



Session: **WO4-2\_oral**

Session title: **Production Management and Optimization**

# **Field Management & Information System using integrated modeling to optimize Hassi Messaoud Algerian Field**

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# I am just thinking...

have a nice Car

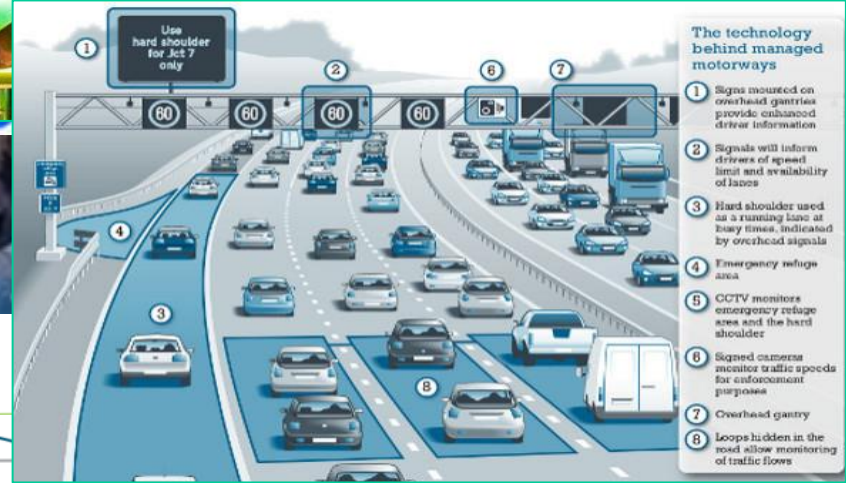
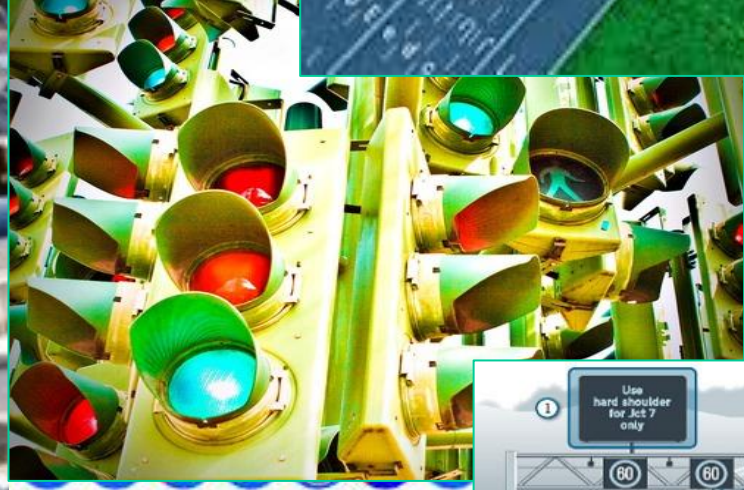
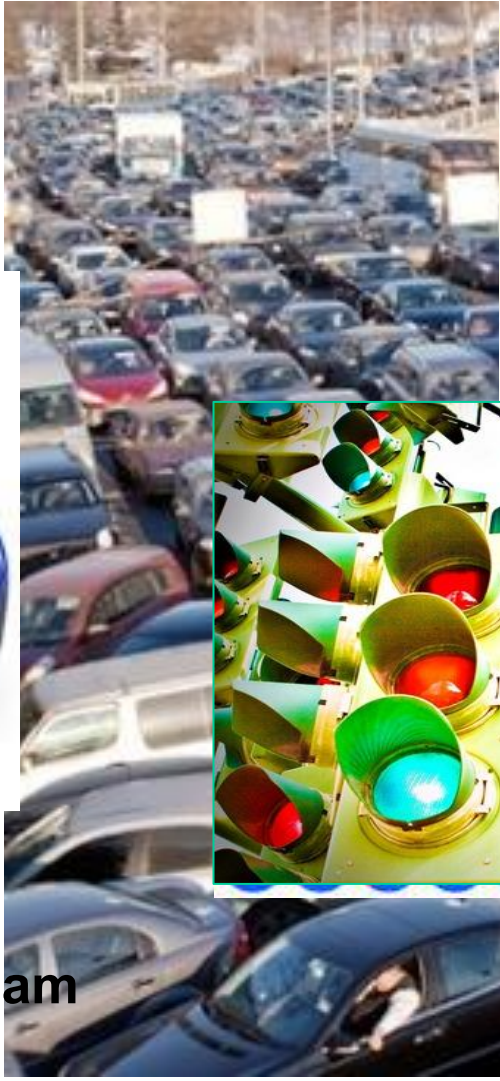


