Operational Intelligence: Real-time Data supporting Real-time Production Optimisation

Presented by **Ali Hamza**

BG GROUP

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BG Group at a glance

We are an international exploration and production and LNG company

Challenges facing the energy industry

- **Our focus is to deliver safe, reliable, clean and optimised production**
  - Our goal is incident and injury-free workplaces in all countries where we work
  - Reducing our environmental impact: Mitigating our impact on the environment goes hand in hand with creating business value and long-term sustainability. We do this in a number of ways, including working to ensure we use energy as efficiently as possible
- **The Global demand for energy is increasing year by year**
  - Helping to meet the world's ever-rising energy needs presents a clear opportunity for us
  - It also presents an increasingly complex range of operational, economical, environmental and social challenges
- **The current drop in Oil price is leading us to think about doing things differently, and more efficiently**

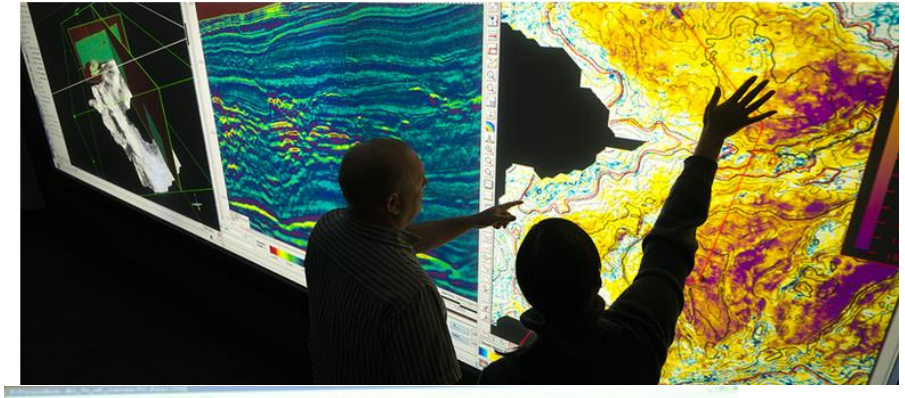
Challenges facing the energy industry

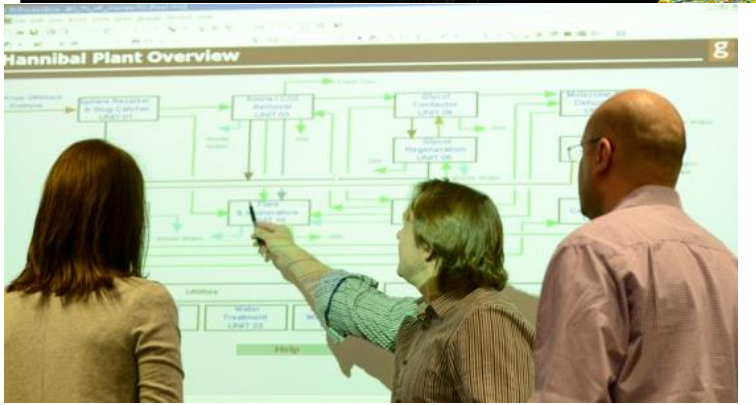
Technology

Since its inception, the oil and gas industry has overcome technological challenges

The industry's track record of innovation must continue as it focuses on extracting hydrocarbons more safely and efficiently from increasingly difficult, technically complex and remote locations:

