From Data to Dollars: The Rapid Integration of AVEVA™ PI System™ into bpx Energy Upstream Operations

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About bpx Energy

bpx Energy is bp’s US onshore upstream and midstream operations

- Premier, US onshore oil and gas producer operating within the Eagle Ford, Permian, and Haynesville plays
- Achieving operational excellence with safety and environmental stewardship at the forefront

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Initial Challenges

After acquiring BHP assets, bpx had limited access to adequate historical data & visualization tools

• **Limited data granularity**
  - We could only access 10-minute or daily averages of data, lacking the granularity needed for effective decision making and analysis

• **Limited historical data**
  - Historical data access was restricted to 3 years, limiting our ability to derive insights from long-term trends

• **Pivot from data lake attempt**
  - Our company attempted to build a data lake for onshore upstream oil and gas operations but faced challenges
    - Real-time series data couldn’t be effectively managed using relational database management systems (RDBMS)
Rapid Integration of AVEVA™ PI System™ into bpx Operations

The AVEVA PI System was rapidly integrated into bpx Energy operations

- **Decision to leverage AVEVA PI System** – leverage existing systems
- **Swift implementation** and integration within 4 months
- **Leveraged PI Asset Framework (PI AF)** providing a structured, organized approach to data management, enhancing data accessibility and visibility
- **Leveraged PI Vision displays** for intuitive, interactive data visualization, improving data interpretation and enabling quicker, more-accurate decision making
- **Integrated AVEVA PI System into the corporate network**, ensuring secure, efficient data transfer and access
- **Leveraged PI Notifications for alerting and notifications** for ESP pumps, enhancing real-time monitoring and enabling proactive response to operational issues
Use Case Examples

Enhancing operations with the AVEVA PI System
Improved ESP Production with AVEVA™ PI System™

Challenge
- Before AVEVA PI System, bpx Energy could only trend ESP performance with 90 days of data
- ESP wells could not be aggregated for troubleshooting
- Well performance could not be easily compared
- Downhole ESP data could not be easily correlated with surface Cygnet data on one screen

Solution
- Through PI Vision, bpx Energy gained:
  - Easier diagnostic trending capabilities
  - The ability to quickly identify issues with oil/water/gas meters in entire well areas
  - Compare individual well performance
  - Monitor key parameters
  - Efficiently filter data to identify the highest producing wells
  - Reducing well downtime and improving issue resolution

Benefit
- After adopting AVEVA PI System, bpx Energy experienced:
  - .5% BBLS production improvement
  - Significant reduction in well downtime
  - Enhanced diagnostic capabilities
  - Improved visibility of meter data
  - More effective well-to-well performance comparisons
  - Efficient monitoring of key parameters and easy identification of highest and lowest producing wells
Improved ESP Production with AVEVA™ PI System™

- Easier diagnostic trending capabilities resulting in easier troubleshooting and less well downtime
- Easy to see if oil/water/gas meters are showing zero for all wells in an area
- Able to trend separate wells against each other (ex. motor temp for casing leak investigation)
- Able to monitor and trend key parameters
- Able to sort/filter parameters from highest to lowest (easily ID highest producing wells)
Improved Compressor Run Time with AVEVA™ PI System™

**Challenge**

- Difficult to achieve high compressor efficiency throughout bpx Energy
- Disparate compressor data sources operated by several 3rd party vendors
- Before AVEVA PI System, quick RCFAs following compressor failures were challenging and diagnosis often took over 6 hours after production ceased
- Comparing and sorting compressor performance data was also impractical, as compressor data came from multiple sources

**Solution**

- Incorporate all compressor data from multiple sources into AVEVA PI System, and build PI Vision displays to enable diagnostic trending and filter capabilities
- Create alerts and notifications for compressor performance to simplify troubleshooting and reduce deferment while enabling bpx Energy to effectively trend and filter parameters for better analysis

**Benefit**

- Prior to AVEVA PI System, diagnosing compressor failures was often delayed, while performance comparisons and parameter monitoring were efficient
- After AVEVA PI System, we could swiftly identify repeat failures, conduct timely RCFA, enhance performance analysis and efficiently monitor and detect anomalies for improved maintenance
Improved Compressor Run Time with AVEVA™ PI System™

- Easier diagnostic trending capabilities resulting in **easier troubleshooting and less deferment**
- Easy to identify repeat compressor failures and perform adequate RCFA to deploy appropriate resources
- Able to trend compressors against each other by location and type
- Able to monitor and trend key parameters and set up alerts for failures and anomalies
- Able to sort/filter parameters from highest to lowest (easily ID best and worst performing compressors)
Air-Assist Flare | AVEVA™ PI Vision Example

PI Vision assisted in reducing fuel gas usages enabling more fuel gas to be sent to sales

**Air-assist flare** - Introduces high velocity air into the flare tip, which improves the combustion efficiency and reduces the emissions of unburned hydrocarbons and other pollutants

**AVEVA PI System** - Used to optimize air-assist flare performance by rolling up all air-assist flare historical data, displaying performance metrics (ie. combustion efficiency) and comparing and contrasting performance data for each flare; alerts and notifications can be established that enable engineers to take immediate action if necessary

**Impact** - Increased revenue, reduced cost, reduced emissions

**Fuel Gas Reduction**
- Fuel gas reduced by 150-200Mscfd for each air-assist flare
- Extreme cases can range over 400Mscfd of assist gas
- Existing flares require frequent tuning and are susceptible to failure due to wet gas

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Single site reduces fuel gas usage by 300 Mscfd:

5 site cumulative fuel gas reduction ~1MMscfd:

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Digital Allocation Flow Diagrams (AFD) in AVEVA™ PI Vision

- Quick access to real-time data organized by production process
- Easier to identify and troubleshoot issues
- Easier to implement condition-based monitoring, reducing number of unplanned events, minimize emissions and improve safety
Industrial-Strength ETL Data Connector

To maximize our investment in AVEVA PI System, bpx Energy needed to stream data without:

- Data Gaps
- Reliability Issues
- Capacity Constraints
- Maintenance Challenges

bpx Energy leveraged bifrost for industrial-strength ETL for Cygnet and AVEVA PI System
Future Uses and Enhancements for the bp x Energy AVEVA™ PI System™

The path ahead
What’s Next?

The path ahead for the bpx Energy AVEVA™ PI System™

• **Support bpx Energy maintenance practices by moving organization from continuous surveillance to exception-based surveillance**
  - Implement condition-based monitoring into daily operations
  - Empower teams with more time for optimization
  - Save on labor and equipment expenses
  - Improve asset uptime and production efficiency

• **Support data science group with historical data to solve complex problems**
  - AVEVA PI System to Snowflake
  - Enhance data-driven decision-making capabilities and anomaly detection
  - Improve process optimization

• **Explore possibilities for plunger optimization**
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