**Solution in Action**

**Landmark Services**

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**Shell Aberdeen RTOC Supports Collaborative Well-Delivery Process**

**Customer:** Shell Exploration and Production  
**Location:** Europe

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**CHALLENGE** – Find innovative ways to streamline the multidisciplinary well planning process; reduce nonproductive time during drilling operations; improve safe and effective well delivery from start to finish; and manage well costs more efficiently

**SOLUTION** – Established a Real-Time Operations Center (RTOC) in Aberdeen, staffed with engineers from Halliburton’s Landmark and Sperry Drilling services PSLs offering Collaborative Well Planning, Predictive Modeling, and 24/7 Monitoring services

**RESULTS** – Reduced well-planning cycle by factor of 100 in some cases; supported four wells delivered under time and under budget in Shell E&P Europe; repaid CAPEX to build the Aberdeen RTOC in first six months; helped recover enough oil in one well to justify RTOC costs for three years

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Andy Deady was a senior engineering consultant with Landmark, which today is a Product Service Line (PSL) of Halliburton’s Drilling and Evaluation Division. He began working onsite in Shell’s Aberdeen office to develop a collaborative well planning process based on Landmark’s integrated engineering and 3D visualization technologies. After working closely with Shell’s technical professionals, Deady began rolling out the pilot collaborative working environment to multidisciplinary well-planning teams.

Meanwhile, across the pond, Shell New Orleans had embarked on a 24/7 real-time operations monitoring initiative aimed

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The Glomar Arctic IV was one of up to six drilling rigs concurrently supported in 2007 by teams of Halliburton specialists at Shell’s Real-Time Operations Center in Aberdeen. (Photos courtesy of Shell EP-E.)

at improving well execution and managing costs by reducing nonproductive time (NPT). With Halliburton’s assistance, a small “war room” was set up in One Shell Square to monitor a handful of exploratory wells in the Gulf of Mexico.

“About a year into both pilot projects, which had begun independently, we started to learn more about each other,” said Deady. “I was focused on the early well-planning cycle, and New Orleans was focused more on the drilling phase. Eventually, we adopted their predictive modeling and 24/7 monitoring practices, and they adopted our collaborative-planning processes.”
SHELL’S GLOBAL RTOCs – In 2003, Shell expanded and officially christened the New Orleans Real-Time Operations Center (RTOC). As the RTOC concept matured, Shell built a second one in 2004 at its Asia regional headquarters in Miri, Sarawak, Malaysia, supporting wells in Malaysia, China, Australia, and New Zealand. In 2006, a third RTOC opened in Houston. The two U.S. RTOCs serve land and offshore operations in many locations. The fourth RTOC went live in Aberdeen, Scotland, in January 2007. By that time, Deady had joined the company as RTOC Coordinator for Shell Exploration & Production Europe.

Today, New Orleans, Miri, Houston, and Aberdeen are RTOC “hubs”—fully manned, large-scale operations centers supporting wells within their respective regions. Linked to these hubs are smaller “satellite” centers in each region, which are manned as needed rather than around the clock.

“Shell is striving for commonality in the IT infrastructures of all our RTOCs and satellites,” Deady added. “They all have essentially the same standards, rules, and best practices, as well as collaboration technologies, software, networks, firewalls, and so on. That allows our specialists in one part of the world to support operations in any other region. It also gives us a failover capability to ensure business continuity in case of a disaster like Hurricane Katrina in 2005.

“Even before the RTOC had opened in Houston,” he explained, “the 24/7 monitoring room was up and running, so Shell was able to seamlessly switch over operations from New Orleans during the storm.”

COLLABORATIVE WELL PLANNING – “Real-Time Operations Center” is actually a misnomer, Deady noted. “The term seems to cover only the execution phase, but RTOC services include the safe and effective delivery of a well from start to finish.” Core services provided by the Aberdeen RTOC, he said, fall into three broad categories—Collaborative Well Planning, Predictive Modeling, and 24/7 Monitoring.

Before Collaborative Well Planning, the asset team would give a well engineer a set of targets. The engineer would design the initial well path, and pass that back to the geologist and geophysicist to check out in their subsurface models. “Planning a well iteratively could take months, even years, before the design was mature,” Deady observed. “That’s all changed now. We get all those specialists in the RTOC at one time, and a Landmark facilitator helps them carry out their decision-making processes in parallel. In some cases, we’ve reduced the planning cycle by a factor of 100.” Technologies critical to this process include Landmark’s AssetView™ software, which provides the common 3D visualization environment for subsurface and drilling data; COMPASS™ and TracPlanner™ applications for designing rigorous well trajectories; and OpenWire® software, which feeds real-time information into the OpenWorks® data repository for use by geoscientists, who can calibrate and update their models on-the-fly.

PREDICTIVE MODELING – Once the well trajectory is established, drilling engineers from Landmark and Sperry Drilling services begin creating detailed predictive-engineering models, including torque and drag, swab and surge, hook loads, hydraulic calculations, and so on.

Key technologies used in this process are Landmark’s WELLPLAN™ software and the Engineer’s Data Model™, common database designed specifically for engineering applications.

After RTOC staff members have discussed the results of predictive modeling with the asset team, models are handed over to the 24/7 Monitoring team to assist in the execution phase of well delivery.
Landmark Software
& Services

24/7 MONITORING – The 24/7 Monitoring process begins with Sperry's INSITE® system on the rig, which aggregates drilling information and delivers it across Shell's satellite network to a sister INSITE server in the RTOC.