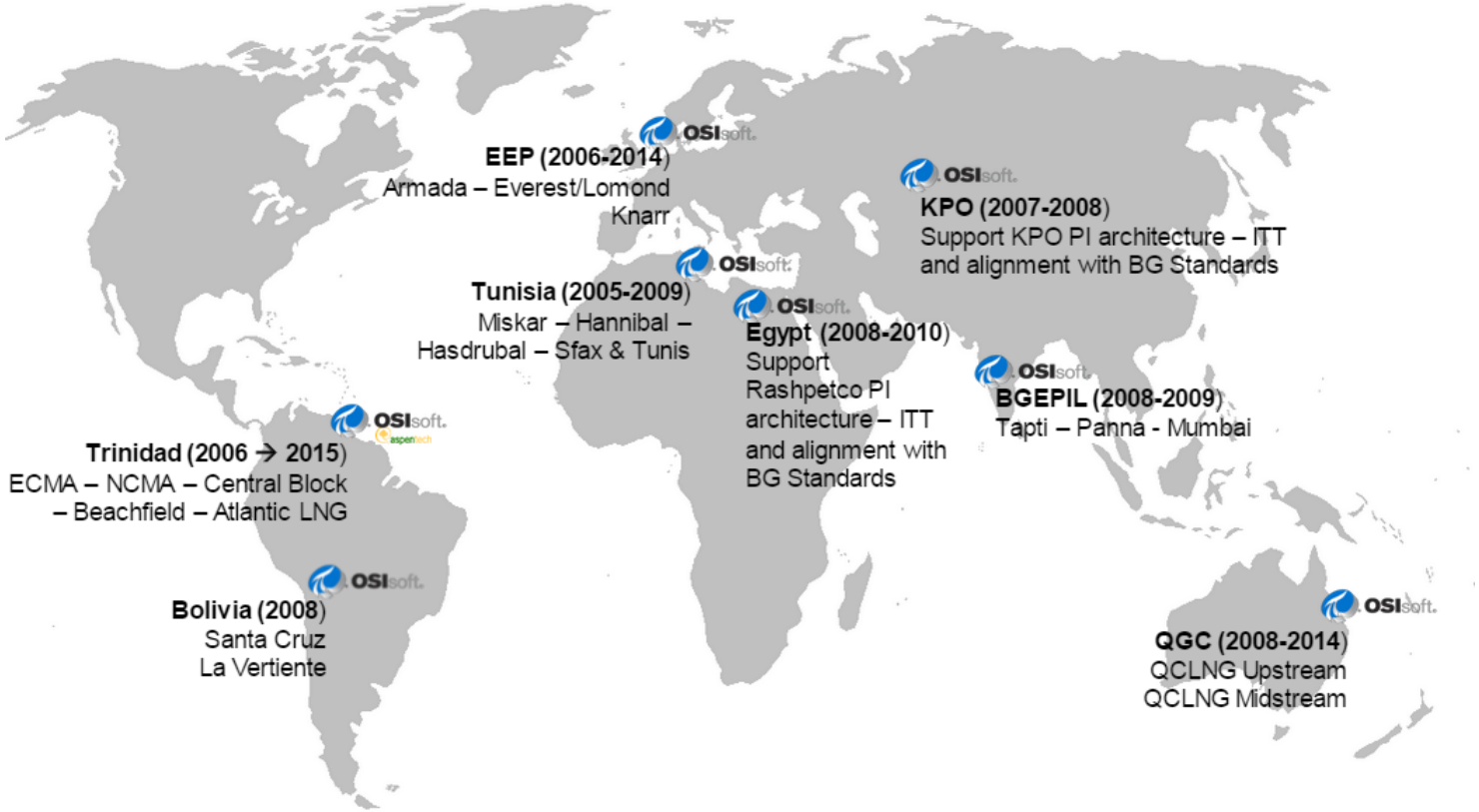
- How can we take full advantage of the data we have?
- How can we optimise production on a real time basis and maximise availability and efficiency?
- How can we deliver the same for less given the current oil price?





OSIsoft PI System

Real-time infrastructure supporting real-time optimisation

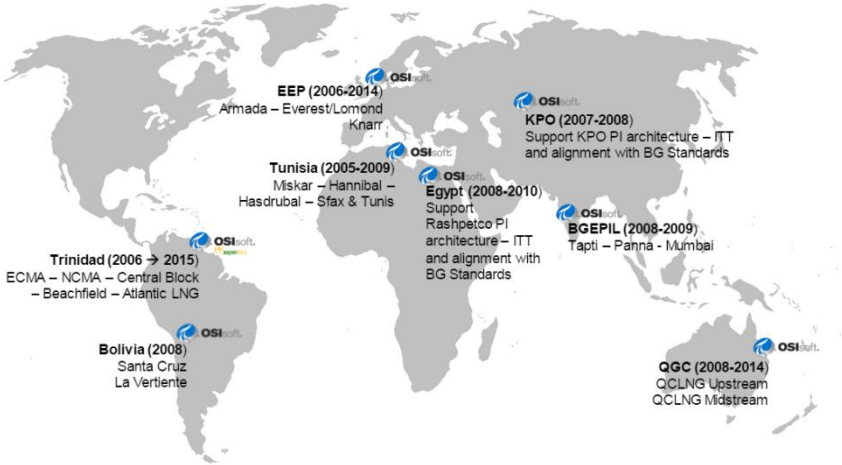


OSIsoft PI System

Real-time infrastructure supporting real-time optimisation

Use Case 1:

Integration of the PI System, Unisim and Resolve to enhance production by maximizing compressor efficiency in India



Use case 1

Integration of the PI System, Unisim and Resolve to enhance production by maximizing compressor efficiency in India

- BG has a 30% interest in the Mid and South Tapti gas fields and the Panna/Mukta oil and gas fields.
- We are developing the existing fields incrementally through well intervention and infill drilling campaigns; evaluating new projects; and planning development opportunities
- Late life asset where real-time Production system optimisation is adding more value than ever

Use case 1

Integration of the PI System, Unisim and Resolve to enhance production by maximizing compressor efficiency in India

Business challenge: Production decline is a major challenge in mature assets like Panna Mukta and Tapti. Both fields have been producing for more than 15 years…

How can we produce more from a mature Asset?

