OIL & GAS USE CASES FOR INDUSTRIAL INTERNET APPLICATIONS

Extend the usefulness of machine-born data beyond the traditional industrial automation use cases of SCADA and process control.

“Only 1% of data gathered is made available to O&G decision makers. Increased data capture and analysis can reduce unplanned well outages by 50% and boost crude production by 10% over 2 years.”

- Deloitte “Transforming oil and gas strategies with the Internet of Things”

The upstream industry loses $8 billion per year in non-productive time (NPT) as engineers spend 70 percent of their time searching for and manipulating data. Our objective is to provide these engineers with the Operational Intelligence and situational awareness that they need to make data-driven decisions.

This is Actionable Analytics leveraging the Industrial Internet of Things.

XMPro’s Intelligent Operations Monitor creates multiple events streams with data from devices, applications and sensors. It allows you to embed Machine Learning in these event streams and combine them with business rules to create actions from event information.
## Intelligent Business Operations

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<th>Use Case</th>
<th>Description</th>
<th>Benefits</th>
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<tr>
<td>Digital Oilfield Optimization – Intelligent Well Monitoring</td>
<td>Sensors monitor well production across a large oilfield with XMPro Actionable Analytics that identify wells with declining performance. Predictive models can be developed to predict which wells are likely to have declining production and corrective action tasks can be assigned through XMPro BPM or in the EAM solutions. Maintenance work can be optimally planned and scheduled for Simops (Simultaneous Operations) by combining well production data with condition monitoring sensor data.</td>
<td>• Increased yield across an oilfield • Reduced downtime for maintenance (Simops) • Real time information for improved data-driven decisions</td>
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<td>Monitoring, Diagnostics and Control Operations</td>
<td>Sense and Respond solutions combine sensor data with other business and/or external data with thresholds and immediate response workflows based on the type of business events, severity and impact. Examples include: • Combining data from level probes in effluent dams with weather web services to schedule and plan preventative effluent management. • Remote monitor on well pads (unconventional) including video surveillance data, sensor data and weather web services to monitor and respond to events such as tampering, snow and ice, and changed operating conditions. UAVs (drones) can be deployed from within the XMPro BPM application for additional surveillance data collection based on GIS and location information. • Remote wellhead monitoring with sensor data and video surveillance. • Correlate performance with benchmark data (internal, manufacturers &amp; external – ESP data sharing initiative for example).</td>
<td>• Local or remote monitoring and response • Avoid environmental and safety incidents by not putting people in harm’s way • Enable remote field workers with real-time situational awareness and data from sensors and other business systems or services</td>
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| LACT (Lease Automatic Custody Transfer) Also applicable to barge and railcar unloading | Sensor data on LACT skids are checked by XMPro IOM for missing values, variances to previous reading and then posted to the business systems (CRM, ERP etc.) to coordinate immediate electronic invoicing. Exceptions are automatically handled through XMPro BPM and Workflow. The LACT solution can check product quality, sediment and water content, for example. It validates that the correct product has been transferred and provides geo-location verification that can be integrated with GIS and mapping solutions. The solution also includes predictive maintenance of the equipment to ensure continuous operation, even in remote areas. | • Accurate recording of hydrocarbon transfer reduces loss of revenue  
• Immediate notification of “bad” products  
• Reduces effort to manually capture data for invoicing |
| Tilt Event Monitoring                 | For surface tilt mapping an array of tiltmeters or sensors are placed on the surface around the well and record the tilt before, during and after hydraulic fracturing (frac). The change in tilt due to the frac is then used to calculate the orientation. XMPro IOM can be used to collect the sensor tilt data, look for thresholds that have been exceeded or predict where thresholds are likely to be exceeded. It can also find trends, like where tilt is approaching a point where wellbores may be damaged and create the necessary actions to reduce damage to the wells. | • Reduce likelihood of surface expressions in enhanced oil recovery (steam)  
• Reduce cost of wellbore damage (not breaking wellbores)  
• Increase safety of operations |
| Safety Monitoring – Personal Safety   | Sensor-based personal gas detection devices alert employees of potentially dangerous areas or high risk of gas exposure. This sensor data is tracked in real-time and combined with other business application data to create exposure profiles of employees and feed into production and maintenance planning schedules. | • Improved worker safety and well-being  
• Reduced risk of litigation claims |
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| Operational Intelligence and KPIs | Combine data from business systems and applications with historian and real-time device data to create Actionable Analytics to optimize production. Measure real-time operational and business KPIs on a dashboard interface that display sensor data as well as business application data. Extend sensor and historian data to measure real-time performance with alerts and corrective actions. | • Real-time situational awareness  
• KPI threshold triggers provide early warning of production, operations or other business performance issues |
| Optimize Production from RTP wells | On completion of planned or unplanned maintenance, wells are returned to production (RTP) by a different operational group to the ones that completed the work. It is often the case that wells are signed off for RTP, but there is a delay in physically bringing the well back online.  
XMPro IOM monitors wells that are RTP in the EAM or business system but where there is no production flow indicated from the sensors and flow meters on the well. It is typically monitored at 15-minute intervals and after 2 or 3 intervals a notification is sent to a production supervisor or site manager if the well is still not in production. | • Increased production yield |
| Well Pad Handover                | Increase sensor deployment and data through each stage of well development and track key KPIs during well pad hand-off procedures. Pad hand-offs transfer business and legal liability from one project team to another and key environmental and other operational data is collected during this process. | • Accurate “state” when well pads are handed over to other crews/stages in the well development cycle.  
• Safety and environmental impact |
| Securing Data Flows              | Monitor Industrial Network and sensors for suspicious activity and intrusions.                                                                                                                                 | • Limit security breaches  
• Early detection |
## Intelligent Maintenance Operations