But, Can not Drive

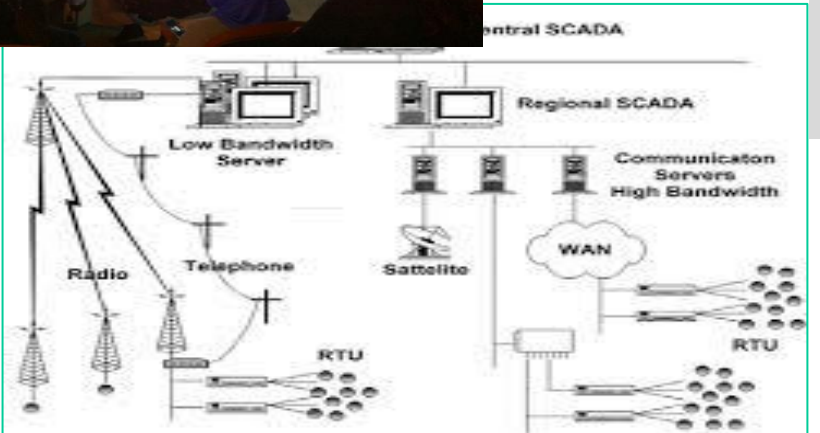
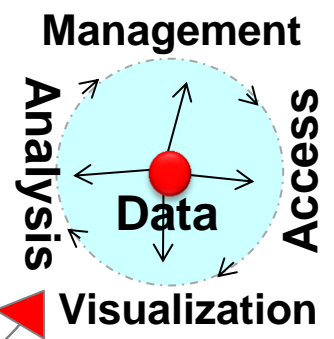
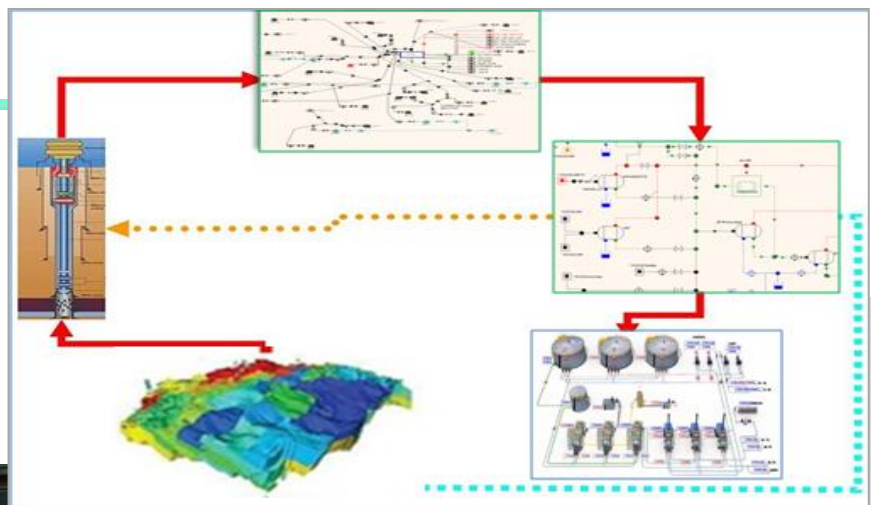
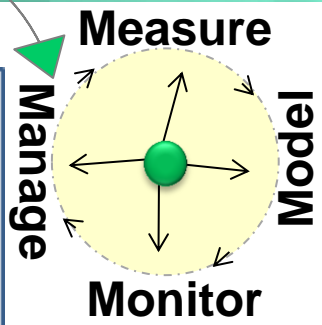
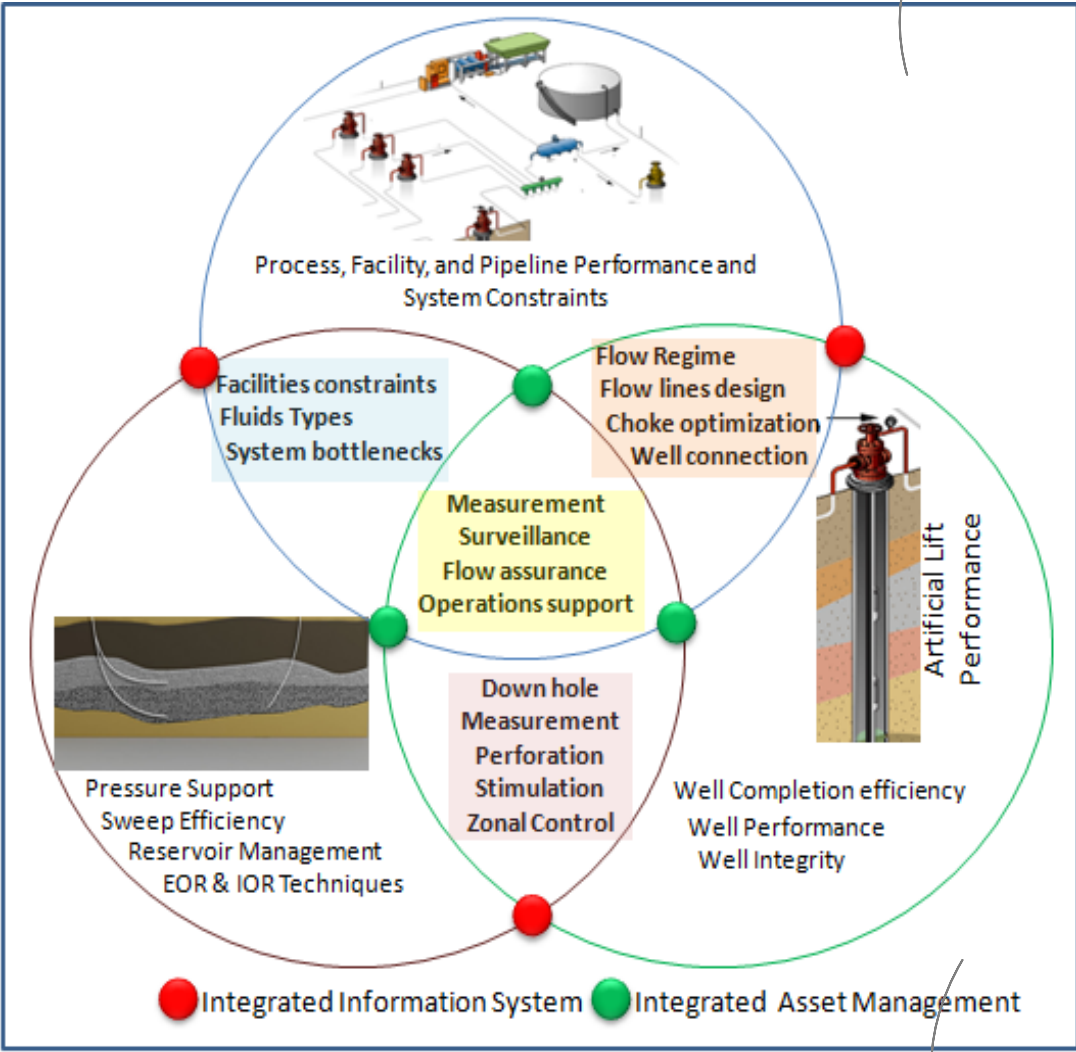
..., Don't have Insurance

