Well Monitoring & Integrity
Onshore Production Management

This Application Opportunity Brief introduces the challenges addressed by our Onshore Well Monitoring & Integrity solutions and provides a starting point for your initial evaluation of specific customer opportunities. This brief includes production and injection wellheads and their relation to field controllers and SCADA.

Compelling Industry Facts

Use this exercise to help convey the importance of onshore wellhead integrity to your customer.

<table>
<thead>
<tr>
<th>PRODUCTION START</th>
<th>CURRENT DECLINE</th>
<th>FUTURE DECLINE</th>
<th>AUTOMATION INVESTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>7–14 DMTS TO AUTOMATE A WELL</td>
<td>6.7% CURRENT ANNUAL PRODUCTION DECLINE</td>
<td>8.6% FUTURE ANNUAL PRODUCTION DECLINE</td>
<td>REMOTE 100% LOCAL 450%</td>
</tr>
<tr>
<td>4.5X INVESTMENT REQUIRED FOR LOCAL AUTOMATION</td>
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Production Start
On average, it takes 7-14 days to automate a well.

Current Production Decline
The International Energy Agency (IEA) determined that well production declines by 6.7% per well annually.

Future Production Decline
The IEA projected that well production will decline by up to 8.6% per well annually by 2030, an additional 28% drop in annual production.

Automation Investment
ARC estimates producers re-spend 450% of their initial automation investment over the life of the well due to reworks and ongoing maintenance.

ELEVATOR PITCH

The most common cause of not meeting production goals is a lack of information about wellhead operations. Some critical wellheads already have automated monitoring, but due to cost barriers, most do not.

Now you can monitor and control all production and injection wellheads by taking advantage of Emerson’s cost-effective solutions. Wellheads that previously made it hard to meet your production goals can now be monitored, optimally controlled, and maintained locally and even remotely. You can also reduce environmental and safety incidents, as well as streamline operations and reallocate resources.

You can start with your essential wells first, then expand your equipment coverage with ease.

SIZE OF THE OPPORTUNITY

- There are approximately 1,000,000 production and injection wells worldwide.
- Typically, only 20% have any remotely automated monitoring because of high criticality.
- Another 50% are wells that have local automated monitoring (that requires unnecessary trips to the field).
- Therefore, 30% of wells have no automation, making them candidates for wireless and wired monitoring solutions that reduce well shut-ins and eliminate costly work overs.
### Onshore Well Challenges

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Process Change</th>
<th>Equipment Impact</th>
<th>Environmental Impact</th>
<th>Business Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scarce labor resources</td>
<td>Delayed startup</td>
<td>Equipment damage</td>
<td>Process leak(s)</td>
<td>Excess labor costs</td>
</tr>
<tr>
<td>Slugging</td>
<td>Change in flow—up or down</td>
<td>Well damage</td>
<td>Potential reservoir damage</td>
<td>Deferred/lost production</td>
</tr>
<tr>
<td>Inefficient injection</td>
<td>Flow change</td>
<td></td>
<td></td>
<td>Reports, fines</td>
</tr>
<tr>
<td>Lack of information</td>
<td>Reduced production flow</td>
<td></td>
<td></td>
<td>Replace/repair equipment</td>
</tr>
</tbody>
</table>

**Undetected Conditions** → **Abnormal Situations** → **Avoidable Consequences**

### Common Threats to Onshore Well Performance

**WELL INTEGRITY**
An increase in either the annulus or bradenhead pressure can result in a well shut-in, increased workovers, or a potential safety/environmental incident.

**HEALTH & SAFETY**
Manual monitoring and repairs increase time in the field, resulting in elevated personnel risk and more exposure to site-related hazards.

**COMMUNICATION**
Lack of timely and reliable communication leads to deferred/lost production and increased costs.

**ENVIRONMENTAL**
Leaks caused by mechanical failures can have an environmental impact. Early detection of abnormal conditions such as sand and erosion can help avoid leaks and their consequences.

