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Accelerating the Adoption of Digital Twin in India's Energy Landscape to Elevate Value and Efficiency

This relatively young but fast-evolving innovation is increasingly being adopted across large enterprises, with a report by McKinsey on digital-twin technology estimating that 70 per cent of C-suite tech executives are already exploring and investing in them.



S Sandeep Gupta , • ETEnergyWorld

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A digital twin, at its core, is a virtual representation of a physical asset in real-time, drawing on advanced data analytics. Today, technology is transforming industrial ecosystems, providing an exceptional array of benefits

that help unlock greater value and efficiency.

This relatively young but fast-evolving innovation is increasingly being adopted across large enterprises, with a report by McKinsey on digital-twin technology estimating that 70 percent of C-suite tech executives are already exploring and investing in them.

There is enormous value to be derived, especially with the integration of AI and digital twin in the industry, which is expected to secure an additional US\$450 billion annually.

The opportunities that digital twin technology brings for the oil and gas industry are tremendous, especially in enhancing safety, identifying choke points that help increase production, strengthening operational efficiency, and promoting sustainability standards.

In the industry, leveraging digital twin technology is seen as a crucial pathway to support twin goals. Firstly, it allows companies to contribute significantly to the production of crude oil and gas in India, aligning with the vision of making India self-reliant in the energy sector. Secondly, by adopting digital twin technology, companies can accelerate operational efficiency in the energy sector. This is vital to achieving the global goal of a just and reliable energy transition.

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Tapping into the power of predictability

The oil and gas industry, especially exploration and production, has an inherent challenge-geographical constraints. Equipment and manpower deployment are to be mapped, taking into consideration a diverse range of variables, and monitoring operations is central to achieving and ensuring operational efficiency. What the digital twin technology enables is a comprehensive 360-degree virtual replica of all the crucial physical assets, covering pipelines, gathering systems, heat exchangers, turbines, pumps, and compressors, as well as the entire plant operation.

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This replication allows for real-time monitoring and analysis, delivering crucial insights into the performance, health, and condition of critical equipment, translating to lesser downtime by taking prompt corrective measures, ensuring higher productivity and efficiency through seamless operations, and cost optimisation.

In today's oil and gas industry, there is a strong focus on decarbonization and building a sustainable future. Many organisations have been at the forefront of integrating strong ESG goals into their operations. The use

of digital twin technology complements this effort by leveraging clean energy across operational pathways and promoting responsible consumption. This aligns with the guiding philosophy of transforming energy responsibly and achieving net zero before the end of this decade.

One of the key benefits of digital twin technology is its ability to reduce flaring and minimise environmental impact. This has been exemplified in various locations, such as Rajasthan and Gujarat, where the implementation of digital twin technology has successfully increased the volume of gas directed to Recycle Gas Compressors (RGC) instead of being flared, resulting in a more sustainable approach. Additionally, digital twin technology goes beyond traditional monitoring by enhancing overall yield and maximising profitability. It allows for the integration of renewable energy solutions and the implementation of state-of-the-art technologies.

Setting industry-firsts

With the enormous benefits to be derived from the digital twin technology, few of the first upstream companies invest in digitalization and explore the potential offered by the digital twin technology. By deploying Enterprise Performance Management (EPM) software, the industry positions itself at the forefront of the digital revolution in the industry.

Infusing digital context into virtually every asset, component, and calculation, the oil and gas sector has optimised operational performance for an increase in production, underlining a commitment to driving innovation and efficiency. What lends strength to this journey in the digital twin realm is the power of partnerships with leading

technology players to bolster process monitoring, real-time data analysis and process optimisation.

This approach has also extended to the meticulous monitoring of critical components such as heat exchangers, compressors, and refrigeration loop efficiencies.

Leveraging advanced modelling techniques, digital twin technology not only provides real-time insights into the performance of these components but also facilitates the recommendation of optimal set-points, including pressures and temperatures, all contributing to a paradigm shift in operational efficiency.

Technology for a secure energy future

The digital twin technology offers a multitude of advantages, contributing positively to increased operational efficiency and promoting sustainability. This strategic utilisation of advanced technology and bringing world-first solutions to the hydrocarbon sector in India is at the cornerstone of our commitment to the country.

As India ascends to a prominent position on the global stage, the application of digital twins will help drive the triple bottom line—promoting the well-being of people, preserving the planet, and embracing a shared sense of purpose in the pursuit of sustainable and secure energy solutions.

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