- Usual focus area in increasing production from a mature field is improving well and reservoir performance

- However, facility operations, particularly compressor performance, is a key variable that should be considered, as it has a high impact on daily well deliverability

  – A drop of 2% compressor efficiency when left unnoticed could lead to 300 bbl/d loss @ $50/BBL = $5.4M/yr

Use case 1

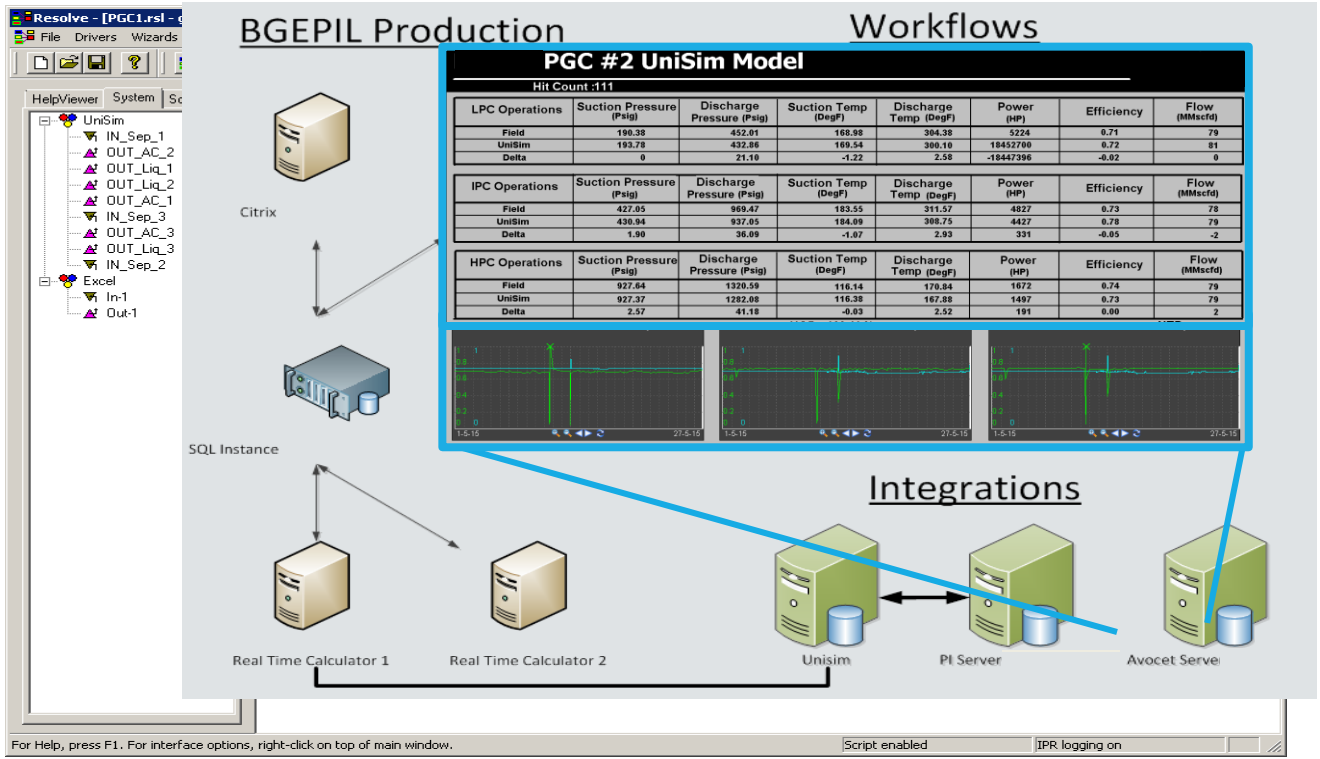
Integration of the PI System, Unisim and Resolve to enhance production by maximizing compressor efficiency in India

- **Approach:**
  - This project relies on our **understanding of the system**, **integrates existing software and tools**, includes **an algorithm to measure and predict compressor performance**, and **uses design and operational data on a real time basis**
  - **Step 1:** model the platform in UniSim – this involved:
    - Changing the design model to an operating model
    - Making the model fit for purpose – a sampling campaign kicked off to make sure the mass balance is honoured using an Excel interface to run different cases in UniSim
  - **Step 2:** build confidence in the model – tune the model using the PI System data using different operating scenarios built in Excel to focus the effort on analysis rather than data management
  - **Step 3:** removing the user interface between UniSim and the PI System, use Resolve (as the controller of the data transfer PI Server/UniSim/PI Server) to automate the analysis and report gaps

⇒ The integrated Model is now able to highlight the gap between actual compressor performance and predicted performance

Use case 1

Integration of the PI System, Unisim and Resolve to enhance production by maximizing compressor efficiency in India



Use case 1

Integration of the PI System, Unisim and Resolve to enhance production by maximizing compressor efficiency in India

Benefits:

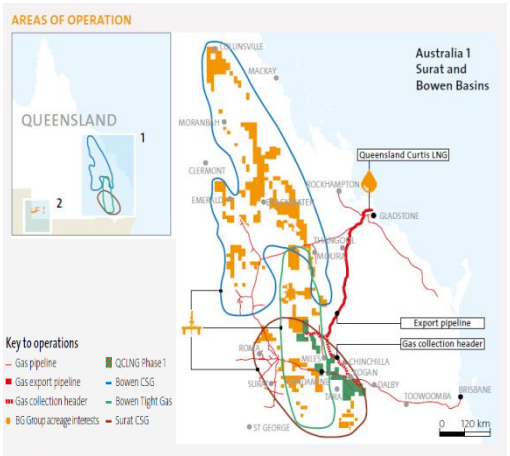
- Real-time optimisation highlighting drop in the efficiency of compressors, post which corrective actions were taken (anti-foulant injection)
- Increased Gas Production of up to 2MMscf/d
- Optimised Liquid Recovery
- Provided strong case for further optimisation of compressor design modifications to achieve higher efficiency
- Opened up the ability to install similar set-ups in other assets

Total spent on the project is $150k, estimated benefits before the year end is approx. $6M

Use Case 2:

Event Frames supporting production loss management

- BG is a leading natural gas explorer and producer in Australia and have executed a project to convert gas from coal seams into liquefied natural gas. It produces gas from southern Queensland, uses a 540km underground pipeline to transfer coal seam gas to an Island in North Queensland, liquefies the gas in the LNG plant and exports to Asian markets.
- The upstream assets currently consists of over two thousand wells (and will increase over the economic life of the Asset), thousands of kms of gathering network, a large set of field compressor stations and a number of Central Processing Plants



Use Case 2:

Event Frames supporting production loss management

Business Challenges:

This vast asset landscape operating across three large regions present a unique set of challenges:

- Existing process requires extensive manual intervention
- With thousands of wells required over the economic life of the asset, a large number of daily events associated with wells can be expected;
- There is a significant number of non-well (facility) related events (compressor trips, scheduled preventative maintenance, etc)
- The Production Engineers currently spend a significant proportion of their time manually entering and validating loss event data
- The different regions also use different sets of tools/excel sheets to carry out the loss event detection and management with thousands of wells required over the economic life

Use Case 2:

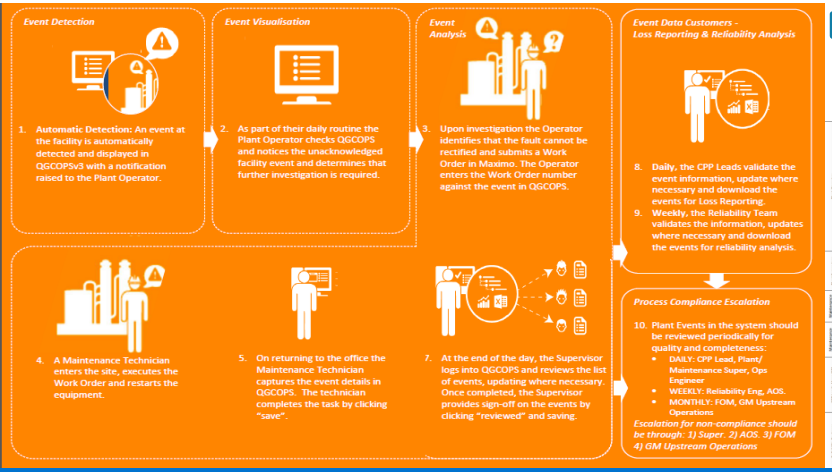
Event Frames supporting production loss management

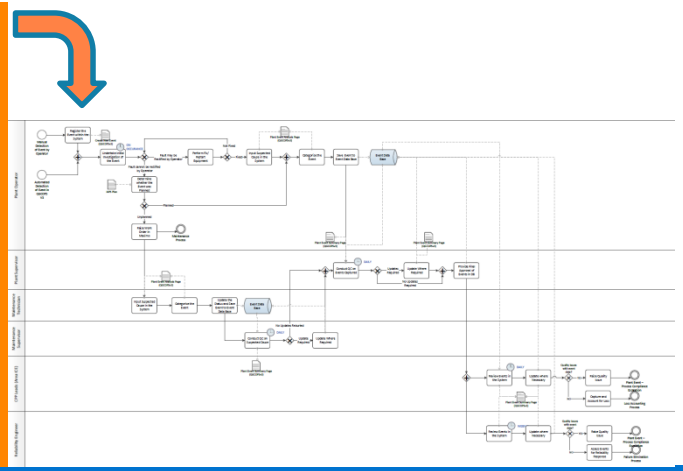
Solution:

Redesign the business processes for Production Loss Management:

- A future-state process model was designed to streamline process execution, better align activities to the right resources, and reduce overall resource intensity

- The project evaluated several strategic technology solution alternatives and made a final recommendation based on business-supplied criteria/principles and scoring