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| Condition-based Predictive     | Perform condition-based and predictive maintenance for all levels of plant equipment. Leverage Machine Learning built into the data capture processes of XMPro IOM to predict machine failure and integrate with EAM and other business systems to create work tasks, order parts and schedule maintenance. | • Reduce unplanned down time  
• Reduce maintenance costs  
• Improve safety and risk of environmental exposure  
• Improve production and utilization  
• Go from reactive to proactive maintenance |
| Maintenance                    |                                                                                                                                                                                                             |                                                                                                                                                 |
| Warranty Cost Management       | Track equipment and assets that are under warranty conditions to monitor operating conditions and provide evidence of operations and application in the event of a warranty claim or dispute. Monitor warranty compliance and create corrective actions for breaches. | • Increased recovery on warranty claims  
• Resolves disputes with evidence                                                                                              |
| Pipeline Leak Monitoring       | Annual losses due to fuel leaks and thefts amount to approximately $10bn per year in the US alone (Deloitte). Sensor-based leak detection and real time monitoring not only improves revenue but also improves safety and reliability.  

Real-time sensor data is made available to field service crews through XMPro Mobile to ensure that crews make data driven decisions, optimize maintenance truck rolls and improve safety. UAVs (drones) can be deployed by these inspection crews for improved surveillance and can be coordinated from within the XMPro Intelligent Business Operations platform. | • Reduced losses  
• Improved safety and reliability  
• Improved pipeline integrity  
• Informed field crews                                                                                                        |
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<td>Pipeline Corrosion Prediction</td>
<td>Pipe corrosion prediction is a special use case of pipeline leak monitoring. It provides an opportunity to use sensor data about operating conditions and combine it with data from non-destructive testing to predict the likelihood of pipe corrosion that would lead to failure and loss. XMPro IOM combines data from these sensors and test results and then uses machine learning embedded in the workflow process to predict these failures.</td>
<td>• Reduced losses</td>
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<td>Crew Scheduling Based on Production Status</td>
<td>Maintenance or 3rd party inspection crews often arrive at local or remote locations to find that wells are not shut-in for the planned work. It not only increases safety risk but also increases costs through re-work. Using sensor and production flow meter data to determine if a well is shut-in before a crew is dispatched is a simple but highly effective way to release the work order to the crew.</td>
<td>• Improved safety</td>
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<td>• Reduced labor costs</td>
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## Intelligent Asset Management

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| Asset Integrity Monitoring | Asset integrity management is used to effectively manage production assets in order to gain maximum value, profitability and returns while safeguarding personnel, the community, and the environment. Asset integrity monitoring refers to the continuous and real-time data collection from applications, databases, web services and sensor/devices to measure compliance with key business KPIs and metrics. XMPro IOM continuously scans inspection records for overdue regulatory inspections on wells and equipment like safety valves, pressure vessels, boilers etc. and combines this with condition monitoring data from sensors. It monitors environmental records for compliance and operational data, as well as sensor information on the health and status of environmental monitoring. Our Actionable Analytics gives a global view that not only provides a visual dashboard of asset integrity but also enables automated and intelligent triggers that alert asset owners with tasks and traceable actions. | • Improved regulatory compliance  
• Reduced exposure to asset integrity compromises  
• Real time situational awareness of asset integrity |
| Asset Integrity Deferral | Deferring regulatory inspections requires dispensation and authorization at the highest levels in the organization. These executives are often far removed from the operating assets and rely on the information relayed in the deferral requests. Using sensor data provides a mechanism to get real-time situational awareness of the asset and assist with data-driven decision making. XMPro BPM embeds sensor and operational data from the asset into the deferral request to provide the approver with up to date information. Furthermore, it maintains a record of the data that the decision was made on as part of a searchable audit trail. This means the evidence that supported the decision is maintained if required for proof or in the event of an incident. | • Data-driven decision support  
• Evidence of the operating conditions of assets  
• Searchable audit trail for recordkeeping purposes  
• Reduced exposure to regulatory risk |
### Tag and Track Moveable Assets

**Description:** Not all assets are immovable or fixed. High value capital items are often used in the establishment of new well pads and in the maintenance of completed ones. Some of these items are often left on well pads, misplaced or lost due to theft or negligence. Simple track and trace sensors provide a cost-effective way to monitor the use and location of these assets. XMPro Business Activity Monitor for IoT provides a simple and cost-effective solution to monitor and manage actions for recovery of these assets.

**Benefits:**
- Reduce the cost of lost assets
- Reduce cost of lost time and production due to unavailability of moveable assets
- Monitor utilization rates

### Intelligent Field Service

#### Field Service Enablement

**Description:** Giving technicians access to real-time sensor data from an easy-to-use mobile application is the first step to IoT field service enablement. But, to make the most of real-time condition monitoring data, XMPro also gives dispatchers the ability to dynamically schedule technicians to attend to critical situations as they arise. By combining GPS location data from maintenance trucks with data about the inventory stocked in each truck, field service dispatchers are able to find the closest technician with the right parts to fix assets the first time.

XMPro’s Actionable Analytics also provides field service managers with real-time dashboards for managing SLA’s and KPI’s like first time fix rate and technician utilization.

**Benefits:**
- Improve first time fix rate
- Improve tech utilization
- Decrease average repair time
- Replace pen and paper
- Reduce fuel costs

#### Automated Service Enablement

**Description:** Sensor-based devices can communicate with other business systems through XMPro IOM and BPM to schedule maintenance or service tasks without human intervention.

**Benefits:**
- Decrease average repair time
- Reduce unplanned down time
- Reduce maintenance costs