SIEMENS DIGITAL INDUSTRIES SOFTWARE

Unlock new possibilities with executable digital twin

Deploy simulation insights into operations and optimize performance across the production lifecycle to achieve continuous operational excellence

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Trends, challenges and opportunities

It's no surprise that the energy industry is rapidly changing. The increasing demand for energy, rising concerns about carbon emissions and ongoing market volatilities continue to transform the industry landscape, creating more challenges and raising the bar on performance.

To stay relevant tomorrow, energy businesses must be efficient and resilient today. They will need to innovate to dramatically improve operational performance and achieve higher productivity levels. And with the global demand for energy output at an all-time high, they will need to maximize production while reducing carbon emissions at the same time. That's a tall order.

To respond swiftly to changing market dynamics and remain competitive, energy companies must leverage advanced engineering and simulation tools and pursue design excellence.

The executable digital twin promises to be the perfect solution for designers and engineers to improve their designs and enhance performance in real time. As an intelligent virtual representation of a physical plant or an asset, the executable digital twin can perform real-time performance analysis to simulate and test system performance, recognize the environment it is in, and adjust to those conditions—offering faster and intelligent insights into plant processes. Read on to see how.

Top trends

Navigate market volatility

50% increase in energy prices expected from 2020 onwards.[1]

Focus on sustainability

45% reduction in emissions required to meet the 2050 net-zero goals.[2]

Keep up with the energy demand

2% is the increase in global energy consumption per year.[3]

Go beyond basic digital twins

Given the complexity in today's technologies, engineers and designers often struggle to understand and manage all the interdependencies that exist between various models and systems. It's crucial that the production assets they are responsible for are connected, monitored and accessible across devices. However, incomplete, and unorganized data sets can get in the way, making it almost impossible for teams to make accurate decisions.

Furthermore, the energy industry is capital-intensive requiring large investments in manufacturing equipment and plants that can remain active for decades.

To address the increasing system complexity, extend the lifespan of their facilities, and keep up with this dynamic environment, companies need a comprehensive digital backbone that enables a shared view of truth and ensures the final product is powerful, yet greener and lighter.

Using a digital twin allows engineers to find the optimal design even before the product goes into production. However, these digital twins cannot be deployed at the operational level as they are too complex or too slow to provide real-time operational insights. That's where the executable digital twin comes in. It bridges the gap between digital twins and plant operations.

As a physics-based simulation model, the executable digital twin uses data from a small number of sensors embedded in the physical product to perform real-time simulations using reduced-order models. From those small numbers of sensors, it can predict the physical state at any point on the object, even in places where it would be impossible to place sensors. This can help engineers validate their simulation models, identify problems, and make important decisions early on, allowing sustainable processes—from concept to production.

By using an operational excellence approach, energy leaders can expect: [4]

2.3X margin growth

1.8X revenue growth

3X ESG improvements

Bridge the digital and physical divide

Digital twins are quickly becoming important business tools for many organizations, especially those in manufacturing. By 2025, the manufacturing industry is forecast to reach a digital twin market size worth over $6 billion.[5]

With Siemens Operational Excellence for energy and utilities, engineering teams can have real-time access to data to evaluate critical insights into ongoing production behavior which will allow them to respond proactively to issues and opportunities. The executable digital twin can process sensor information, recognize its environment instantly, adjust to those conditions, enabling you to optimize operational performance to power business outcomes and sustainability.

Furthermore, the executable digital twin can be leveraged by anyone at any point of the production lifecycle on any certified device—from edge to cloud, without the need for heavy simulation software and infrastructure. All of this allows energy organizations to stay ahead of changing times, cater to the sustainability-focused consumers and investors, and more importantly save resource time that would otherwise be used for hours of testing and prototyping. The solution is a part of Siemens Xcelerator as a service, powered by Amazon Web Services (AWS), a comprehensive portfolio of software and services that can help you solve your most complex engineering design challenges.

Key capabilities

- Run a self-contained, executable digital twin model on the industrial IoT platform for near real-time condition monitoring.

- Utilize advanced engineering simulation to model system performance, troubleshoot issues and perform different 'what-if' scenarios.

- Model and analyze the operational efficiency of high-value assets using virtual sensors.

- Predict potential catastrophic loss even before it happens by continuously monitoring in real time

- Make informed decisions by accessing the digital twin at any point of the production lifecycle, on any certified device, from edge to cloud.

- Connect simulation to the engineering definition of your plant and production assets

Customer success

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SANY Heavy Energy

In the rapidly changing wind power industry that has many giants, the key for SANY Heavy Energy to succeed is to fully utilize smart technologies like the digital twin to improve development efficiency and product reliability, thus lowering LCOE and supporting our ultra-low wind speed product strategy. In this process, Simcenter 3D provided by Siemens Digital Industries Software is a key value."

Wu Shengfei, CAE Simulation Manager
 SANY Heavy Energy

Read the case study

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Department of Wind Energy, Technical University of Denmark

The focus is to make wind turbine blades more reliable by using a digital twin. That was one of the ideas of establishing this project."

Kim Branner, Senior Researcher
DTU Wind Energy Technical University of Denmark

Read the case study

Siemens ranked overall leader in industrial simulation

In a recent ABI Research study, Siemens was ranked overall leader in offering software to create and simulate the most comprehensive digital twin that closely matches the behavior of real-world production systems.

Read the Analyst Report

References

1. **World Bank Blogs, The energy shock could sap global growth for years, June 2022**

2. **UN Article: For a livable climate: Net-zero commitments must be backed by credible action**

3. **Our World in Data: Energy Production and Consumption**

4. **Accenture Best of 2021 Energy Insights**

5. **Statista.com Report: Global digital twin market size in the year 2020 and 2025, by industry**

About Siemens Operational Excellence:

Siemens Operational Excellence for energy and utilities enables more responsive production capabilities with comprehensive analytics from plant assets and systems and complete lifecycle visibility. It does so by leveraging a common digital thread spanning engineering through operations, positioning energy businesses to continuously achieve their operational excellence objectives in real-time. Energy businesses can equip their field operators with highly customizable apps and analytics that consume data from smart assets and networks of sensors to alert them of potential operational issues before they occur. In addition, your business gains the ability to apply real-time performance analysis to troubleshoot critical systems, simulate new concepts, or diagnose internal flow issues that can lead to instability or plant outages.

For more information on Siemens Operational Excellence, visit siemens.com/oe or follow us on LinkedIn and Twitter.

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