

# Connecting Subsurface Intelligence with Surface Operations

A new digital twin proxy is set to transform operational efficiency.

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Despite the recent oil price optimism, returning to pre-2013 operational tactics seems unlikely. The demands for digitalization and automation from oil and gas operators are rising at unprecedented speed. By 2020 well over 20 billion Internet of Things (IoT) devices will be connected, with more than 5 billion devices starting to use edge intelligence and computing to usher in the next phase of digital transformation.

Furthermore, volatile oil prices and super-fast drilling operations have become today's new global normal. It is increasingly difficult to build E&P plans that can be operationally credible and still make financial sense a year or two into execution. A new emerging concept, a proxy digital twin, is starting to bridge this gap by virtually connecting services between all surface and subsurface components of the exploration-to-market value chain. Cloud-based connectivity between device sensors, combined with reservoir artificial intelligence (AI) capabilities that scan massive amounts of geological and historical production data using parallel computing, enables full-scale operational control and collaboration between the subsurface reservoir and across surface operations.

The digital twin impact is beginning to spread from manufacturing, where it initially helped prevent unplanned shutdowns by pinpointing root-cause prob-

lems in machinery, into what is called "connected services." These, for example, use subsurface E&P software to provide data about failures in wells or optimization of production operations and flow farther down the chain.

So what is driving this evolution? Managers are making very high-risk decisions about future investment and development strategies at staggering costs. Conventional production operations are dated, expensive, time-consuming and uncollaborative, leveraging only a negligible fraction of data relative to the volumes collected. To provide some context, Emerson Automation Solutions' research, in step with industry data, shows that more than 65% of projects greater than \$1 billion fail, with companies exceeding their budgets by more than 25% or missing deadlines by more than 50%.

To reverse current industry trends of capital project cost and schedule overages, subsurface knowledge must be made available at the speed of surface operations. Today, digitalization is making that possible. Software will connect surface and subsurface technologies with automation and control systems, modeling and simulation systems, and human operations. The Industrial Internet of Things and AI are driving the speed and scale at which Big Data can be translated into actionable findings and reproduced across asset value chains. What is the outcome? Accelerated operations, increased recovery factor and minimized capex are all at reduced risk. Predictive analytics directly translates to operational and project efficiency.

How is it that industrial automation players can lead this transformation? They have a front-row presence in digital transformation initiatives of thousands of clients and their organizations. What Emerson has observed is that if a cross-organizational digital adoption culture is established in advance, then product and IT automation stands a chance. Once actionable data starts flowing through a connected Big Loop via an AI-enabled software infrastructure, more holistic questions about how to improve the bottom-line business value will emerge. Patterns will start to surface from the activity. Oil and gas users will be encouraged to ask questions like: where exactly will maintenance be planned in the hydrocarbon flow process from the reservoir to the well to the pipeline to improve HSE practices, or does it make sense to build a predictive model for data flowing from sensors to allocate the right equipment? That is when and where breakthroughs will happen. Insightful questions can be asked, not just about today's problems, but about future problems as well.

By leveraging predictive analytics, machine learning and IoT-connected sensors, it is possible to improve E&P operations by intelligently using greater masses of data, including seismic, production and historical drilling, to help validate and perpetually refine predictive reservoir models. Reservoir-driven digital collaboration also optimizes production and flow from upstream into midstream and downstream operations, eliminating the remaining area of pervasive inefficiencies. ■



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