**MAINTAINING SECONDARY RECOVERY**
Non-monitoring of injection rates can lead to increased operating costs and, in certain cases, decreased recovery efficiency and reduced production.

**CHANGING PRODUCTION**
A change in the flow, pressure, or temperature can indicate a reduction in flow leading to decreased production or wellbore damage.
Understanding the Customer’s Pain

In a perfect world, producers would get first production online quickly, operate safely and efficiently, reduce maintenance costs, and maintain optimal production. But these efforts are constrained by a host of factors, including inefficient processes, high costs, products from multiple vendors, and a shortage of skilled personnel. Producers are constantly one step behind—juggling equipment, crews, schedules, and data with limited insight into what is required to optimize and maintain production.

Key Players

- **ASSET/FIELD MANAGER**
  - "I lack timely insight into field operations and I missed my production target, again this month."
  - **REASONS**
    - Excess time and costs to get to first production
    - High maintenance, operating and compliance costs
    - Inability to optimize production and yield
  - **IMPACT**
    - Deferred production
    - Excessive labor costs
    - Reduced return on investment

- **PROJECT MANAGER**
  - "Getting to first production is expensive and time-consuming."
  - **REASONS**
    - Integrating automation can be complex and time-consuming
    - Installation may require too much time and skill
    - Skilled personnel are scarce and expensive
  - **IMPACT**
    - Delays that lead to deferred production
    - Troubleshooting and rework to resolve errors
    - Excessive labor costs

- **OPERATIONS/FACILITY MANAGER**
  - "My operating, maintenance and compliance costs are too high."
  - **REASONS**
    - Frequent maintenance and repairs require too many expensive trips to the field
    - Regulatory compliance takes a lot of time and effort
  - **IMPACT**
    - Higher costs
    - Equipment problems that affect production
    - Fines due to missed deadlines on compliance reports

- **PRODUCTION SUPERVISOR**
  - "I’m unable to optimize production and yield."
  - **REASONS**
    - Measurement data may be insufficient, inaccurate, or out of date
    - Ineffective manual controls and decision-making can limit optimization success
    - May be unable to tell why (or whether) a well’s production has decreased
  - **IMPACT**
    - Lower production or yield than expected
    - Risk of damaging wells or the reservoir
Establishing a Vision

Help the customer visualize how Emerson’s solution will benefit them directly: Without accurate, timely information, producers struggle to get first production online quickly, maintain optimal output levels, operate safely with minimal maintenance issues, and allocate scarce resources. By eliminating these blind spots, producers can make better decisions faster—and have confidence that they’re utilizing the best information.

Probing Questions

**ASSET/FIELD MANAGER**
- How would you describe your experience with automation?
- What effect has it had on project schedules?
- How many workers do you have in the field? How do they spend most of their time?
- What challenges do you face to hit your targets for well utilization?

**PROJECT MANAGER**
- Where have you found the greatest difficulties integrating automation? How did they affect your schedule?
- How long does it take to install automation for a typical well? Which tasks are the most troublesome?
- Where do you find personnel with the right skills? What happens when they’re not available?

**OPERATIONS/FACILITY MANAGER**
- How many site visits have your operators made in the last three months? What is the average labor and transportation cost per trip?
- Who collects environmental compliance data and how?

**PRODUCTION SUPERVISOR**
- How effective is your current wellhead optimization program? What’s keeping you from making it better?
- What challenges do you face to hit your targets for well utilization?

Wouldn’t it be great if...?

...your project team could complete their work more quickly so you could get your wells up and running sooner?
...your operations and maintenance staff could keep everything running smoothly with fewer trips to the field?
...your production engineers had better insight into your well production changes to avoid well shut-ins?

...you could count on all automation components—from the wellhead to the back office—working easily and seamlessly, right from the start?
...you could install each well’s automation in a fraction of the usual time?
...your local project staff had all the skills required and could take advantage of technologies that make their jobs easier?

