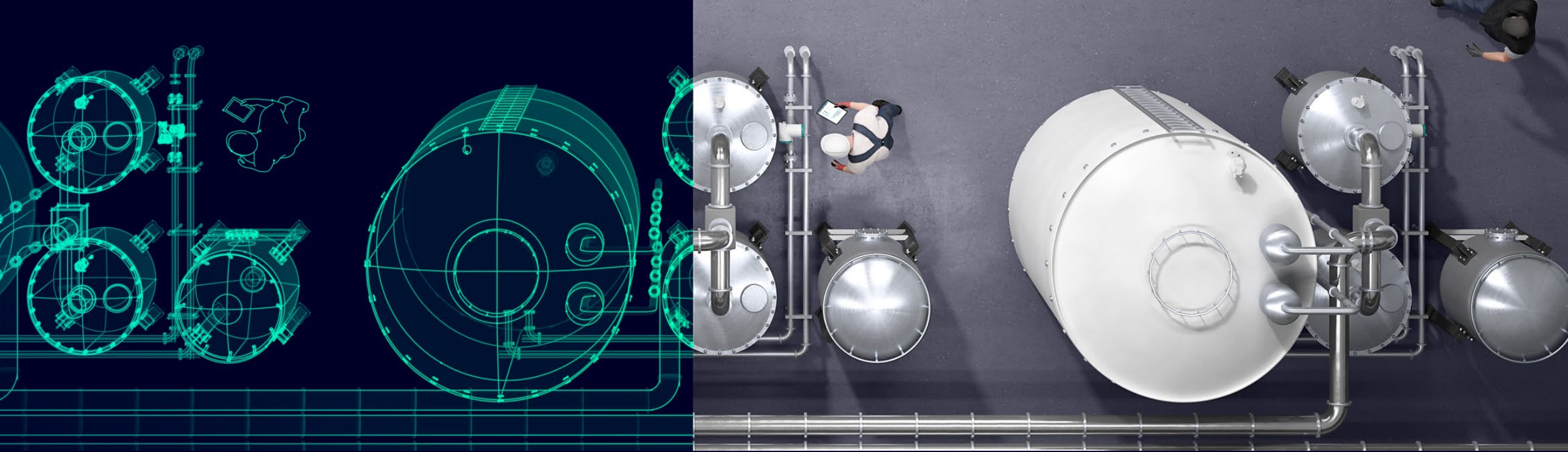
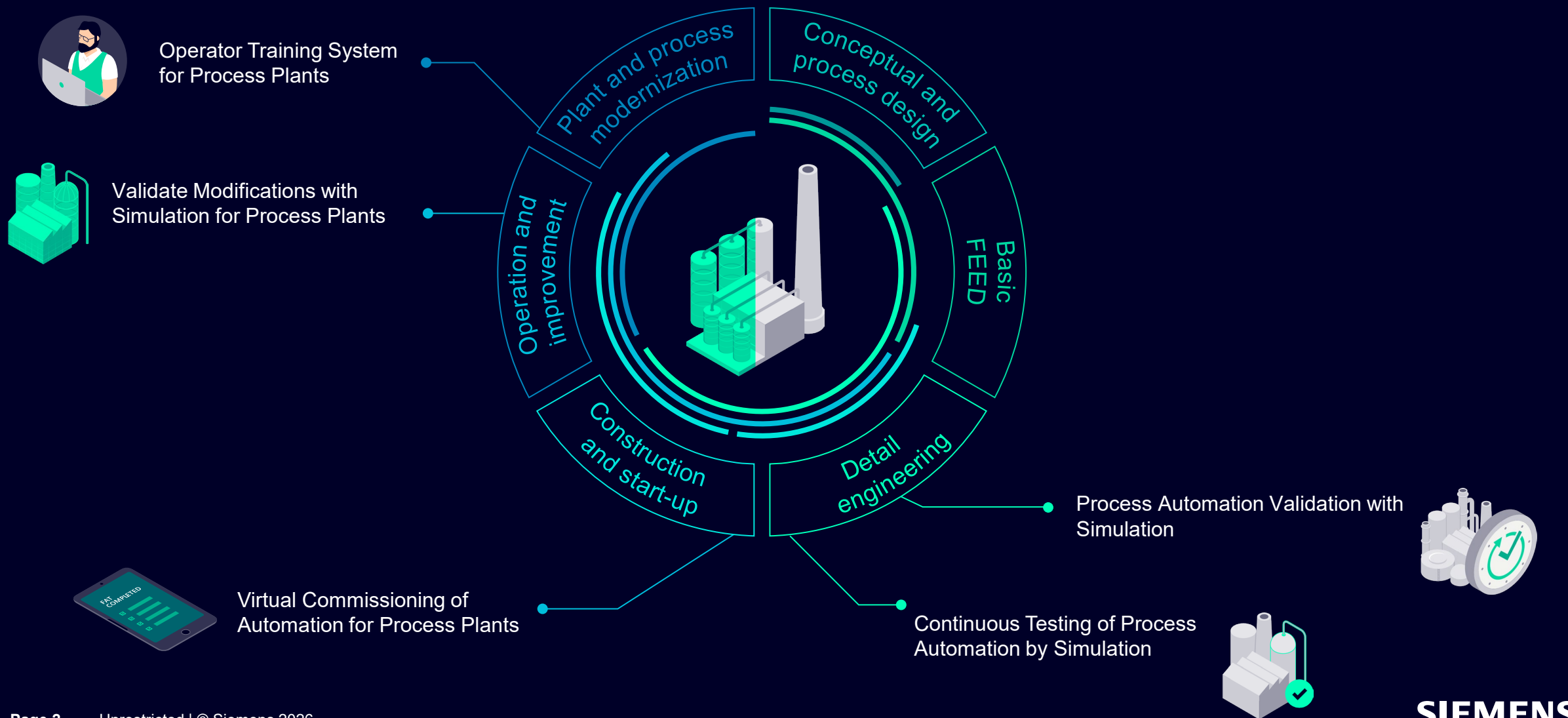