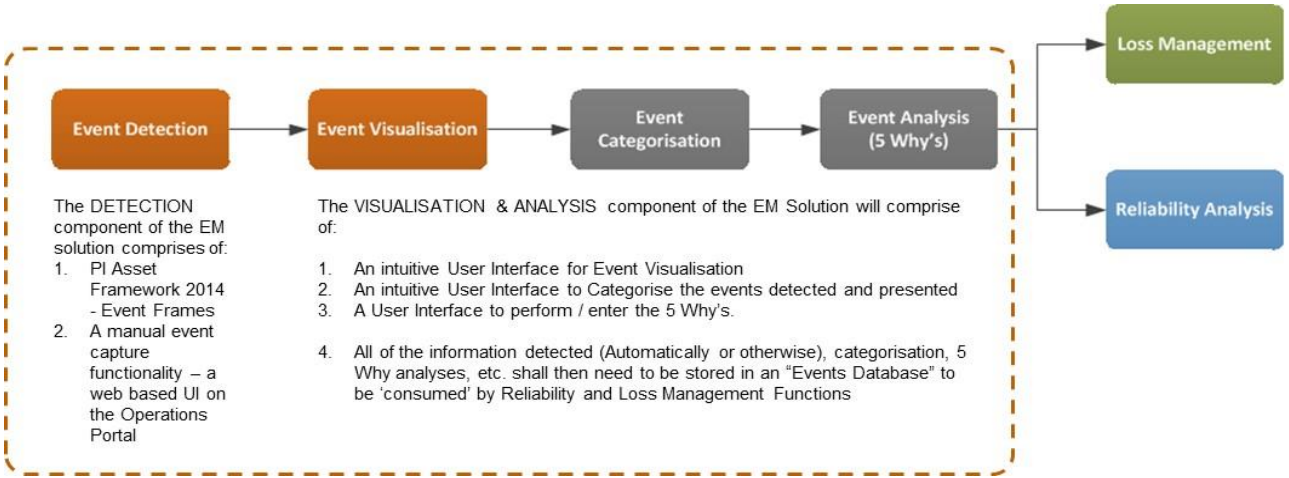


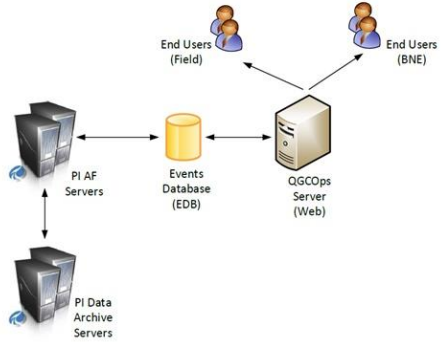


Use Case 2:

Event Frames supporting production loss management

- The functional components of the solution are represented in the following diagram:



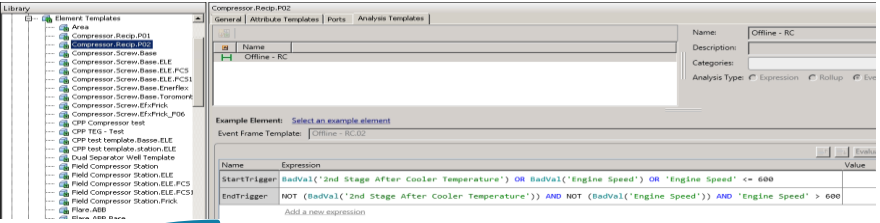


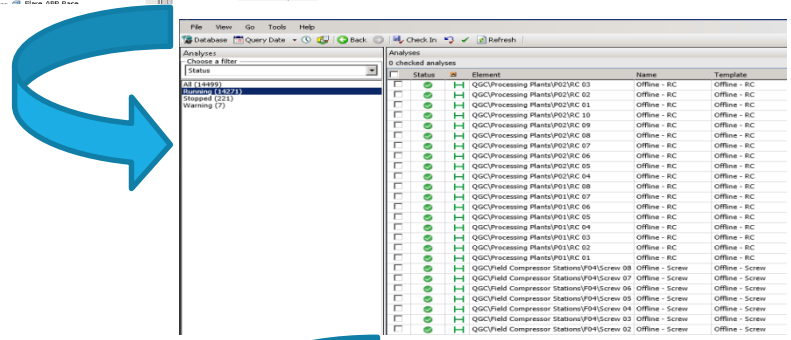
- The Event detection component is realised using the PI Asset Framework 2014 and Event Frames (combination of Asset Analytics/Calculations and Event Frames)

- While detection is realised using Event Frames and Asset Based Analytics, the visualisation components were designed on the Operations Portal using SharePoint and HTML5 based UI components.