..., Lost the Trajectory

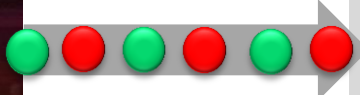
..., Get stacked in a traffic jam



# So, Drive your field

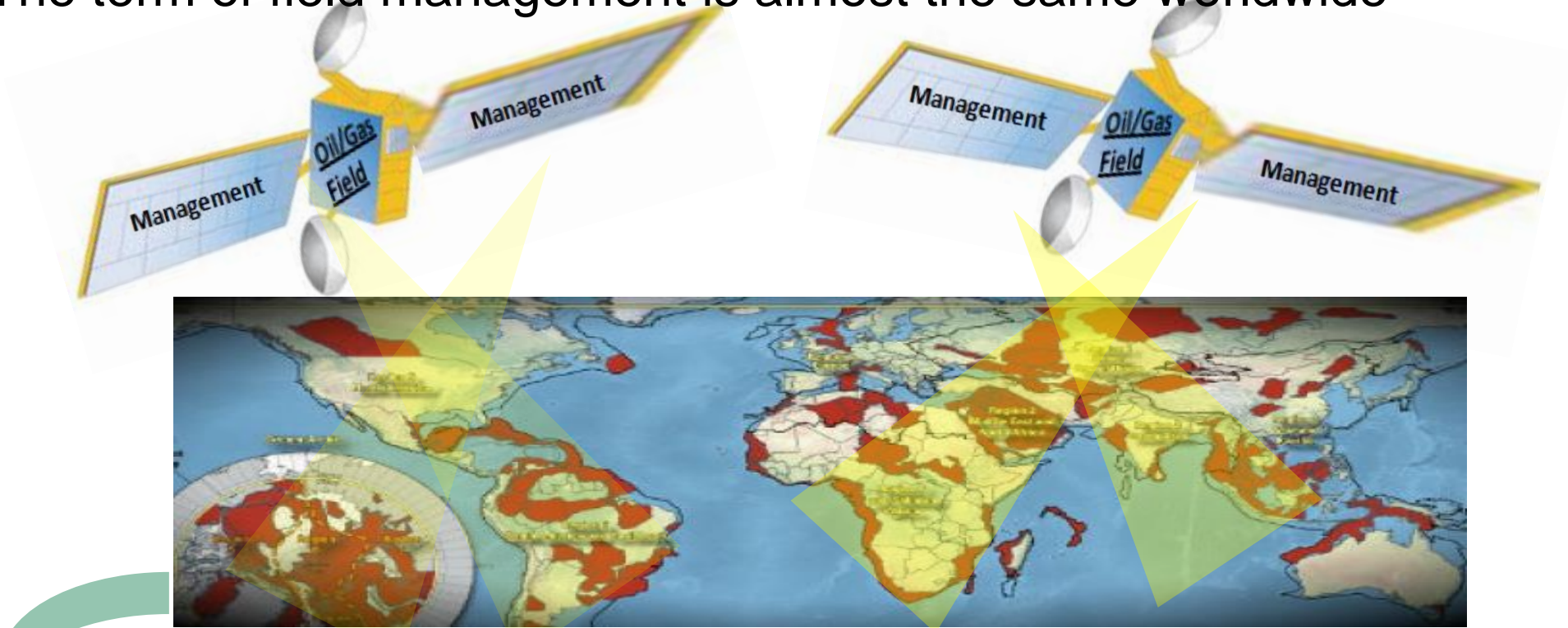


**Field Optimization & Decision Making**



# Field Management /from Theory to Practice

The term of field management is almost the same worldwide



**However,** The approach vary from field to another, depends on :

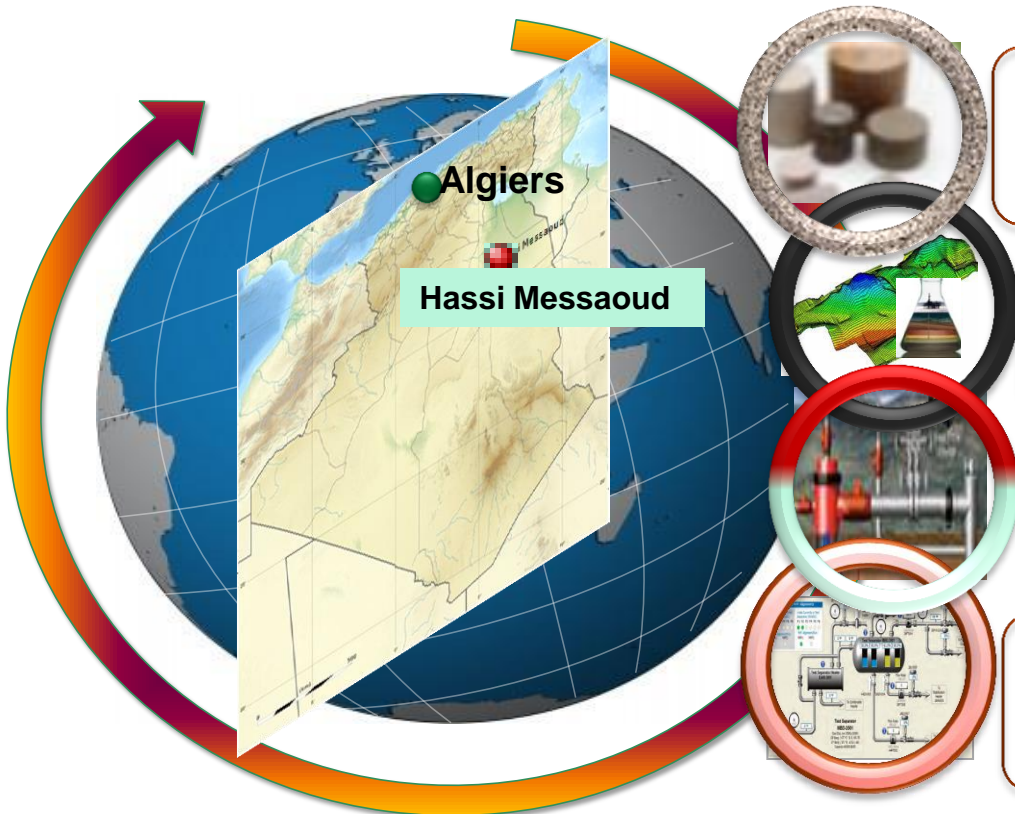
- Green, Brown or mature field
- Field Size, wells number and reservoir types
- Exploitation constraints, Man power and technology
- Economic Constraints

# Hassi Messaoud Algerian Oil Field

**Discovery** : 1956  
**Start of production** : 1958

**Superficial** : 3300 Km<sup>2</sup>  
**Depth** : 3100 until 3380 m

**Thickness** : Up to 200 m  
**Formation** : Cambro - Ordovician



## Rock type:

Quartzite Sandstone; Porosity range 5 to 10 %.  
Permeability range from less than 1md to 1000 md in opened fissured layers

Oil °API from 43.7 to 45 ; Viscosity at surface is 2 cp.  
Bo is 1.6-1.7 rb/stb; Pb ranges from 145 to 200 kg/cm<sup>2</sup> from west to east  
Reservoir Temp is @ 118 °C; Original WOC @ 3380 m subsea.

**Wells** : Total of 1400 wells (700 NF, 350 GL and 300 gas and water injector)  
**Well deviation:** Vertical, horizontal , short radius and sidetrack.....

