Remote Monitoring & Diagnostics System for an LNG Loading Arm with the PI System Infrastructure

Presented by  Walter Flores
Instrument Maintenance Supervisor
Hunt LNG
Agenda

• About Hunt LNG & Peru LNG
• LNG Loading Faculty/Arm Overview
• Business Challenge
• Solution
• Results and Benefits
• Summary
Peru LNG Overview

- 1st LNG plant in South America
- Commissioned in June, 2010
- 4.4 MTPA Capacity
- Gas is supplied from Repsol YPF and Petrobras developed fields near the Camisea fields via a 34-inch (860 mm) supply pipeline runs 408 kilometres
- The LNG plant is operated by Peru LNG which is a consortium of Hunt Oil Company (50%), SK Energy (20%), Shell (20%), and Marubeni (10%)
LNG Loading Arm – A Complex & Critical Asset
Business Challenge – Time is

- Loading Arm issue resolution delayed due to:
  - No Limit switch status in any HMI
  - Limited field data in the HMI including limit switches
  - Distance between loading arm and instrument maintenance shop
  - Different descriptors in DCS and PLC/HMI for same failures
  - Very difficult to troubleshoot and resolve issues in a timely manner

Inability to quickly resolve loading arm issues resulted in over 700 hrs downtime/yr (~2%) resulting in increased demerge cost and lost capacity equating to over $1M/yr
Loading Arm HMI - Limited Information
Many descriptions, one Failure

DESCRIPTION IN HMI FROM FMC
Low Pressure in HPU ACCU on Berth1

DESCRIPTION IN DCS
Low Oil Press in HPU ACCU

DESCRIPTION IN TRAINING MANUAL
Low oil pressure in HPU Accumulator

DESCRIPTION CONTROL LOGIC DIADRAM
Oil Low pressure
We had to be fortune tellers to see what the instrument alarm refers to…….
And now what to do?

Low Pressure in HPU ACCU on Berth1

Low Oil Press in HPU ACCU

Oil Low pressure

Low oil pressure in HPU Accumulator
Solution – Leverage the PI System to:

1. Identify Tag number
2. Identify place in plant
3. Find information quickly
4. Identify location in plant from any part of the network
5. Solve the problem in less time
6. Colabórate with stakeholders
Solution Overview- PI System to the Rescue!

Predictive Maintenance

PI ProcessBook

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Window Application per tag

Available pictures

Available information
Using Pictures to Help Identification
# Limit switches overview for Loading Arms

<table>
<thead>
<tr>
<th>Limit switches name</th>
<th>Limit switches tag and status</th>
<th>Trend of limit switches</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECTED</td>
<td>ZS-134501-1</td>
<td></td>
</tr>
<tr>
<td>ERS VALVE OPENED</td>
<td>ZSO-134509-1</td>
<td></td>
</tr>
<tr>
<td>ERS VALVE CLOSED</td>
<td>ZSC-134509-1</td>
<td></td>
</tr>
<tr>
<td>STORM LOCKED</td>
<td>ZS-134513-1</td>
<td></td>
</tr>
<tr>
<td>STYLE 80 SLEW RIGHT</td>
<td>ZSC-134505-1</td>
<td></td>
</tr>
<tr>
<td>STYLE 80 SLEW LEFT</td>
<td>ZSL-134505-1</td>
<td></td>
</tr>
<tr>
<td>COUPLER CLOSED</td>
<td>ZSC-134506-1</td>
<td></td>
</tr>
<tr>
<td>SPOOL DETECTED</td>
<td>ZS-134711-1</td>
<td></td>
</tr>
<tr>
<td>STOP RETRACTION INBOARD</td>
<td>ZS-134512-B1</td>
<td></td>
</tr>
<tr>
<td>STOP RETRACTION OUTBOARD</td>
<td>ZS-134512-A1</td>
<td></td>
</tr>
<tr>
<td>PRE-APPROACH APEX ANGLE</td>
<td>ZS-134710-1</td>
<td></td>
</tr>
<tr>
<td>PULLEY HIGH</td>
<td>ZSH-134508-1</td>
<td></td>
</tr>
<tr>
<td>PULLEY DOWN</td>
<td>ZSL-134508-1</td>
<td></td>
</tr>
<tr>
<td>PULLEY FREE ROPE</td>
<td>ZS-134508-1</td>
<td></td>
</tr>
<tr>
<td>IN ALARM</td>
<td>ZAL-134510-1</td>
<td></td>
</tr>
<tr>
<td>SELECTED</td>
<td>ZL-134501-1</td>
<td></td>
</tr>
</tbody>
</table>
Limit switches locations overview
Window application per limit switch
Send Notification if there are some Failures
Send Notification if there are some Failures

PI Notifications Server

Name: (Z-3401) - Sts Proximity Switch Fault
Condition: Sts (XL134588/PV.CV) Proximity Switch Fault = 1

Start Time: 22/01/2015 09:59:34
Trigger Time: 22/01/2015 09:59:34

Path: P1\P1-T1\TRAIN 1\UNIT 3400\LNG LOADING\Notifications[(Z-3401) - Sts Proximity Switch Fault]

Target: P1\P1-T1\TRAIN 1\UNIT 3400\LNG LOADING

Value: 1
State: LAL
Priority: Normal
Results and Benefits

• Deduced LNG Carrier demurrage
• Reduced LNG Loading arm downtime by >700 hrs/yr
• Increased LNG loading capacity by >2%
• Improved overall plant utilization
• Annual savings are estimated to be >$1MM/yr

Leveraging the PI System to solve this business challenge is illustrative of the “art of the possible” and value now, value over time.
When Loading LNG, Time is Money

“Using the PI System to integrate, normalize, analyze, visualize and notify instrument alarms and related information on 4 LNG loading arms reduced downtime, demerage costs, and increased LNG loading capacity by over 2% resulting in annual savings >$1MM/yr”.

Business Challenge

• Inability to quickly troubleshoot LNG loading arm issues due to lack of data and information in context led to:
  – Increased demurrage
  – Decreased LNG loading & plant capacity

Solution

• Use the PI System to integrate, normalize, analyze, visualize, and notify enabling a proactive, efficient approach to LNG loading arm issues

Results and Benefits

• Reduced loading arm downtime by >2% resulting in:
  – Decreased LNG carrier demurrage
  – Increase LNG loading utilization and capacity
  – Annual savings >$1MM/yr

Mr. Walter Florez, Instrument Maintenance Supervisor
Hunt LNG
Walter Flores

- wflores@huntloc.pe
- Instrument Maintenance Supervisor
- Hunt LNG
THANK YOU