The Journey into Integrated Refinery Information System with the PI System

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History of Rijeka Oil Refinery

- First Europe's industrial oil refinery founded in 1882 with capacity of 60,000 t/y
- Becomes part of INA at 1964
- INA becomes part of MOL group at 2003
### About MOL Group

**Oil and Gas Company**

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Countries of operation</td>
<td>40</td>
</tr>
<tr>
<td>Number of employees</td>
<td>27,500</td>
</tr>
<tr>
<td>Barrels of oil equivalent produced per year</td>
<td>36 MILLION</td>
</tr>
<tr>
<td>Reserves SPE 2P</td>
<td>555M BARRELS OF OIL EQUIVALENT</td>
</tr>
<tr>
<td>MOL Group Service Stations</td>
<td>1,750+</td>
</tr>
<tr>
<td>Customers buying our fuels every day</td>
<td>750,000</td>
</tr>
<tr>
<td>Refineries</td>
<td>4</td>
</tr>
<tr>
<td>Refineries throughput per day</td>
<td>417,000 BARRELS</td>
</tr>
<tr>
<td>Petrochemical facilities</td>
<td>2</td>
</tr>
<tr>
<td>Petrochemical production</td>
<td>2080 KTPA</td>
</tr>
</tbody>
</table>
Business challenge

Adequate material and utility balancing is essential for a refinery. It is the basis for:

• Accounting
• Controlling
• Performance Monitoring & KPI
• Production Planning
• Benchmarking
• Refinery Transparency
• Supporting Supply Chain Management activities
• Emission Control – Legal obligations, Norm obligations
Background

- Inaccurate, EoS, EoL on some primary measurements at tank farms and battery limits of units
- Islands of control systems with own historians
- Rare automated connection of different systems
- Material movements are logged on paper
- Manual data entry into home made applications for reports
- Lately published reports
Solution

Establish reliable and accurate primary measurements at tank farms and battery limits of units, implement the PI System for real-time data gathering and Sigmafine for material balance reconciliation in order to:

• Improve data accuracy and quality
• Improve reporting quality and speed
• Enable well-informed intelligent business decisions to users at all levels of the company - from the plant floor to the enterprise level
• Provide better information for Planning and Scheduling
• Reduce production losses
• Identify measurement meter maintenance (setting priority)
• Improve productivity
Execution

The project was divided in two parallel subprojects:

1st Subproject: Instrumentation improvement
- Tanks
- Battery limit measurements

2nd Subproject: Refinery Information System upgrade
- Server room & Server park implementation
- Connecting distributed control systems
- The PI System integration
Server room implementation

- HVAC 2 x 20 kW redundant
- UPS 2 x 20 kVA redundant
- Central supervision and control system
- Fire alarm and fire fighting
- Technical protection and video surveillance
Server park implementation

Designed with redundancy on hardware level
• 4 copper switches in 2 power zones
• 2 power supply from 2 sources
• 2 Fiber channel switches
• 4 Copper switches

Blade Center H Servers with 7 physical machines
• 2 PI System servers in high availability
• 3 Vsphere 5 Cluster
• Power 7 – Oracle 11 db Server
• Management / Tivoli Server
Connecting distributed control systems

- Based on TCP/IP
- New infrastructure
- Connection with business network
- Securely
  - ISO/IEC 27002
  - NIST PCSRF
  - ISA SP99
PI System integration architecture
Results: Data Integration

Connectors
- OPC
- PI SDK
- PI API
- PI OLEDB
- VB for applications
- Native applications
Results: Refinery material balance improvement

- Based on Sigmafine models by units
- Automatic raw data and movements loading
- Daily reconciliation reports by unit with better insight in unit production
  - yields
  - quantities
  - energy consumption
- Identify primary measurements errors

\[ \text{In} - \text{Out} + \text{Production} - \text{Own Consumption} - \text{Accumulation} = 0 \]
Results: Productivity

- Easy and fast data acquisition by users for reporting and analysis from one place
- Automated quality monitoring system with notifications in PI Server Asset Framework
- Over 1,000 calculation inside PI Server Asset Framework
- Custom based reports for easy reuse
Results: Visibility

Synthesis – PI WebPart portal

- Layered dashboards for real-time and analyzed data
  - Overview and KPI for managers
  - Details for engineers
- Over 200 views with integrated data model
Impact on business

• Accurate and faster material balance reports
• Accurate planning
• KPI becomes important
• Earlier and better identification of measurement problems
• Faster reaction on product quality and environmental issues
• Reliable and accurate data for decision making
• One version of the Truth from bottom to top
• External company engagement on control of oil products is not needed anymore
Future Plans and Next Steps

• Continue Synthesis development
• Upgrade to the PI System 2014 and the PI Asset Framework 2014
• Real-time Energy balance
• Sending smart signals to DCS
  – Alarm system
• Asset management
  – Condition based monitoring
  – Connection to SAP
## Summary

Adequate material and utility balancing is essential for a refinery operations it has direct impact on performance monitoring, planning, benchmarking….and thus directly impacts financial results.

Implementing the PI System as data infrastructure helped us in this challenge.

### BUSINESS CHALLENGES

A. Adequate material and utility balance  
B. Performance Monitoring & KPI  
C. Production Planning & SCM  
D. Refinery Transparency

### SOLUTION

A. Improve primary measurement accuracy and reliability  
B. Implement the PI System for real-time data infrastructure  
C. Implement Sigmfine for material balance reconciliation

### RESULTS AND BENEFITS

A. Accurate daily reconciled material balance  
B. Accurate planning  
C. Increased productivity  
D. Visibility on all plant levels with one version of the Truth
Contact Information

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Rijeka oil Refinery Process information team:
• Darko Klarić - Head of process information
• Igor Gregurić - Process information engineer
• Sergej Horvat - Process information engineer
• Ivica Matasić - Process information engineer
• Zoran Grgić - Processing IT Independent Technician
Questions

Please wait for the **microphone** before asking your questions

State your name & company

Please don’t forget to...

Complete the Online Survey for this session

http://eventmobi.com/emeauc15
Thank You

감사합니다

Дankе

Merci

谢谢

Gracias

Спасибо

Obrigado

ありがとうございます