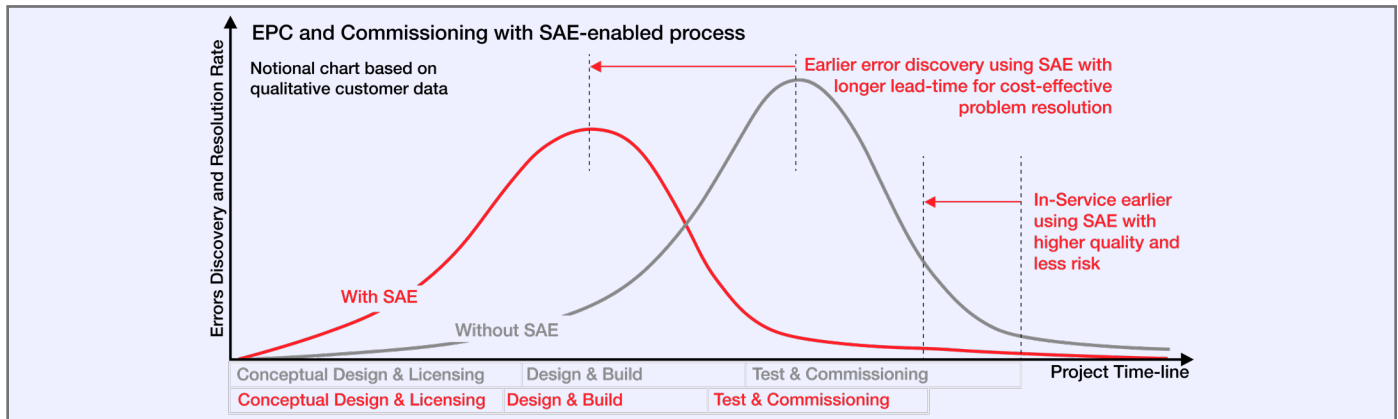


Simulation Assisted Engineering (SAE)

Solutions for Simulation Modeling

**CURTISS -
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Power & Process Products and Services



What is SAE?

Over the past several years, there has been an increasing trend in the use of simulation beyond the traditional use of training power plant operators. In particular, power plant control rooms that incorporate distributed control systems (DCS) have brought about the need for applications such as Simulation Assisted Engineering (SAE) to develop, optimize, and validate new DCS designs prior to commissioning.

Plant technical staff have a blind spot with their traditional engineering tools that only provide static information. They cannot take their designs for a test-drive or put them through “what-if” scenarios to shake-out potential problems associated with integration, operator interaction, or functional performance. Nor can they test their designs across a full range of operating scenarios or changing conditions.

SAE incorporates simulation as a core engineering practice to fill this gap, enabling engineers to efficiently answer questions about the dynamic behavior of complex systems and optimize their designs. This allows problems to be identified and solutions tested and incorporated earlier in the development cycle, avoiding costly and time consuming design revisions during production, construction, or commissioning.



*: WSC, a legacy brand of Curtiss-Wright's Simulation Group, headquartered in Frederick, MD, is a global simulation and services company. Acquired by Curtiss-Wright in 2024, WSC is recognized for the quality and efficiency of their products and flexible team-oriented approach to serving its customers.

How can 3KEYMASTER™ Enable SAE?

There have been barriers to the adoption of simulation in engineering due to issues with usability, completeness, accuracy, and efficiency of simulation tools. 3KEYMASTER™, from our Simulation Group*, changes that. Built ground-up, using true object-oriented technology and an open architecture, its tools have been assessed as “best of breed” by leading engineering companies, and have now been embedded in their design, test, and project delivery lifecycles.