...your operators and technicians didn’t have to spend so much time dealing with unreliable or difficult-to-service equipment and could even resolve many issues before they become problems?
...your environmental engineer could detect problems in time to mitigate or avoid them and could easily generate automated compliance reports?

...you had a steady flow of accurate, reliable, and up-to-date wellhead information?
...you knew that you were going to hit your production goal by knowing each well is up and running?
Solution Value

Emerson’s automation solutions and expertise help customers reduce, and in some cases eliminate, various costs and inefficiencies in their current production operation. Whether they choose only our wireless technology that eliminates trenching and cables, easy-to-maintain instruments that provide accurate, reliable measurement and diagnostic information, or a fully integrated field controller/SCADA automation solution, they can count on fast installation, easier maintenance, and increased insight about each and every well. As a result, they’ll be able to drive down operational costs while optimizing production, leading to greater overall value and a better return on their investment.

Why Use Emerson?

Streamline Installation
Installs quickly and easily, without specialized personnel

Optimize Production
Get better, more reliable information about what’s happening in your wells

Predict Problems
Get early indication of developing problems

Increasing your profit
Industry experts suggest that onshore production is not optimized and that wells are often shut in unnecessarily. Do you want to get that production back?

ANNUAL OPERATIONAL BENEFITS

Revenue from Production Increases

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td>Increased gas production from automation (availability and optimal rates)</td>
<td>$2,117</td>
</tr>
<tr>
<td>j.</td>
<td>Increased gas production from operator spending time on optimization</td>
<td>$1,059</td>
</tr>
<tr>
<td>k.</td>
<td>Increased oil production from automation (availability and optimal rates)</td>
<td>$1,241,000</td>
</tr>
<tr>
<td>l.</td>
<td>Increased oil production from operator spending time on optimization</td>
<td>$620,500</td>
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Cost Reduction

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Value</th>
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<tbody>
<tr>
<td>m.</td>
<td>Manpower savings</td>
<td>$20,000</td>
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TOTAL ANNUAL PROFIT INCREASE $1,884,676

ASSUMPTIONS

Revenue from Production Increases (Typical)

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<tr>
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<th>Description</th>
<th>Value</th>
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<tr>
<td>n.</td>
<td>Increased gas production from automation (availability and productivity)</td>
<td>1.0%</td>
</tr>
<tr>
<td>o.</td>
<td>Increased gas production from operator spending time on optimization</td>
<td>0.5%</td>
</tr>
<tr>
<td>p.</td>
<td>Increased oil production from automation (availability and productivity)</td>
<td>1.0%</td>
</tr>
<tr>
<td>q.</td>
<td>Increased oil production from operator spending time on optimization</td>
<td>0.5%</td>
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Cost Reduction (Typical)

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<td>r.</td>
<td>Manpower savings</td>
<td>10.0%</td>
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Value calculation notes
- Basic: 40 well field with mixed production (gas & oil)
- mscfd = thousand standard cubic feet per day
- Production increases based on major oil company data

Formula calculations

\[ i = a \times b \times c \times n \times 365 \]
\[ j = a \times b \times c \times 365 \]
\[ k = a \times b \times c \times a \times 365 \]
\[ L = a \times d \times e \times q \times 365 \]

Total Annual Profit Increase = i + j + k + l + m

Selling Summary & Core Sales Tools

<table>
<thead>
<tr>
<th>Qualify &amp; Develop Opportunity</th>
<th>Create Buying Vision</th>
<th>Confirm Vision &amp; Value</th>
<th>Develop Consensus</th>
<th>Secure Commitment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Get your customer to reveal their pain and its impact</td>
<td>Get your customer to feel a need or opportunity to resolve these issues and take action now</td>
<td>Confirm the differentiated vision and associated value of the Emerson solution</td>
<td>Confirm the vision is accepted by all the key players</td>
<td>Create a unique solution for your customer</td>
</tr>
<tr>
<td>• Key Players List</td>
<td>• Business Development Presentation (PPT)</td>
<td>• Value Model</td>
<td>• Draft Evaluation Plan</td>
<td></td>
</tr>
<tr>
<td>• Industry Application Training</td>
<td></td>
<td>• Business Development Presentation (PPT)</td>
<td></td>
<td>• Bill of Materials</td>
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<tr>
<td></td>
<td></td>
<td>• Proven Results (Proofs)</td>
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Emerson’s Onshore Wellhead Solutions

