT ZETA!

ZETA is a globally active end-to-end solution provider for the pharmaceutical and biopharmaceutical industries. The company specializes in the design, construction, automation, and qualification of customized process systems. ZETA offers comprehensive solutions and services across the entire active ingredient development and manufacturing process. By leveraging a fully integrated digital value chain – including engineering, process simulation, qualification, and operator management – ZETA ensures seamless integration across all project phases. Simulation plays a key role by enabling early, informed decisions, reducing risks, and significantly improving efficiency in planning and operations. In addition, ZETA manages complex large-scale projects as an EPCMV expert and develops holistic decarbonization strategies.



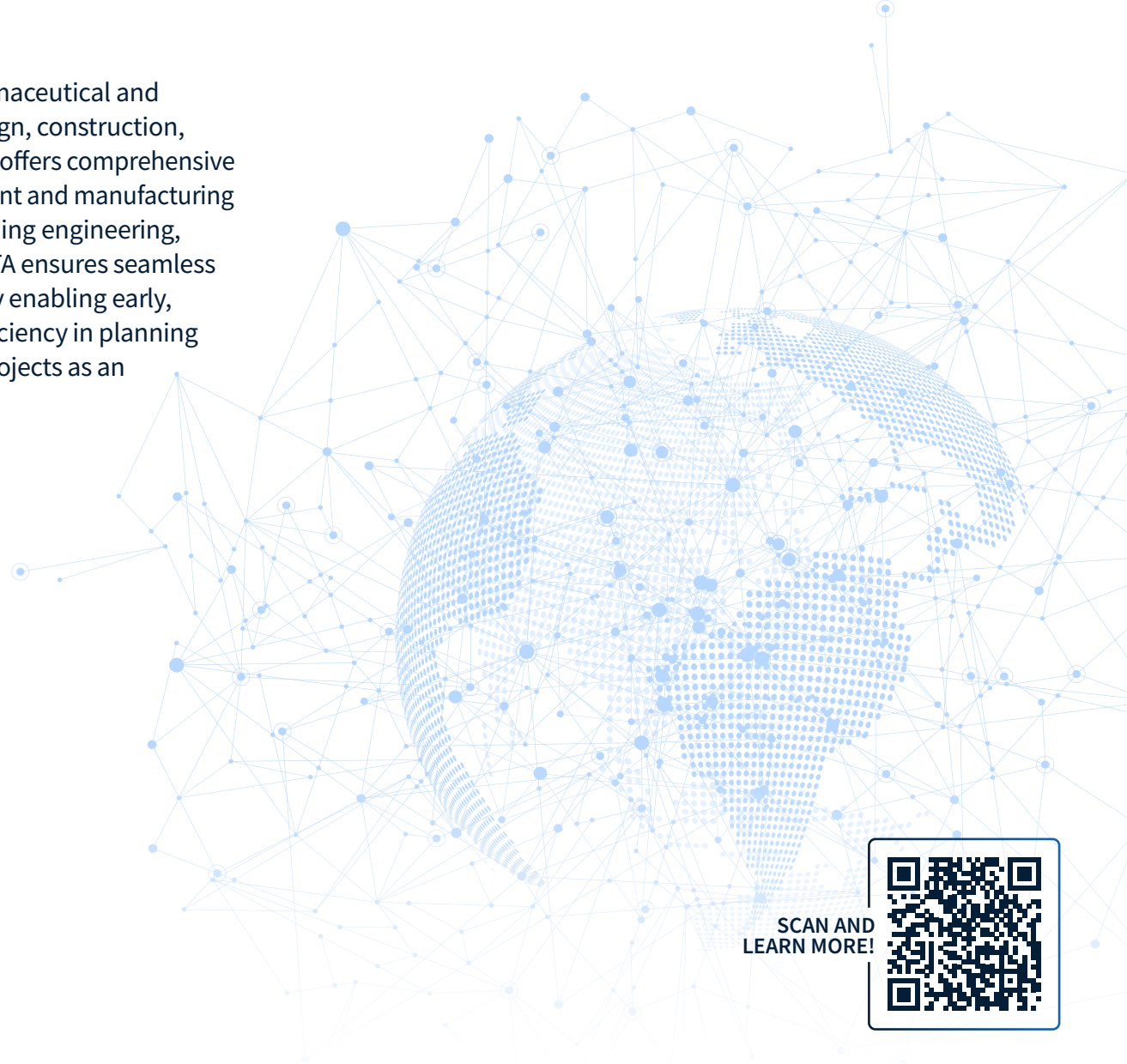
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