**Surface Facilities:** about 4500 Km of piping , 20 processing Satellites  
and 04 Huge Centre of Treatments

# Objective of this work

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## **Improve Management of Production on Daily Basis**

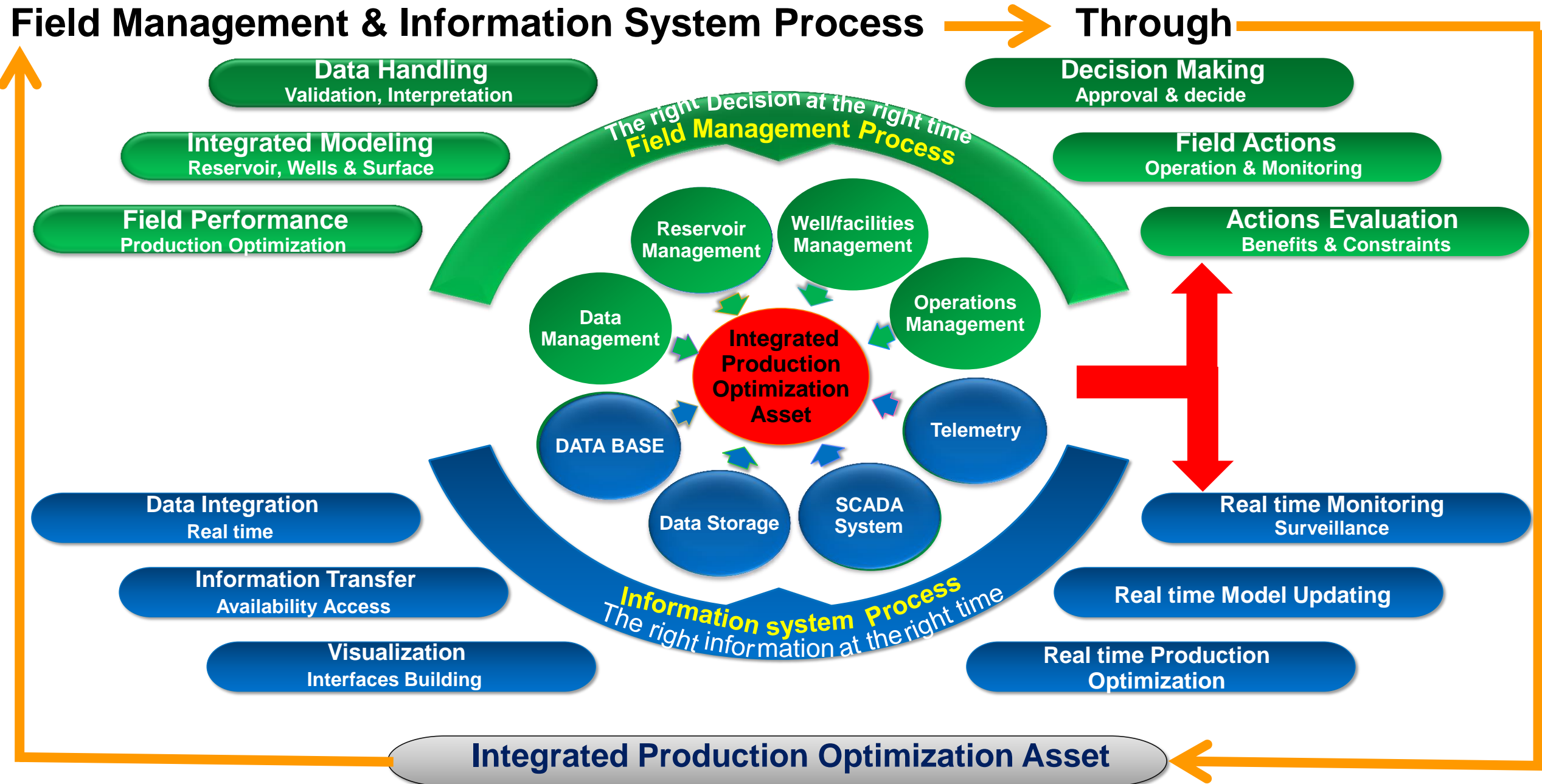
due to better understand what the wells are doing. Where to focus engineering efforts and how to effectively use engineering resources to optimize field production

## **Generalize Integrated Production Optimization System**

due to an accurate use of an integrated model (Reservoir, wells and Surface facilities), enabling optimization and assessment of field production and identifying bottlenecks in the system

## **Emphasize the Importance of Information System**

automate field surveillance, improve data management system via web base interfaces to easy access ,analyze and help for decision making



