“Monitoring Implementation for Measuring Points and Pipelines of PEMEX”

Presented by Ruben Leo Robles
Monitoring Implementation for Measuring Points and Pipelines

- “The geographic dispersion together with lack of communication infrastructure, information systems, and storage outlets and ducts, hinders proper management of transmission and distribution processes by not having continuous and timely information in the administrative offices to allow decisions effectively. The PI System as an Integration and applications infrastructure enabled PEMEX to solve this problem.”

- **Case**
  - Lack of a holistic view of pipeline information including missing and quality measurements
  - Lack of tool support for the proper administration of the transport processes and distribution of hydrocarbons

- **Solution**
  - PI System as an integration applications infrastructure for PEMEX pipelines and associated meter stations.
  - Integrate IT and decision support tools and applications to support real time information integration and exploitation

- **Results and Benefits**
  - Ability to gather pipeline information and perform quality check and approximate missing meter information
  - Perform both reactive and proactive visualization and analytics to improve pipeline and logistics system performance including hydrocarbon loss
Content

- Overview of pipeline network
- Strategy
- Implementation of the solution
- Benefits
- Conclusions
La Región Norte de PEP

- Desde 1992 inicia la nueva visión de exploración y producción como Región
- Actividades en 10 Estados y cerca de 200 Municipios
- Superficie mayor a 2 millones de km²
  - Área total Papaloapan B: 15,765 Km²

Pipeline Network Overview
Strategy

• The process management provides transmission and distribution strategy in the real-time monitoring of installations
Implementation of the Solution

Objective: To support the management of transportation and distribution processes, monitoring the operating performance of the installations in real time via the PI System platform.
Implementation of the Solution

- **9 Measurement points (6 of Oil and 3 of Gas):**
  - C.A.B. Poza Rica - Marfo
  - C.A.B. Poza Rica - Pozoleo
  - B.S. Arenque
  - B.S. Muro
  - B.S. Horcón
  - B.S. Álamo
  - C.P.G. Poza Rica
  - C.P.G. Arenque
  - EPMG. Raudal

- **Variables**
  - Instantaneous flow (gross/ net)
  - Instant pressure
  - Instantaneous Differential Pressure
  - Instantaneous temperature
  - Flow Daily (gross/ net)
  - Average Temperature
  - Average pressure
  - Chromatography
Implementation of the Solution

- **3 Gasoline ducts and 6 Pipelines:**
  1. Gasoline duct E.C. Cuervito – C.M. Km. 19
  2. Gasoline duct Entronque Comitas – C.M. Km. 19
  3. Gasoline duct B.S. Monterrey – C.M. Km. 19
  5. Pipeline C.A.B. Cacalilao – P.N. Ref. Madero
  8. Pipeline B.S. Perdiz – E.M.C. Papan
  9. Pipeline B.S. Mata Pionche – V.S. Paso del Toro

- **Variables:**
  - Volumetric Flow (gross and net)
  - Pressure pipeline without pumping
  - Pressure pipeline with pumping
  - Total volumetric flow (gross and net)
  - Percentage of Water
  - Alarm and Leak Location
  - State of the measuring instruments
Implementation of the Solution

Identify Needs

- Installations and information to integrate
- Piping and instrumentation diagram
- Data dictionary of interface nodes

Analyze

- PI SYSTEM SERVER
- Interface for data acquisition
- Variables to integrate
- Exploiting Information

Designing

- Graphics
- Web Portal
- Reports
- Users Groups
Implementation of the Solution

ITC

Communications

Data Storage

Instrumentation

Information Technology and Communications (ITC)

Processing
Implementation of the Solution

**INSTRUMENTATION (DATA SOURCES)**
- Pipeline
  - Flow Meters and Pressure Transmitters
- Points of Measurement
  - Flow Computer

**TELECOMMUNICATIONS**
- Radio Link
- Satellite Link
- PEMEX Data Network

**IT PEMEX**
- Regional Center for Data Processing
  - PI System Server
  - Interfaces Server
  - Web Server, Real Time

**EXPLOITATION OF INFORMATION**
- Executive users
  - Real time monitoring
  - Reports
# Results

<table>
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<tr>
<th>Measuring Points</th>
<th>53</th>
<th>20</th>
<th>8</th>
<th>18</th>
<th>68</th>
<th>21</th>
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<td>Instantaneous flow (gross / net).</td>
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<td>Pressure pipeline without pumping.</td>
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<td>Percentage of Water.</td>
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<td>State of the measuring instruments.</td>
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303 Integrated process variables.  
15 Deployed Graphics Processing.  
30 web users.  

586 Integrated process variables.  
28 Deployed Graphics Processing.  
10 web users.
Pozoleo Oil Selling Point
### Wet Sweet Gas Chromatography Monitoring

**CROMATÓGRAFO DE GAS HÚMEDO DULCE**

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<th>Value</th>
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<td>Metano / Nitrogeño</td>
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<td>Nitrógeno / Dióxido de Carbono</td>
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<tr>
<td>Dióxido de Carbono / Sulfuro de Hidrógeno</td>
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<tr>
<td>Etano / Agua</td>
<td>5.7587</td>
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<tr>
<td>Propano / Helio</td>
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<tr>
<td>Agua / Metano</td>
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<td>Mol %</td>
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<tr>
<td>Sulfuro de Hidrógeno / Etano</td>
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<tr>
<td>Hidrógeno / Propano</td>
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<tr>
<td>Monóxido de Carbono / n-Butano</td>
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<td>Mol %</td>
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<tr>
<td>Oxígeno / i-Butano</td>
<td>0.0000</td>
<td>Mol %</td>
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Central Pump Storage, Cacalilao – North Yard
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<tr>
<th>Fecha</th>
<th>Hora</th>
<th>Volumen Bruto ITF01 (TAMPS) (BPD)</th>
<th>Volumen Bruto ITF01 (MADERO) (BPD)</th>
<th>Diferencia (BPD)</th>
<th>Flujo Bruto Salida ITF-01 (BLS)</th>
<th>Presión Salida ITF-01 (KPa/cm²)</th>
<th>Flujo Bruto Llegada ITF-01 (BLS)</th>
<th>Presión Llegada ITF-01 (KPa/cm²)</th>
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Information for Better Decision Making
Benefits

Monitoring real-time operating information is a tool that gives the ability of analysis, evaluation and decision making. Some benefits are mentioned as follows:

- Ability to monitor interruptions or pumping rhythms, instantaneous flows and production volumes.
- Use of the information in the form of historical production reports and statistical analysis for process operating conditions.
- Preemptively react to unwanted events.
- Ability to monitor possible leakage events and their location through site in real time.
Conclusion

The real-time monitoring information from operating variables, measuring points, and pipelines through the PI System supports the proper management of transmission and distribution processes, allowing monitoring the operating performance of facilities paying attention to the following critical events that can occur:

- Pressure drop
- Repressing out in inputs or outputs (high pressure)
- Difference production
- Stop unscheduled equipment
To Ponder

“Enterprises use ITC, not just to improve what they already do, but to generate new knowledge.”

“In a situation of continuous improvement, the enterprises should make the right decisions about optimizing through ITC.”

“The ITCs can be used by all industry to achieve the fundamental objectives defined by the mission and vision.”

“We rely on ITC tools, the challenge is being creative and efficient so that the results are growth and strength of the industry using them.”
Ruben Leo Robles

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Administrador Plataforma PI System

Dirección Corporativa de Tecnología de Información y Procesos del Negocio