

Operator saved USD \$64 million integrating real-time data into production optimization workflows

Halliburton implemented an integrated series of workflows, tools, and technologies to optimize field performance and ultimate recovery



OVERVIEW

Development of a deepwater oil field was this company's first opportunity to implement its digital oilfield initiative in a deepwater environment. Halliburton provided the intelligent well completions that enabled real-time production monitoring and remote control of downhole interval control valves (ICV). Halliburton's Landmark Software & Services group collaborated with the operator to deliver an integrated petrotechnical architecture, portal-based visualization and orchestrated workflows. The integrated workflow environment that resulted from this collaborative effort delivered the right information to the right people at the right time. The system enabled the company's asset team to manage the site proactively and achieve 95% uptime during the first month of production. During the first 18 months, engineers using it avoided more than USD \$64 million in lost production.

CHALLENGE	SOLUTION
<p>Overwhelming volume of data</p> <p>The operator's interest in the field consisted of 38 wells, 17 of which have intelligent completions, generating about 500MB of data every day. But engineers spent more time managing the data than interpreting it, making it counterproductive.</p>	<p>Automatic data translation and visualization</p> <p>Landmark DecisionSpace® for Production software enabled data from multiple sources to be visualized in a single, integrated environment. As a result, the team monitored well performance via a management-by-exception process and could quickly take preventative or remedial action.</p>
<p>Existing workflows did not support real-time data</p> <p>Beyond delivering, processing and managing this flood of new data, the operator needed to set up workflows to incorporate real-time data within its existing engineering processes, applications, and databases.</p>	<p>Thirty new production optimization workflows</p> <p>Halliburton worked closely with the operator to develop new automated workflows specific to technology and engineering challenges at this field.</p>
<p>High capital investment with uncertain payoff</p> <p>Intelligent completions cost more than traditional completions, yet there was no benchmark for determining the payback on this type of investment. Financial uncertainty raised many questions during planning.</p>	<p>Proactive asset management demonstrated ROI quickly</p> <p>Because the system immediately alerts the right people when well data indicated potential problems, the operator could act quickly to avoid lost production – about USD \$64 million in the first 18 months.</p>

65%
UPTIME
ESTIMATE

95%
ACTUAL
UPTIME

**Faster, better
decisions
improved uptime**

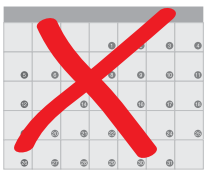
The operator expected the facility to average 65% uptime at production startup (First Oil). It achieved 95%.

PRODUCTION GAINED

\$64

MILLION
AND COUNTING

The operator avoided more than USD \$64 million of lost production in the first 18 months.

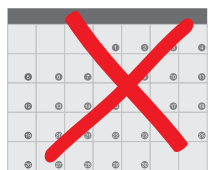
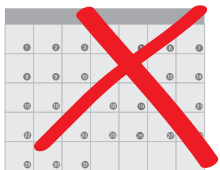


**MAXIMUM
DAILY
PRODUCTION
ACHIEVED**



4 MONTHS

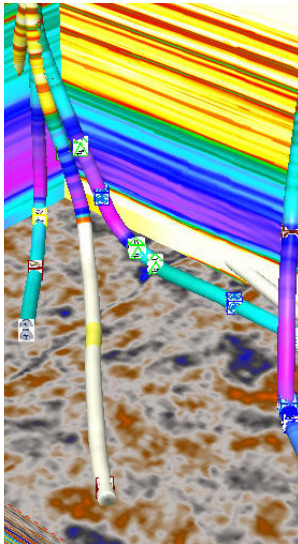
**AHEAD
OF
SCHEDULE.**



Using intelligent completions, the team re-optimized choke positions without intervention. Production from the affected zone doubled from 5,000 to 10,000 barrels per day. By averting intervention, the team avoided an estimated USD \$22.5 million loss in production.



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Operator developed deepest asset with most advanced technology

In a conventional oil field, by the time engineers get the data that shows a well is underperforming, they may have already lost a month of production or more. At this deepwater oil field, the operator wanted to enable its asset team to continuously perform production surveillance and manage by exception. It chose WellDynamics SmartWell® systems to deliver complete, relevant and up-to-date data on well performance. Because the site was so complex, the operator also sought out a partner with prior experience implementing digital oilfield technology in a deepwater environment.