Use Case 2:

Event Frames supporting production loss management



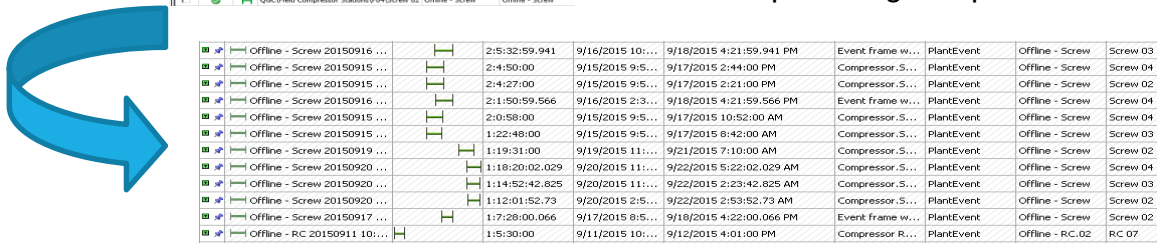


Event Frames Analysis - Defining event logic:

- if Compressor Speed is below x rpm and motor current is below y Amps, consider as a trip
- For Reciprocating compressors, if final discharge temperature is below x deg C and engine speed is below y rpm then consider it as trip

Running the analysis per equipment:

- 100+ Screw compressors
- 15+ Centrifugal compressors
- 15+ Reciprocating compressors



Offline - Screw 20150916 ...	2:5:32:59.941	9/16/2015 10:...	9/18/2015 4:21:59.941 PM	Event frame w...	PlantEvent	Offline - Screw	Screw 03
Offline - Screw 20150915 ...	2:4:50:00	9/15/2015 9:5...	9/17/2015 2:44:00 PM	Compressor.S...	PlantEvent	Offline - Screw	Screw 04
Offline - Screw 20150915 ...	2:4:27:00	9/15/2015 9:5...	9/17/2015 2:21:00 PM	Compressor.S...	PlantEvent	Offline - Screw	Screw 02
Offline - Screw 20150916 ...	2:1:50:59.566	9/16/2015 2:3...	9/18/2015 4:21:59.566 PM	Event frame w...	PlantEvent	Offline - Screw	Screw 04
Offline - Screw 20150915 ...	2:0:58:00	9/15/2015 9:5...	9/17/2015 10:52:00 AM	Compressor.S...	PlantEvent	Offline - Screw	Screw 04
Offline - Screw 20150915 ...	1:22:48:00	9/15/2015 9:5...	9/17/2015 8:42:00 AM	Compressor.S...	PlantEvent	Offline - Screw	Screw 03
Offline - Screw 20150919 ...	1:19:31:00	9/19/2015 11:...	9/21/2015 7:10:00 AM	Compressor.S...	PlantEvent	Offline - Screw	Screw 02
Offline - Screw 20150920 ...	1:18:20:02.029	9/20/2015 11:...	9/22/2015 5:22:02.029 AM	Compressor.S...	PlantEvent	Offline - Screw	Screw 04
Offline - Screw 20150920 ...	1:14:52:42.825	9/20/2015 11:...	9/22/2015 2:23:42.825 AM	Compressor.S...	PlantEvent	Offline - Screw	Screw 03
Offline - Screw 20150920 ...	1:12:01:52.73	9/20/2015 2:5...	9/22/2015 2:53:52.73 AM	Compressor.S...	PlantEvent	Offline - Screw	Screw 02
Offline - Screw 20150917 ...	1:7:28:00.066	9/17/2015 8:5...	9/18/2015 4:22:00.066 PM	Event frame w...	PlantEvent	Offline - Screw	Screw 02
Offline - RC 20150911 10:...	1:5:30:00	9/11/2015 10:...	9/12/2015 4:01:00 PM	Compressor R...	PlantEvent	Offline - RC.02	RC 07

Event frames generated based on event logic defined

Use Case 2:

Event Frames supporting production loss management

Facility Events | Create New Event | Group Analyse | Export Data | Refresh

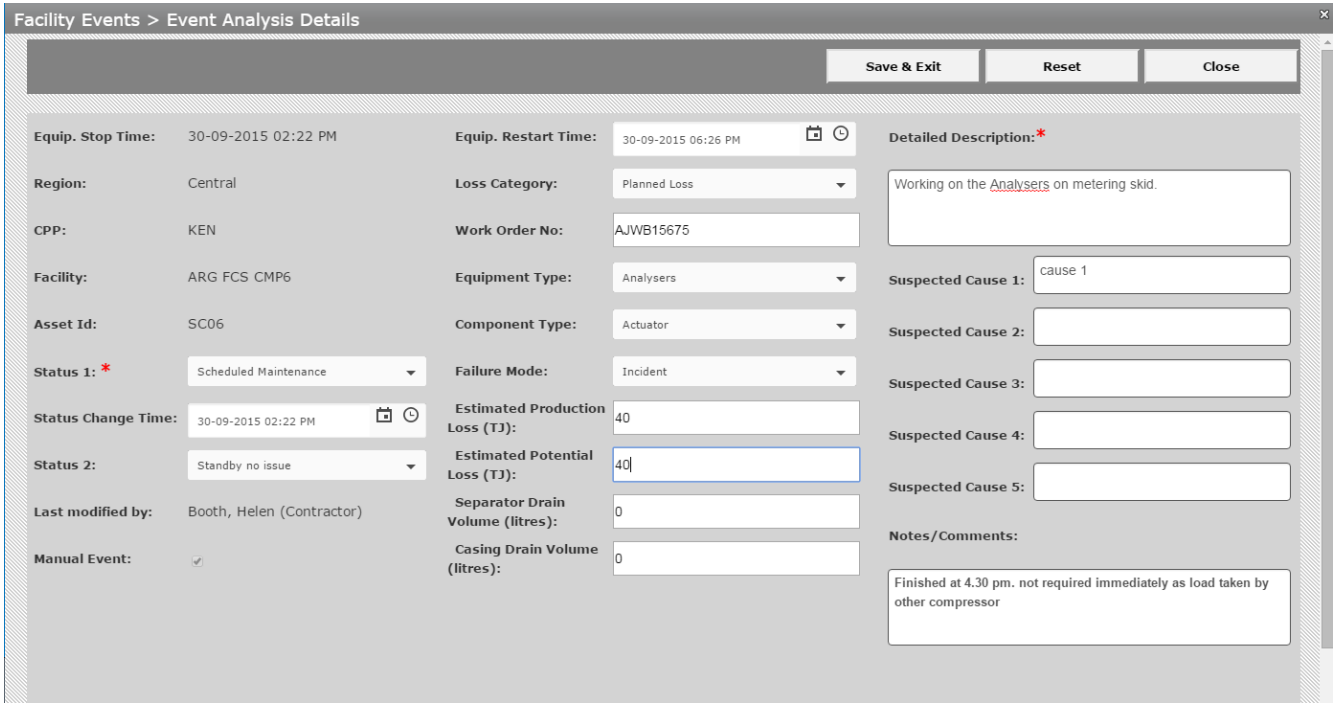
CPP	FACILITY	ASSET ID	EQUIP. STOP TIME (29-09-2015 04:38 PM)	EQUIP. RESTART TIME (01-10-2015 04:38 PM)	SELECT	STATUS 1	STATUS 2	EVENT ANALYSIS
KEN	ARG FCS CMP6	SC06	30-09-2015 02:22 PM	30-09-2015 06:26 PM		Available but with issues	Scheduled Maintenance	Partially Analysed
WIN	WIN CPP CMP1	RC01	30-09-2015 09:35 AM	30-09-2015 09:41 AM		Running but with issues	Available but with issues	Analysed
KEN	ARG FCS CMP6	SC06	30-09-2015 09:01 AM	30-09-2015 09:25 AM		Unplanned Offline	Select	Analysed
WOL	CAM FCS CMP 4	SC04	30-09-2015 08:51 AM			Scheduled Maintenance	Scheduled Maintenance	Partially Analysed
WOL	ROS FCS CMP 1	SC01	30-09-2015 08:50 AM			Standby no issue	Available but with issues	Partially Analysed
KEN	ARG FCS CMP6	SC6	30-09-2015 08:33 AM	30-09-2015 06:05 PM		Available but with issues	Scheduled Maintenance	Analysed
WIN	BWS FCS CMP6	SC06	30-09-2015 07:54 AM			Scheduled Maintenance	Select	Partially Analysed
KEN	ARG FCS CMP5	SC05	30-09-2015 01:00 AM			Running but with issues	Select	Partially Analysed
KEN	KEN CPP CMP5	RC05	30-09-2015 12:05 AM			Unplanned Offline	Select	Partially Analysed
KEN	ARG FCS CMP6	SC06	30-09-2015 12:00 AM	30-09-2015 03:00 AM		Available but with issues	Scheduled Maintenance	Partially Analysed
WIN	BWS FCS CMP1	h	30-09-2015 12:00 AM			Unplanned Offline	Select	Partially Analysed
RUB	Ruby JO FCS CMP3	ADVCVCC	30-09-2015 12:00 AM			Standby no issue	Scheduled Maintenance	Partially Analysed
KEN	ARG FCS CMP6	SC06	29-09-2015 08:30 PM	29-09-2015 08:50 PM		Unplanned Offline	Scheduled Maintenance	Analysed
WOL	WCK FCS CMP 3	SC03	29-09-2015 06:47 PM			Standby no issue	Select	Partially Analysed
WOL		SC03	29-09-2015 06:18 PM			Unplanned Offline	Select	Partially Analysed
KEN	KEN FCS CMP5	SC05	29-09-2015 06:09 PM			Scheduled Maintenance	Select	Partially Analysed
KEN	KEN FCS CMP5	SC05	29-09-2015 05:53 PM	29-09-2015 06:08 PM		Scheduled Maintenance	Standby no issue	Partially Analysed

