Using the PI System to Improve Safety at Suncor’s SAGD Operations

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Agenda

• Suncor at a Glance
• History with the PI System
• Improving Safety and Performance
  – Observations wells monitoring for Steam-Assisted Gravity Drainage (SAGD) operations
  – Safety Interlock Bypass Monitoring and Reporting
• Concluding Remarks
About Suncor
Canada’s Leading Integrated Energy Company

- HQ in Calgary
- 14,000 employees
- Global E&P ~170 kboe/d
- Oil Sands – ~499 kbbls/d
- 4 Refineries – 460k kbbls/d
- +1,500 Petro-Canada stations
- 6 wind farms – 255 MW
- 1 Ethanol Plant
Our Journey from a “Historian” to an Infrastructure

• First PI System installed in 2006 at Firebag SAGD

• Current installed base
  – 4 sites/18 EA PI System servers, 2 non-EA sites/3 server w ~100k tags
  – PI-AF, PI Notification, PI ACE, and other advanced functionality
  – Remote asset surveillance and support of all PI installations (Managed PI)

• EA Signed in late 2009 covering our In Situ operations

• EA Expanded in late 2012 to include Oil Sands (Mines, Extraction, Upgraders, E&U)

• Key areas of Use:
  – Operations visibility and KPI
  – Energy and environmental regulatory reporting (WPT, MARP)
  – Plant & Asset performance and monitoring
  – Assist in managing safety
Steam-Assisted Gravity Drainage (SAGD)

• Approximately 80% of Canada’s Oil Sands too deep to mine

• Two key SAGD facilities – Firebag & MacKay River

• Parallel pairs of horizontal wells are drilled:
  – one for steam injection
  – one for oil recovery

• Safety and Operational challenges:
  – Large numbers of assets and instrumentations
  – Complex logic and criteria
  – Process Changes

Source: Canadian Centre for Energy Information
Enhancing SAGD Operational Safety & Reservoir Monitoring & Optimization

“Any abnormal reservoir responses are captured automatically and alert the responsible parties immediately, so that prompt actions are taken place to ensure a safe operation.“

Manager Reservoir Management, Firebag

Business Challenge

- Identify abnormal pressure, temperature and steam migration outside of the reservoir
- Real-time information for large number of wells and conditions

Solution

- Selected and installed the PI System as a real-time integration infrastructure
- PI System infrastructure key components - PI-AF, PI Notifications

Results and Benefits

- Enable enhanced safety, environment & production
- Assist in SAGD operations, & asset reliability & optimization
- Continuous improvement, and collaboration
Proactive Reservoir Monitoring – The Role of Observation Wells

Observation wells provide early alarms for high pressure and rising pressure in the steam chamber and below the caprock.
Legacy Monitoring System without PI AF

SQL Tables

- dbo.Notification_Config
- dbo.Notification_Contacts
- dbo.Notification_Tag_Contacts
- dbo.Notification_Users

Challenges:

- Longer development time
- Unhandled exceptions trigger false alarms
- Challenge to manage business change requests
Synchronization of Object Models

Production Model

System Model
PI AF and PI Notifications

- Ease of use
  - Templates to set up new notifications
  - Support & development
- Better Exceptions handling
- Highly reliable than custom code
- No False Alarms
- Historize notifications

High or lower levels alarms available on DCS.
PI AF and PI Notifications
Alert type: High Blanket Gas Pressure

Investigation
Reservoir Engineer called the field to get the confirmation that there was a hydrate/freezing in the pipeline which caused the blanket gas pressure to increase.

End of alarm status
High Blanket Gas Pressure Alarm Ended.
Low Flow alerts on ESPs (electric submersible pump)

A Low Flow event was detected in one of the pumps based on wellhead temperature fall off

- Lost production
- Potentially fail of an ESP, around $0.5 million at risk
- 130+ wells at Firebag
Using the PI System to Monitor Critical Interlock Bypasses and Equipment Trips

It is very important to continuously monitor and audit safety critical bypasses as bypasses compromise the protection functions that are designed to protect human Health & Safety and the Environment.

**Business Challenge**
- Thousands of bypass tags
- Custom logic and reporting requirements
- Multiple points can be used to monitor one bypass

**Solution**
- Monitor, report, and audit safety critical bypasses through
  - PI Data Access Server,
  - PI JDBC
  - ETL and BI

**Results and Benefits**
- Improved governance of critical interlock bypass
- Ability to track bypass history for audit purposes
- Enable risk mitigation planning (responsible groups, bypass duration)
Example - Bypass in Control System
Data Flow for the Bypass & Equipment Trips Monitoring

DCS -> PI System -> PI JDBC -> SQL -> Business Intelligence Tools
Extract history from PI Archive into SQL

jdbc:pisql://localhost/Data
source=FIREBAGPI; Integrated
Security=SSPI; command timeout = 1200;

JDBC driver: com.osisoft.jdbc.Driver
Equipment Trip Report

To be replaced with Event Frames to understand Downtime and Overall Equipment Effectiveness
Closing Comments

1. Increased data availability to users through PI System
2. Assist in following operations strategy and optimize production
3. Enhanced decision making & collaboration
4. PI AF enabled us to meet rapid business growth
5. Increasing PI System installations with the EA
6. What is next?
   – PI Event Frames and PI Analytics
   – Migrate custom alerts to PI AF
7. Use of PI system to assist in improving safety
Contact us

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