3KEYMASTER™ and 3KEY-SAE™ Advantages

- Ease of use - fully graphical approach without requiring any programming or coding knowledge.
- Fast, efficient, and robust environment for cost-effective model construction, test, and re-engineering.
- Comprehensive, accurate, and high-fidelity modeling of systems - knowledge of physical principles and equation solution methods are embedded in the modeling tools.
- Multi-user, parallel project development
- Extendable - easy to add new modeling objects and code, or port custom code, to provide complete simulation of complex system

3KEYMASTER™ Value Propositions for SAE

Historically, the most common use of high-fidelity simulation has been in training, with simulator deployment occurring towards the end of the development cycle of a complex engineering project. However, with engineering-grade simulation technology provided with 3KEY-SAE™, it is now possible to reap accumulating benefits throughout the project lifecycle by deploying simulation earlier to accelerate delivery, improve quality, reduce risk, and lower cost.

Simulation Assisted Engineering (SAE)

Solutions for Simulation Modeling

Higher Quality Management Value Proposition: Increase V&V Rigor, Discover and Resolve Problems Earlier and Faster

- Deploy a 3KEYMASTER™-based simulator as an evolving V&V platform in parallel with the actual engineering schedule
- Incorporate design and operational information from various sources on an on-going basis
- Verify for completeness and compatibility, and validated for faithfulness to design criteria - if it doesn't work in an engineering-grade simulator, there is a high likelihood that it will not work in the real world

Integrated Systems Engineering Value Proposition: Accelerate Engineering Cycles with Increased Quality

- Use 3KEYMASTER™ directly as a platform for functional and HMI design, test, analysis, and optimization
- The powerful 3KEYMASTER™ environment, installed as a Graphical Engineering Station on engineers' computers, allows efficient parallel development and integrated system testing

Delivery-Cycle SAE Applications

Conceptual Design and Licensing

- Developing process flow sheets and nominal operating parameters for equipment
- Specifying system boundaries and integration parameters at key operating conditions
- Conducting human-factors engineering studies and developing HMI designs
- Conducting preliminary failures and safety analysis studies for single or complex failures

Design and Build

- Developing systems engineering artifacts such as P&IDs, Logic & Control and Electrical Diagrams
- Developing equipment sizing and capacity specifications
- Developing engineering-grade first principles models

Testing & Commissioning

- Virtual commissioning and verification of the entire integrated plant
- Verifying equipment performance
- Performing DCS systems functional and sensitivity tests, and tuning
- Verifying test and operating procedures
- Verifying response to failures and faults
- Identifying and diagnosing problems, and exploring solutions



Conceptual Design & Licensing

- Human Factors Engineering
- Scoping & Pre-Sale Support
- Process Flow Diagrams
- Systems Engineering
- Safety Analysis



Design & Build

- Piping & Instrumentation Diagrams
- Thermal Hydraulic Performance
- Logic & Control Design
- Electrical Design
- Equipment Specification



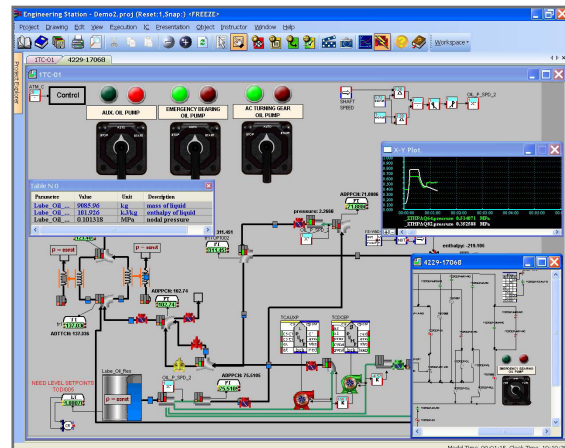
Testing & Commissioning

- Integrated Plant Design Verification
- I&C, DCS Testing & Tuning
- Commissioning Procedure Verification
- System Pre-Testing
- Fault Diagnosis

In-Service SAE Applications

In-Service Operations, Engineering, and Maintenance

- Operator training, certifications, and facilitating knowledge management and learning across various technical departments
- Verification and updates of operating and test procedures
- Performing studies in support of licensing and life extensions
- Proposed design and I&C modifications analysis and verification
- Procedural and timing studies for maintenance planning
- Performance optimization studies through control systems tuning, system operating parameters adjustments, or modifications
- Predictive health monitoring - comparing actual system measurements with "should-be" predicted values from the simulator



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