EMPOWER YOUR ANALYTICS WITH OPERATIONAL DATA

Design Excursion Monitoring

Franco Branca, Snr Process Engineer, Methanex NZ

1 October 2019
Franco Branca

Senior Process Engineer at Methanex New Zealand
Based in New Plymouth Taranaki.

Degree in Chemical Engineering, University of Pretoria

Operations support Petrochem and Gas Production
Engineering Project support
Design and Governance
Energy Efficiency
Team

IT manager: Ngaio Crook
IT expert: Gavin Aspeling
Engineers: Franco Branca
           Ama Wickramanayake
           Nick Hornby
Maximo Database: Jamie Booker
Dimension Software: David Barker
                   Tom Buznik
Methanex
Methanex

We employ over 270 jobs directly & 3,000 jobs indirectly

Our contributions to the economy total 8% of Taranaki GDP $834m Nationally

Methanex is New Zealand’s only methanol producer, exporting up to 2.4 million tonnes per year from our two sites in Taranaki.

Our key markets in New Zealand are China, Japan and Korea.

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How we make methanol

Natural gas and steam combined under heat to make Synthesis gas.

Synthesis gas compressed and converted to Methanol with some water by-product.

Methanol separated through distillation and piped or shipped to our customers.
Safety at Methanex

“The safety and well-being of our employees, contractors and the communities in which we do business is our number one priority”
API RP-754
Process Safety Indicator Pyramid

Tier 1
Events of greater consequence

Tier 2
Events of lesser consequence

Tier 3
Challenges to Safety

Tier 4
Operating Discipline and Management System performance indicators
Process Safety Metrics

API RP-754
Process Safety Indicator Pyramid

- Incident
- Event
- Near Miss – final layers of protection
- Unsafe behaviour or operation
Process Safety Metrics

API RP-754
Process Safety Indicator Pyramid

Swiss Cheese
Process Safety Metrics

API RP-754
Process Safety Indicator Pyramid

Swiss Cheese
API RP-754
Process Safety Indicator Pyramid

Tier 3 and 4 indicators provide information about the strength (or lack thereof) of barriers and weaknesses in the equipment and hazard control systems.
Process Safety Metrics

- Safe design limit
- Safe operating limit
- High level alarm
- Normal operating limit
- Low level alarm

TK - 101

Graph showing percentage level over time with different alarm levels indicated.
Process Safety Metrics

Asset Information

- Equipment name
- Design Code
- Protection systems
- Max/Min Level
- Max/Min Pressure
- Max/Min Temperature
- Max/Min Concentration

Safe design limit
Safe operating limit
High level alarm
Normal operating limit
Low level alarm
1985
System Framework – Old System

2018

Data Sources

Asset Database

DCS

Data Archive

Event Evaluation

PI ProcessBook

PI DataLink

Manual Reports

PI DataLink

Email
System Framework – New System

Asset Data

Asset Database

PI System

Notifications

Event Frames

Analytics

Asset Framework

Data Archive

Event Evaluation

Event Notifications

SQL Database

Dashboards & Reports

DCS

Organiser: OSIsoft
Co-host: Dimension Software

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Auckland Seminar 2019
Maximo – Asset database

Process Equipment

• Max/Min Design Temperature & Pressure
• Max/Min Operating Temperature & Pressure
• Design Code
• PSV’s protecting equipment & Setpoints
• PI Tags for process variables
• RMS Risk of failure
System Framework – New System

Asset Data

Asset Database

PI System

Notifications

Event Frames

Analytics

Asset Framework

Data Archive

Event Evaluation

SQL Database

Dashboards & Reports

DCS

Asset Framework

Data Archive

Event Frames

Notifications

Event Evaluation

Dashboards & Reports

PI ProcessBook

PI DataLink

Power BI

ASSET INTELLECT

PI Vision
PI Server Asset Framework

• Asset Framework
PI Server Asset Framework

- Asset Framework
- Asset Templates per type of asset
  - Attributes
PI Server Asset Framework