# Information System- Diving in Data Ocean

*“You can’t manage what you don’t measure.”*





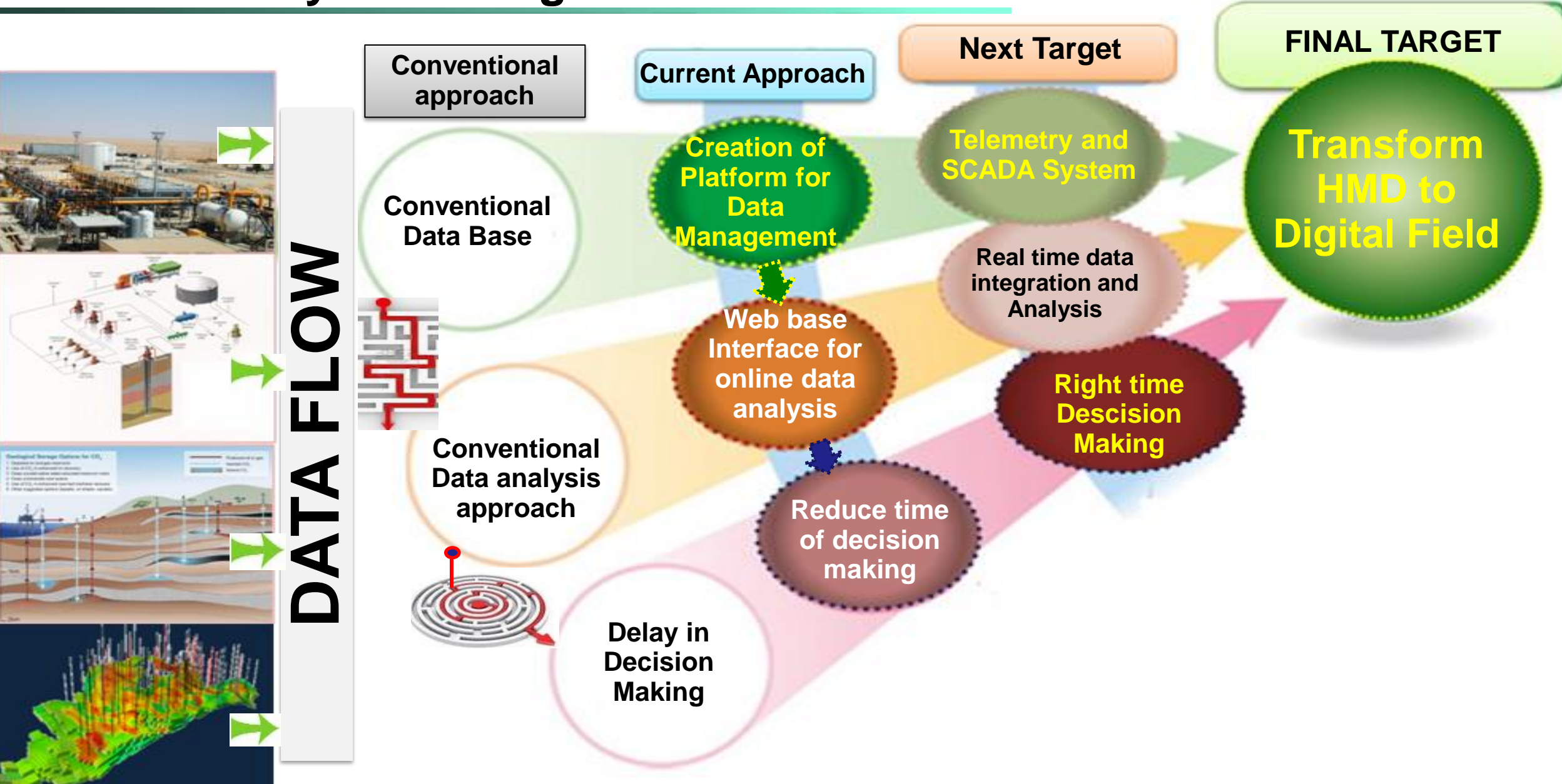
# Information System- Main drivers

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By utilizing a real time, integrated information system we can achieve a sea change in response time and effective data delivery. Some of the benefits are:

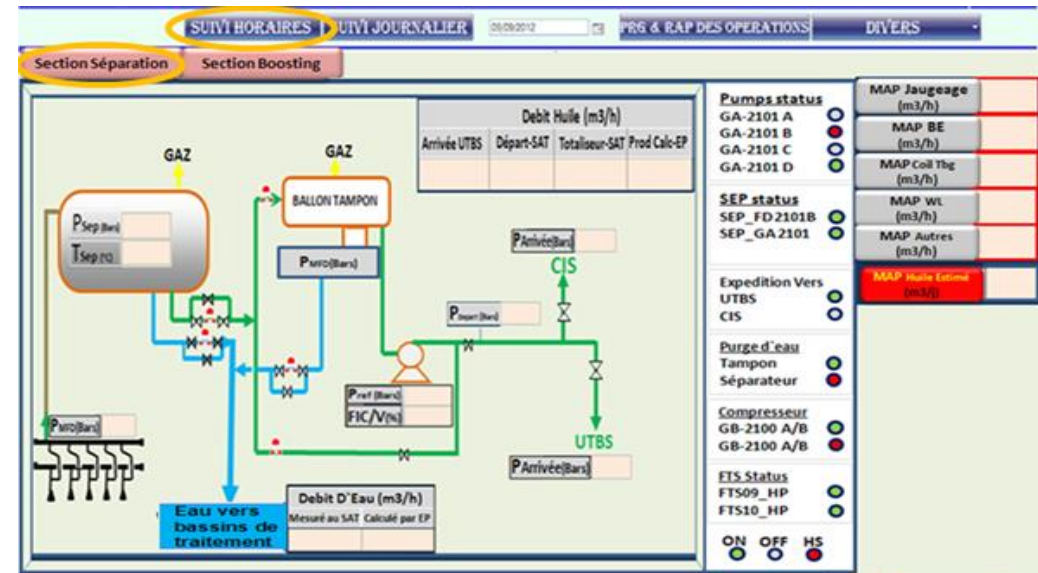
- ❑ Vastly reduced timescales for data acquisition
- ❑ Faster updates of interpretations and analysis
- ❑ Improved response times to stakeholder enquiries with associated increases in stakeholder confidence
- ❑ Increased productivity through faster data delivery to interpreters, managers, engineers, economists, and other professionals
- ❑ Immediate reporting of key performance indicators (KPIs)