Simulation in Process Industries



How to use simulation and enable a holistic approach along the value chain





Process Automation Validation with Simulation

Use Case scenario within lifecycle

Process industries aim to reduce manual tasks and automate engineering processes, introduce efficient workflows and standardization, and implement new technologies for optimization. To ensure a sustainable and cost sensitive operation, there is a high need to test, change, update and improve the process behavior and process parameters of devices, sequences, recipes, formulas and the entire plant.

Challenges

- Changes can involve very costly modifications in the process or in the plant. Not only cost but also time periods of impaired operation during plant modifications can become a challenge
- Diverse objectives and constraints related to safety, security, product quality, cost, time, sustainability and operability need to be considered during plant operation regarding the whole plant lifecycle

Key Portfolio Elements

- SIMIT, gPROMS, COMOS, SIMATIC PCS neo / PCS 7

Simulation of Process Automation

1 | Process Automation Validation with Simulation

2 | Continuous Testing of Process Automation by Simulation

3 | Validate Modifications with Simulation for Process Plants

4 | Virtual Commissioning of Automation for Process Plants

5 | Operator Training System for Process Plants



Process Automation Validation with Simulation

Benefits



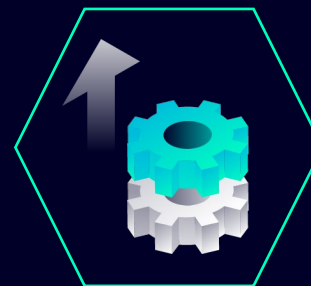
Higher quality

Repeatable high quality of engineering and predictive test of process behavior



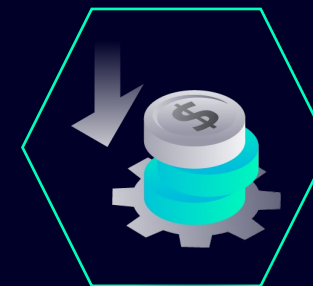
Failure elimination in an early stage

Test changes prior to deployment to the running plant throughout the whole lifecycle



Increased productivity

Can be done independently of real plant operation (e.g. Operator Training)



Reduced costs

Save costs by the reuse of design, planning and engineering data from other tools



Continuous Testing of Process Automation by Simulation

Use Case scenario within lifecycle

Automation engineering in process industries is highly complex and subject to frequent changes. Having a reliable engineering is crucial to ensure efficiency and safety, so repetitive tests of control strategy, logics, interlocks, sequences, etc. are required. Engineering and testing of automation systems in a process plant is usually performed manually, under extreme time pressure and without the real hardware, which is not available right in time.

Challenges

- Automation testing process is repetitive, inefficient and performed manually
- High efforts and risk of human errors
- Need to ensure quality while also increase test efficiency
- Limited test scope to cover all automation scenarios leads to errors in a later stage, with increasingly higher costs to fix them

Key Portfolio Elements

- SIMIT, SIMIT Rapid Tester, SIMATIC PCS neo / PCS 7

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Virtual Commissioning of Automation for Process Plants

Benefits



Reduced time-to-market

Up to 60%-time reduction for commissioning enables faster time-to-market



Increased safety

Reduced risk for errors and accidents



Increased project quality

Also enhanced by the separation of engineering system and test system



Ensure sustainability

Optimized production with increased sustainability



Validate Modifications with Simulation for Process Plants

Use Case scenario within lifecycle

Process plants often struggle with inefficiencies, unexpected downtimes, and suboptimal resource utilization. The conventional approach of reactive maintenance and troubleshooting is no longer sufficient in today's fast-paced industrial environment. Using a Digital Twin for plant and process modernization allows you to perform all kinds of system migrations or expansions (e.g. DCS), review recipe control, check interfaces to third party systems, and significantly reduce the risks.