- Asset Framework
- Asset Templates per type of asset
  - Attributes
  - Analysis Calculations
  - Event Frame generation
  - Event notifications

D-0102

<table>
<thead>
<tr>
<th>Name</th>
<th>Backfilling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Design Pressure Excursion</td>
<td></td>
</tr>
<tr>
<td>Max Design Temperature Excursion</td>
<td></td>
</tr>
<tr>
<td>Min Design Pressure Excursion</td>
<td></td>
</tr>
<tr>
<td>Min Design Temperature Excursion</td>
<td></td>
</tr>
<tr>
<td>PRD 1 demand</td>
<td></td>
</tr>
<tr>
<td>PRD 2 demand</td>
<td></td>
</tr>
<tr>
<td>PRD 3 demand</td>
<td></td>
</tr>
<tr>
<td>PRD 4 demand</td>
<td></td>
</tr>
<tr>
<td>fvd</td>
<td>PSV Set Pressure</td>
</tr>
</tbody>
</table>

Generation Mode: Explicit Trigger

StartTriggers

Output1

"Max Design Pressure Excursion"

Output2

"Pressure"

Output3

"Equipment Number"
PI Server Asset Framework

- Asset Framework
- Asset Templates per type of asset
  - Attributes
  - Analysis Calculations
- Event Frame generation
- Event notifications

<table>
<thead>
<tr>
<th>Added to Asset Framework</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets/Elements</td>
</tr>
<tr>
<td>Design Parameters</td>
</tr>
<tr>
<td>PI Tags references</td>
</tr>
<tr>
<td>Templates</td>
</tr>
</tbody>
</table>
System Framework – New System
Event Notifications

- Safe design limit
- Safe operating limit
- High level alarm
- Normal operating limit
- Low level alarm
Asset Framework

From: mxnz_pialerts@methanex.com <mxnz_pialerts@methanex.com>
Sent: Wednesday, 13 March 2019 9:32 PM
To: Franco Branca <franca@methanex.com>
Subject: MX NZ Design Excursion - Asset:

Automatic Alert, Do Not Reply

A Methanex NZ Design Excursion has occurred, details below:

Equipment: D-0101A
Condition: Overpressure

Start Time: 1/01/1970 12:00:00 AM New Zealand Daylight Time (GMT+13:00:00)
End Time: 31/12/9999 11:59:59 PM New Zealand Daylight Time (GMT+13:00:00)

Excursion Type: Excursions
Max Design Pressure: 35.6 barg
Max Pressure Reached: 45 barg
Max Design Temperature: 428°C
Max Temperature Reached: 70 °C
Protecting PSVs: PSV-01061 Set @ 35.6barg

Please confirm this is a valid excursion event and follow the MX NZ Process Safety reporting and plant monitoring guideline

Asset Intellect Link to review and update event frame
<<https://piportal-nz.methanex.com/AssetIntellect/Portal/Dashboard?elementpath=\mxnz\motsy003\methanex%20nz\assets\motunui&TabId=6>>
Asset Intellect – Event Frame Explorer
Asset Intellect – Event Frame Explorer
Asset Intellect – Event Frame Explorer
Methanex New Zealand

Optimised Process Safety Metrics: Design Excursion Monitoring, AF Event Frames

“Asset Framework Event Frame Analysis together with Asset Intellect and Power BI allows for accurate recording and reporting of asset excursions.”

Franco Branca, Senior Process Engineer, Methanex New Zealand

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**CHALLENGES**

Improve existing design excursion monitoring system with an automated system that allows for real time notification and recording of process safety metrics.

**SOLUTION**

PI Event Frames were utilized to capture events using data from an IBM Maximo asset database. Event frames reviewed using Asset Intellect and PI Vision and reporting was completed using Power BI.

**RESULTS**

An automated real time excursion recording, evaluation and reporting system with interactive dashboard and asset history.

Bonus
- Updated asset database
- Easy Access to asset data
PI Server AF and Asset Intellect removes the need for manual data collection by bringing the information to the end user.
Thank you