Main visualisation page for all facility events
Some events have finished, Some yet to be completed

Categorisation for events done quickly from this page

Use Case 2:

Event Frames supporting production loss management

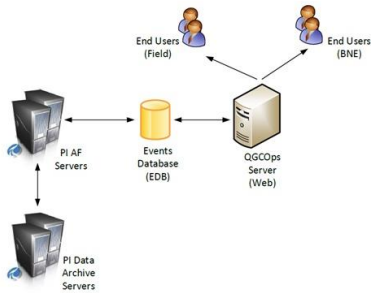


Detailed analysis page allows loss capture information

This feeds back to the PI System

Use Case 2:

Event Frames supporting production loss management



The project cost is $1,060k, the benefits are:

- Production Engineers will spend less time capturing events, analysing them (categorising, sub-categorising and assigning failure modes) and calculating losses, allowing more time for value adding analysis

  => Benefits exceed $600k per year

- A more focussed and targeted approach in loss management leading to a higher Production Efficiency

- All stakeholders will be able to access data from a single source, reducing confusion and effort associated with manual transfer of data

  - **A Single source of truth for production losses in the Asset**

- **There will be a potential of 1-3% increase in facilities availability** through improved focus on reliability issues
  - 1% increase in plant availability for 5 years will generate a **benefit of approx. $53.5million over 5 years**
  - Improved well availability over 5 years will generate a benefit of approx. **$10.3 million per year**

Use Case 2:

Event Frames supporting production loss management

Plan for the future

- The solution will be extended to Loss Management by adding further analysis and automation, and integration with Energy Components.

⇒ **This will help in automating the loss management function to a significant extent**

- The Reliability analysis aspects should be matured by introducing advanced analysis and potential consumption of the data by predictive analytics solutions

- We will look at the integration of collaboration technologies, for quicker value realisation

⇒ We will explore the **extension of the solution to visualisation platforms** and for **Facilities Health Monitoring**

Data to Information =~$27M/yr

Transforming real time data into **information and** transforming that information into **knowledge can lead to increasing Production Efficiency and lowering costs**

Reliable data and information is essential…
having the right people to use it is critical

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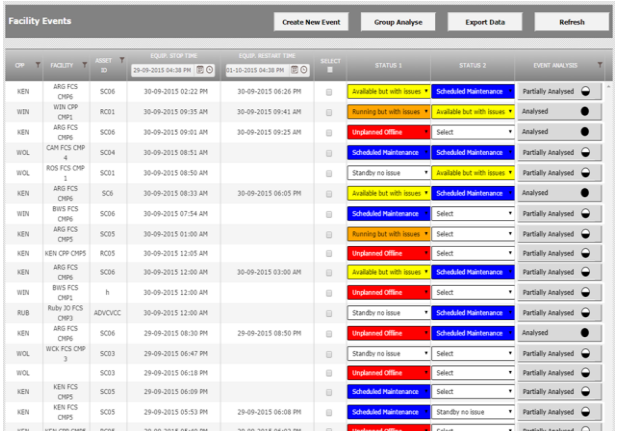


BUSINESS CHALLENGES

A. Increase production efficiency

B. Understand and reduce unplanned losses

C. Unlock potential and maximize recovery from our reserves

SOLUTION

A. Strategic approach: focus on the most valuable opportunities to pursue

B. Business driven solution

C. Technology, processes and systems deployed with strategic use of the PI System

RESULTS AND BENEFITS

- Goals and Initiatives Achieved
- Measurable Value Realized
- High Return on investment:
- Compressor Efficiency: $6M/yr
- Availability and Efficiency:
  - Processing Plant: ~$11M/yr
  - Wells: ~$10.3M/yr

Contact Information

Ali Hamza

Ali.hamza@bg-group.com

Global Production Engineering Manager

BG Group

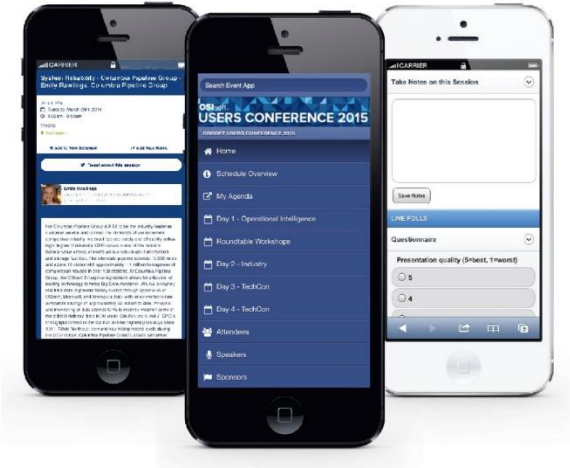
Questions

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



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谢谢

Danke

Gracias

Merci

Thank You

ありがとう

Спасибо

Obrigado