“During drilling operations, experienced Sperry engineers look at real-time data overlaid on top of the predictive models,” said Deady. “If there are discrepancies, they have to be checked out and explained.” Shell's RTOC philosophy is not to take away decision-making responsibility from offshore personnel, but to facilitate remote access to strong support and vital information. Onshore teams with extensive understanding of the well plan and reservoir offer valuable expertise.

Interactions between rig and RTOC staff follow clear protocols, based on a traffic light system. Green means the RTOC is tracking the well's progress, collating information, and making available to the rig more holistic views of data. “Some rigs have never had access to all the surface logging and downhole parameters before,” Deady explained. “So communications are more proactive than reactive now.” An Amber light means real-time monitoring has spotted a deviation from the plan that requires caution and further investigation. Red means the well is at serious risk, so operations must be stopped or altered immediately. “I'm pleased to say we haven't had any Red interventions since the Aberdeen RTOC opened,” he noted.

Sperry Drilling also has two Applied Drilling Technology (ADT) Optimization engineers in the center who provide what Deady calls “a totally independent technical critique” of drilling activities. “Every 12 hours, they analyze real-time data and make recommendations to the drillers offshore on how to respond when parameters change, to ensure wellbore viability, and bring forward what we call 'Practices Worth Replicating' to the next phase of execution. That service has been greatly appreciated.”

In addition, Sperry Drilling's INSITE Anywhere® service delivers real-time data via Web interface to any authorized user on Shell's network, enabling RTOC staff and asset team members to monitor operations from any location. “It’s actually quite addictive, especially on challenging, long-term operations,” said Deady. “We’ve had many instances of engineers logging on from home, to see how things are going.”

MEASURING RTOC VALUE – At present, the Aberdeen RTOC has sufficient staff and workstations to monitor six different drilling rigs concurrently. The facility itself has enough space to boost this to 12. “In Europe, we support quite a variety of jack-up rigs, drill ships, light land rigs, and mobile semi-submersibles,” Deady said. “A number of senior well engineers have told us they believe the RTOC was critical to the successful delivery of their wells.”

“<Generating> a cost/benefit ratio based on all the latest measures...we found we had repaid the CAPEX to build this center in our first six months of operation.”

—Andy Deady, RTOC Coordinator, Shell Exploration & Production Europe

To measure the overall value of the RTOC, Shell rates all activities and services on predetermined scales associated with known bottom-line values. Every month, those values are rolled up and presented to management. “We generate a cost/benefit ratio based on all the latest measures,” explained Deady. “With that data, we found that we repaid the CAPEX to build this center in our first six months of operation.”

In addition, wells delivered under time and under budget—“top quartile” wells—are quite valuable to Shell because the company makes more money on them. “The RTOC is a powerful tool that can enable us to lower NPT, deliver wells at top quartile, and increase return on
investment, "he stated. "All four of the top quartile wells delivered in Shell E&P Europe this year have been supported by the RTOC."

EXAMPLES OF VALUE CREATION – Gavin Robinson, manager of the Aberdeen center, gave a concrete example of how the RTOC is creating value for Shell.

"The logging program for the 8.5-inch section of the first well we hooked up to the RTOC called for pressure-while-drilling (PWD) measurements, which meant they had to stop rotating," said Robinson. "But the previous well in this reservoir had lost its bottomhole assembly due to differential sticking and had to sidetrack twice. So the drilling team was nervous. Sure enough, after penetrating the reservoir and starting to take PWD readings, we saw the hook load go up. The drillers wanted to call TD early. But the development team said, ‘We’ll lose a substantial amount of recovery if we stop now.’ Largely because the RTOC was monitoring drilling parameters in real time and could react quickly to changing hole conditions, the senior well engineer decided to drill halfway to the planned TD—effectively regaining half the oil they would have lost.

“That value alone,” he concluded, “would justify the cost of running the RTOC for about three years.”

Another strategically important drilling campaign in the central North Sea utilized the full suite of RTOC services. Deady himself had facilitated early Collaborative Well Planning on wells in a complex subsalt structure with high-stress regimes. While drilling the main bore into the reservoir, the well crossed the first of three faults that turned out to be more significant than expected, causing high mud losses. A storm moved in and they had to pull back to the casing shoe to wait four days, during which the hole collapsed. The rig asked the RTOC for advice on how to avoid repeating the problem when they sidetracked.

“Our Predictive Modeling and ADT™ service specialists came up with a detailed ECD management plan,” said Deady. “Once drilling resumed, the 24/7 Monitoring team kept close watch on the parameters. In addition, we streamed real-time data to Shell’s satellite RTOC in the Bellaire Technology Center in Houston, where we have a global Pore Pressure and Wellbore Stability team who followed the well and helped keep things on track. Doing exactly as advised, the rig successfully drilled the production bore through all three faults. That well is now producing twice as much as expected.”

Every 12 hours throughout operations, Sperry Drilling ADT Optimization engineers in the RTOC provide a holistic trend-analysis report based on real-time telemetry and other data to ensure wellbore viability going forward

Landmark provides a range of services that help clients maximize the use of their technology assets. Our consultants deliver application implementation, deployment, onsite mentoring, and education programs. In addition, innovative technologies, key industry partnerships, and highly experienced domain experts allow Landmark Services to deliver solutions that optimize clients’ existing assets and enable anywhere, anytime collaboration. These services include intelligent operations solutions, IT/data management, and cloud hosting services to support clients’ national or global workforces. For more information, contact your Landmark sales representative or send an inquiry to Landmark@Halliburton.com.