Upstream Oil & Gas Industry Opportunities

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PI System Support Capabilities

Potential Benefits to Upstream clients:

- Automating Manually Entered Data
- Automating Reports
- Providing Historical Reference Data
- Providing Context to Data
- Standardizing Analysis
- Tracking KPIs via Management Dashboards
- Communicating Key Info. via Notifications & Alerts
- Troubleshooting / Data Access via Mobile Device
- Providing HMI SCADA Graphics

Asset Utilization

Downtime Reporting
The table below illustrates some common upstream business processes and the typical degree of assistance the PI System and PI Client Tools provide to improve ease, speed, efficiency and accuracy of data analysis.

<table>
<thead>
<tr>
<th>Upstream Business Process</th>
<th>Degree of Support from PI</th>
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<tr>
<td></td>
<td>HH</td>
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<tr>
<td>Well Monitoring and Optimization</td>
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<td>Well Downtime Tracking</td>
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<td>Well Interventions Scheduling</td>
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<td>Post-Intervention Results Monitoring</td>
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<td>Data Volumes reporting</td>
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<td>Gas Composition Tests</td>
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<td>Corrosion Management</td>
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<td>Communicating Data and Findings</td>
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<td>BI Integration</td>
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iSolutions Consulting Inc.
## Upstream Business Processes: PI System Support Details

<table>
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<tr>
<th>Upstream Business Process</th>
<th>Degree</th>
<th>Sample Types of Support from PI System</th>
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</table>
| Well Monitoring and Optimization | H      | • RT / NRT data availability for trending  
• View well data (in dashboards/reports format) on mobile devices |
| Well Downtime Tracking     | HH     | • Calculate and report NPT consistently across assets  
• Auto-generate work orders  
• Custom PI Notification alerts via text or email |
| Well Interventions Scheduling and Post-Intervention Results Monitoring | ML     | • View well activity such as interventions, testing, etc. overlaid with production trends (in dashboards/reports format) |
| Data Volumes reporting     | H      | • RT / NRT data availability for trending  
• Integrate with all SCADA systems for scalable analysis (e.g. well, site, region, company-wide, etc.)  
• Generate reports for expedited analysis of production data |
| Production Decline (long term) | L      | • Unlimited historical production data available for trending |
| Production Forecast (7-30 days) | MH     | • Calculate production forecast using actual data for custom ranges |
| Product Quality Tracking / LIMS Integration | MH     | • Integrate production data with LIMS system data for improved analysis and reporting |
| Gas Composition Tests      | L      | • Integrate production data with Gas Comp sample data for improved analysis and reporting |
| Corrosion Management       | ML     | • Manage corrosion coupon process information  
• Custom PI Notification alerts via text or email |
| Communicating Findings     | HH     | • Auto-generated reports (pdf or xls) emailed to a distribution list (e.g. broader group than PI user community)  
• Field and Operations data available for analysis in city-center |
BPM Examples
Well Monitoring & Optimization

Challenge:

- Considering the current low commodity prices, iSolutions’ clients are typically looking to manage costs and optimize production from their existing assets.

### Business Solution:

- Optimize production from a high count of low producing wells by performing fleet wide analysis using historical data and predictive analytics.

### PI System Support:

- Capitalize on measured data by performing analytics that enable proactive fleet management.

- Limit the hindrance of geologically dispersed wells by consolidated all data into one historian to remotely and proactively manage the wells and efficiently schedule well activities.

- Easily scale analysis (e.g. from one well, one gathering system, one province, etc.).

- Simplify the process of pulling and viewing relevant well information in an organization with complex and diverse well types such as multiple drilling techniques across assets, and varying life cycles.

- Automate reports to free up resources and decrease time from measurement to analysis.

- Visualize data into meaningful charts and trends to simplify the process of drawing conclusions from the well data.
Well Monitoring & Optimization
Example: SAGD Well Optimization

Challenge:
• iSolutions’ client sought out ways to increase production from their existing Canadian oil-sands assets through optimization of their fleet of SAGD wells

Business Solution:
• Increase operational efficiency of SAGD fleet using proactive, data driven well management decisions

PI System & Spotfire – Business Solution Support:

<table>
<thead>
<tr>
<th>Data Challenge</th>
<th>Solution</th>
<th>Results</th>
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</thead>
<tbody>
<tr>
<td>• Inability to efficiently analyze production and sensor data across all wells at our facility over multi-year time horizons</td>
<td>• Marry PI Asset Framework with PIOLEDB Enterprise to create an on-demand data load template for Spotfire</td>
<td>• Data friction eliminated</td>
</tr>
<tr>
<td>• Sampling rate of data in PI very high</td>
<td>• AF model of Steam Injection, Producer Well, Obs well Models</td>
<td>• Common analytics platform for production engineering</td>
</tr>
<tr>
<td>• 1000+ tags needed for min. viable analysis models for prod. optimization</td>
<td>• Pre-computation of daily statistics</td>
<td>• Happy Users!</td>
</tr>
<tr>
<td>• Inability to perform fleet analysis with existing toolsets</td>
<td>• Well level data from PI</td>
<td>• Data now loads on-demand with no user intervention needed</td>
</tr>
<tr>
<td>• Data loads being done on a manual, biweekly basis (best case)</td>
<td>• In-memory rollups (Pad, Full Field) and KPI’s in Spotfire</td>
<td>• Model scales automatically as new wells &amp; sensors come online</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Eliminated data binding errors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Optimization now done with most recent data</td>
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Business Intelligence (BI) Integration:

- Sensor and volumetric data should form the foundation of the engineer’s analyses.
Well Monitoring & Optimization
Sample BI Implementation Roadmap

Gated delivery for a 1 year program:

- Pilots are recommended to prove the value of a BI well optimization project when resources are scarce
- Focus on problematic assets first to maximize ROI

Data model projects
- Downtime
- eLog and unstructured data
- Predictive analytics training
- Template standardization
- User training

User-facing projects
- Power user training
- Full facility SAGD well model
- Secondary well types
- Single pad trial
- Review findings & sanction next phase

User-facing projects
Well Downtime Tracking

Challenge:

• Calculating downtime consistently (e.g. multiple operating areas potentially measuring run time differently)
• Turning NPT data into useful and actionable information

PI System Solution:

• The PI System computes downtime / NPT with consistently across assets and translates the information into useful analysis for a variety of audiences, for example:
  o Representing downtime as production loss by area for management to communicate cost implications of downtime
  o Reporting downtime code breakdown for Operations as an input to pre-emptive failure mitigation strategies
  o Feeding downtime and equipment type information to Maintenance and Supply Chain for Total Cost of Ownership analysis
Corrosion Management

• Corrosion Coupons (e.g. Representative Metal sample sitting in the process stream for a given time) “experience” the process variations over its time in the system

• Data Collected in the PI System:
  o “Static” Information (e.g. Serial Number, Size, Metal Type, Physical Location)
  o “Process” Information (e.g. Date Inserted, Date Removed, Initial Weight, Final Weight, Calculated Corrosion Rate, Corrosion Type, Pit Depth)

• PI System Event Frames catalogue the corrosion events and enable the user to:
  o Represent corrosion coupon data
  o Visualize the event frame data
  o Transform the event frame information into a time series function using AF data reference

Case Study Source: PI Event Frames: Nalco Esposito
# Typical Risks and Considerations

<table>
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<th>Risk / Consideration</th>
<th>Mitigation</th>
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<tr>
<td>Multiple data systems with varying degrees of FDC capability (often due to mergers and acquisitions)</td>
<td>• The PI System has vast integration capabilities including out-of-the-box solutions and receptivity to customized solutions</td>
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<tr>
<td>Old or obsolete data systems</td>
<td>• (See integration capabilities above)</td>
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</tbody>
</table>
| Compliance with new regulatory directives                                              | • After initial configuration, adjustments to AF model can be made easily  
                                          | • Automated reports can be built or altered to                                                                                                                                                                                                                                |
| Monitoring dynamic system performance (e.g. upon quickly scaling up or down production due to market flux) | • PI AF model allows for easy grouping of assets to jump between viewing production from a single well to full facility production                                                                                                                                 |
| Prioritizing projects and resources (e.g. why focus on data management over other initiatives?) | • Pilot programs to test value-add before committing time and resources to full-scale implementation  
                                          | • Focus on high value assets or ‘problem’ assets                                                                                                                                                                                                                       |
| Multiple user groups with different                                                  | • PI AF can support multiple meta-data layers over the data model so users find the data in a way that makes sense to them                                                                                                                                               |
OSISoft PI is a real-time data historian that can capture production data from virtually any data source.

Through a suite of reporting tools it can display current and past operating conditions anywhere and anytime to provide users with data to make decisions.

OSISoft is the leader in real-time data historians with over 16,000 installations in over 100 countries.
PI System Benefits

- A full, preserved, real-time data trail of plant/field process variable values
- Analysis of real-time process data allows for operational, engineering and management users to make educated, site-specific production and operational decisions to enhance production and increase operational efficiencies
- Standard platform that can collect and store data from any field/plant control system. Corporate users only need to access a single source to see real-time data for all sites
- A central location for key calculations (production, KPIs, etc) that can be used by all business stakeholders
- Reduced impact to field/plant control system infrastructure as users would not need to login to the remote systems to see their processes in real time
- Advanced trending, reporting and notification capabilities available with historian solutions
- Standard access interfaces that allow for easy integration to downstream systems (asset management, field data capture, production and financial accounting, etc.)
- Secure access to real-time data for partners
PI AF (Asset Framework) enables organizations to define representations of their assets for use in developing analyses:

- Specify relationship or organizational structures (hierarchy or connectivity models)
- Organize elements into logic/physical groups to provide a common view for similar assets
- Associate data (real-time or relational data sources) into a single view