# Information System- Target Vision



# Information System- Web base Interface Developed In House

Efficient  
Data Management  
Improve  
Understanding  
and  
Analysis Quality

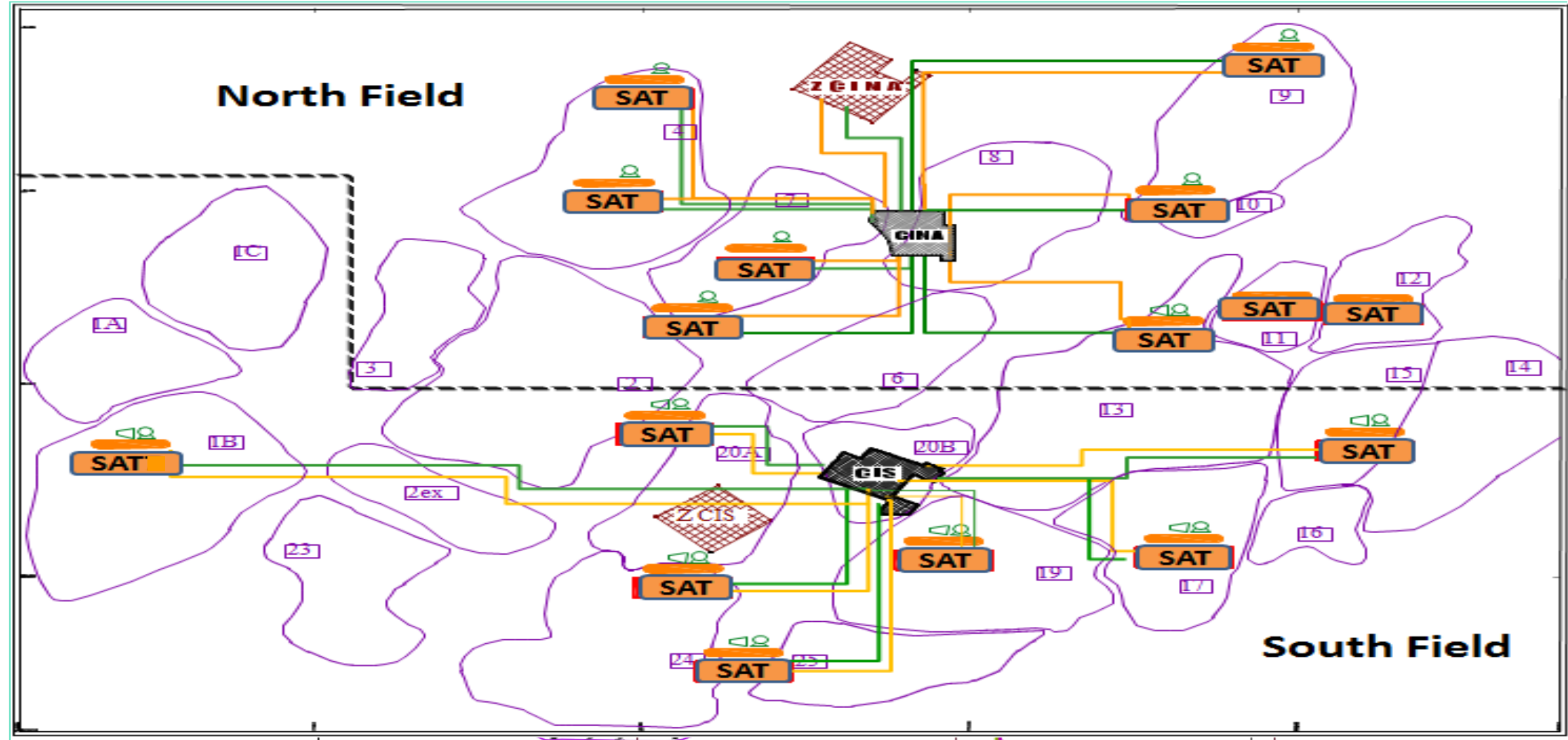


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# **Integrated Production Modelling Hassi Messaoud field Case study**