Halliburton offered combined software technology and engineering expertise. This enabled the operator to create an integrated workflow environment to continuously monitor every well in the field through real-time data integration, visualization and workflow automation. Halliburton also helped develop new workflows to enhance and support well-reliability monitoring, reservoir management, and production optimization.



Robust data architecture provided foundation for collaboration

The new system didn't just integrate information. It integrated teams. The SmartWell system continuously delivered information to mirrored data historian servers at both the floating production, storage and offloading (FPSO) unit and the onshore office. With this live, shared connection, every person across the entire asset team viewed the same data – oil rate, fluid density, pressures, temperatures and more – at the same time. When problems arose in any well, the team could collaborate to remotely adjust ICVs in the well, without interventions or workovers.

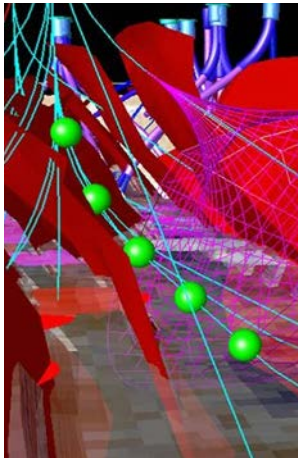


A collaborative relationship yielded better than expected results

Halliburton took a phased approach to implementation as the first oil deadline loomed. First, the team validated the data produced by the intelligent completions and defined the variables for each workflow. The team then designed seven interrelated production-engineering workflows to analyze well shut-ins, monitor key performance indicators and more. Finally, Halliburton linked these workflows through the DecisionSpace® for Production technology suite so, when required, the output from one analysis automatically became the input for the next – saving engineering time and increasing data integrity.

The operator estimated its wells would have 65% uptime for the first six months, in line with historical norms. Instead, the facility was up 95% of the time, thanks in part to the rapid decision-making enabled by the integrated system. Based on this early success, the company asked Halliburton to help develop the remaining 18 engineering workflows. Since then, Halliburton personnel have become an integral part of the company's team, continuing to optimize workflows and ensuring maximum return from its technology investment.

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Completion-integrity protection added USD \$22.5 million of production

With fully integrated and automated workflows, the operator could proactively manage the whole field. For example, the well shut-in analysis workflow monitored well status and collected data for a build-up analysis. During a shut-in, sensors detected higher-than-expected drawdown pressure in the upper zone of one of the production wells. The system shared this data with four other workflows, which enabled the asset team to confirm this reading quickly and find significant skin damage. The team then used the intelligent completions to re-optimize the choke positions, which doubled the zonal rate from 5,000 barrels per day (b/d) to 10,000 b/d. As a result, the team avoided an estimated USD \$22.5 million loss in production.

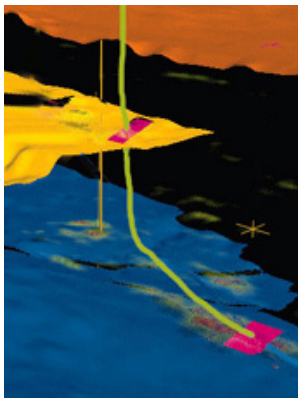


Performance analysis helped avoid USD \$11 million in lost production

On another occasion, the company planned to bullhead completion fluids and seawater into an injection well before it pumped in the gas. However, during the production performance analysis workflow, the coring sample data indicated the treatment could reduce the permeability by up to 85%. The asset team used the internal control valves to close off the lower zone and added tension reducers to the completion fluids used in the upper zone. As a result, the team maintained the high permeability of the injection well, which helped the company avoid about USD \$11.2 million in lost production.

Timely manifold balancing maximized production from two wells

In yet another case, two wells connected to the same subsea manifold experienced a production decline of 8,000 b/d when they produced concurrently. Engineers suspected higher pressure in one well was forming a hydraulic dam, blocking production from the other. The asset team used the system to examine multiple optimization scenarios. From there, the team decided how to balance the internal control valves of each well to manage the back-pressure effects, which maximized production from both wells and eliminated lost production of USD \$9 million over two years.



Putting this knowledge to work in new fields

Through the above examples and others like them, the operator realized more than USD \$64 million in increased production in the first 18 months, helping the company quickly recoup its original technology investments.

There are other economic benefits as well. The company implemented similar workflows for another offshore, deepwater field and migrated the workflows to two additional fields in the same region. The system has also been quickly adapted for other fields, demonstrating the reusability and scalability of the Halliburton integrated engineering system.