Challenges

- Ensure plant availability and efficiency through validation of automation and process changes
- Validation of changes before qualification (e.g. FDA)
- High operational risks for changes and modernizations
- Excessive energy consumption and increased operational costs

Key Portfolio Elements

- SIMIT, gPROMS, COMOS, SIMATIC PCS neo

Simulation of Process Automation

1 | Process Automation Validation with Simulation

2 | Continuous Testing of Process Automation by Simulation

3 | **Validate Modifications with Simulation for Process Plants**

4 | Virtual Commissioning of Automation for Process Plants

5 | Operator Training System for Process Plants



Continuous Testing of Process Automation by Simulation

Benefits



Increased quality

Continuous validation of automation and safer operations due to failure elimination in an early stage



Easy traceability

Automatically generated reports ensure traceability of every engineering increment and operation scenario



Reduced time and costs

Minimize the time for FAT/SAT with less effort for testing and save costs



Reduced risks

Automated testing reduces the risk of human errors



Virtual Commissioning of Automation for Process Plants

Accelerate commissioning with the use of simulation

Use Case scenario within lifecycle

The automation and engineering of a process plant are highly complex due to the need for interdisciplinary coordination, customization and the huge amounts of data. Virtual commissioning of automation is crucial for process plants as it allows engineers and plant operators to test and validate processes in a virtual environment, significantly reducing the risk of errors during actual commissioning. This helps avoid costly mistakes and ensures a faster time-to-market.

Challenges

- High operational risks during real commissioning
- Pressure to meet time to market deadlines while guaranteeing quality
- Loss of between 2 – 6 % of production capacity due to commissioning tests and operator errors
- Ensure that the plant operates safely and complies with regulatory and sustainable standards

Key Portfolio Elements

- SIMIT, Virtual Controller, SIMATIC PCS neo / PCS 7

Simulation of Process Automation

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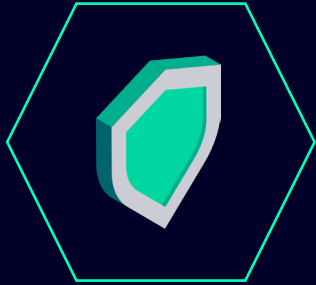
4 | **Virtual Commissioning of Automation for Process Plants**

5 | Operator Training System for Process Plants



Validate Modifications with Simulation for Process Plants

Benefits



Improved security

Due to validation of changes prior running real production



Higher quality

Repeatable high quality of engineering and predictive test of process behavior



Higher plant availability

Early error detection ensures less plant downtime



Increased efficiency

On average, 15 % improvement in turnaround times and operational efficiency



Operator Training System for Process Plants

Virtual operator training in an as-built simulation scenario

Use Case scenario within lifecycle

In the highly complex world of process manufacturing, the skill and preparedness of operators can make or break a plant's performance. The need for a more immersive and practical training solution is clear. With virtual operator training, operators can react faster and better to process upsets, ensuring safety of both personnel and equipment.

Challenges

- High operational risks - around 80% of accidents can be attributed to human error
- Loss of up to 2 – 6 % of production capacity due to operator errors
- Traditional operator training methods often rely on theoretical knowledge, limited hands-on experience and thus are increasingly insufficient for modern control systems

Key Portfolio Elements

- SIMIT, SIMIT Training Platform, gPROMS, SIMATIC PCS neo / PCS 7

Simulation of Process Automation

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5 | Operator Training System for Process Plants



Operator Training System for Process Plants

Benefits



Operational Excellence

Optimized processes ensure less plant downtime and consistent operational procedures



Risk Mitigation

Personnel, environment and equipment are kept safe with less errors and incidents



Increased operator know-how, built-up and transfer

Virtual trainings done with an as-built simulation scenario



Improved Financial Performance

Reduced startup time, production losses, training costs, equipment damage and more



Your benefits with Simulation of Process Automation



Improvement of
cross-discipline
collaboration



Significantly
reduced risk for
errors and accidents



Faster **time-to-**
market



Optimized **production** and
increased **quality**



Improved
sustainability



Open, **scalable** and
modular solution

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