**SCADA SYSTEM**

**OPENENTERPRISE**
Powerful, robust SCADA solution scalable from a single well to an integrated field. Easy to operate, implement, and maintain. OpenEnterprise is a reliable and flexible SCADA system ideally suited for complex telemetry requirements and intermittent communications between the field and the control room.

**FIELD CONTROLLERS**

**CONTROLWAVE®**
Total flexibility to creatively design a complete integrated measurement and control solution. Optimizes delivery of real-time and historical data to critical business systems for making better-informed decisions.

**OR**

**ROC**
Leveraging configurable applications, the ROC platform minimizes programming requirements for optimizing production. Flexible solutions to meet a broad range of application requirements.

**NETWORK INTERFACE**

**IEC 62591 (WIRELESSHART®) INTERFACE**
Make wireless device integration simple and easy without special wireless communication know-how. Commissioning becomes quick and easy utilizing the auto-sense capabilities that automatically find and integrate wireless devices with the field controller, making data and diagnostics ready to use.

**OR**

**SMART WIRELESS GATEWAY**
Connects IEC 62591 (WirelessHART®) self-organizing networks with host systems and data applications.

**DEVICES**

**BETTIS™ EMERGENCY SHUTDOWN SYSTEM**
PressureGuard™ Self-Contained Hydraulic Emergency Shutdown (ESD) Systems provide reliable valve shutdown capability when an external power source is either not available or not dependable.

**FISHER® ELECTRIC ACTUATED VALVES**
Eliminate maintenance and environmental issues with pneumatic equipment on injection and production wells by using a low power, highly reliable sliding stem electric actuator and durable control valve, both designed specifically for oil and gas applications.

**ROSENFORT® WIRELESS DP FLOWMETER**
Achieve dependable, accurate, and fast flow measurements for the life of the well. Long and extended-range options, and a wide selection of connection and preconfiguration options, help ensure timely installation at a variety of sites.

**ROSENFORT WIRELESS PRESSURE TRANSMITTER**
Detect fluctuations or changes in pressure to provide good insight into wellhead performance with flow line, annulus, and other important pressure measurements. Long and extended-range options, preconfigurations and a wide selection of connection options are available for faster installation.

**ROSENFORT WIRELESS DISCRETE TRANSMITTER**
Reliably detect a wellhead plunger arrival notification without needing to run wires out to the wellhead from the field controller. The discrete transmitter also enables making wired, non-powered switch types wireless such as pressure, flow, and level switches. Long and extended-range options.

**ROSENFORT WIRELESS TEMPERATURE TRANSMITTER**
Improve process efficiency and compensate for temperature changes in flow calculations for increased accuracy. Long and extended range antenna options, preconfigurations, and a wide selection of sensor options including surface mount for quick installation are available.

**ROXAR CORRLOG AND SANDLOG WIRELESS TRANSMITTERS**
Monitor sand production and erosion real-time in oil, gas, and multi-phase lines to prevent damage to the well and other above ground equipment. Simple and fast installation provided by integrated wireless solution powered by the smart power module.

**OPTIONAL ASSET MANAGEMENT**

**AMS SUITE FOR MAINTENANCE**
Allows maintenance personnel to diagnose equipment problems using predictive diagnostics. Real-time information provides an early warning about device issues before they cause problems. Personnel can respond quickly, make informed decisions, and troubleshoot each situation.

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Resource Information

**CUSTOMER WEBSITE**
EmersonProcess.com/OnshoreWellhead

**GLOBAL SALES PORTAL**
Sales.EmersonProcess.com
Go to: Industries & Applications/Oil & Gas/Sales Tools

Mobile device needs extranet access

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