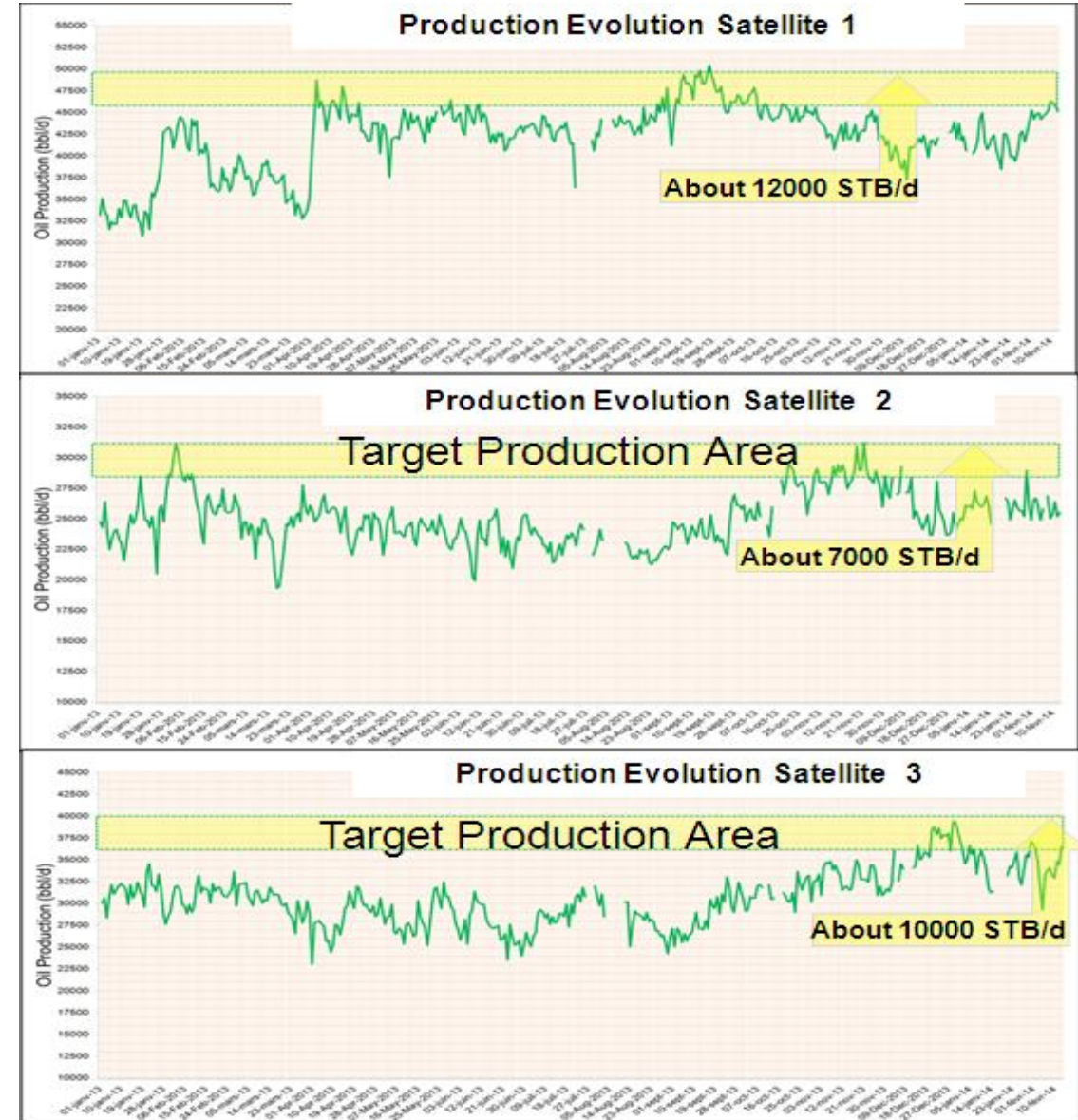
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# Case Study: Production chain of Hassi Messaoud field



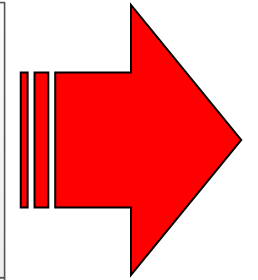
# Case Study: Problematic

- Declining production and increasing unit costs characterize many production areas (satellites) in the field.
- The production profile of the most areas of HMD field is not sustained.
- Huge benefits can be achieved if we can meet this challenge  
(**Target becomes sustainable**).



# Case Study: Main problems experienced in HMD Field

	SAT1	SAT2	SAT3	SAT4	SAT5	SAT6	SAT7	SAT8
Poor Pressure support	✓			✓				
Gas Break through				✓	✓	✓	✓	✓
Water Break through	✓					✓		
Gas Lift Issue (hydrate,...)	✓	✓	✓	✓	✓	✓	✓	
Salt deposit		✓	✓	✓	✓	✓	✓	✓
Asphaltin						✓	✓	
BaSO4 deposit	✓					✓		
Gas capacity Limit	✓		✓	✓	✓			✓
Surface Network problem	✓		✓	✓	✓		✓	



Maintenance of about 100 wells done on daily base, and usually many wells postponed.

To cover the optimized corrective plan more resource required  
(manpower and equipment)

# Case Study: Main phases of the project

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## □ **Build offline model of Integrated Production System**

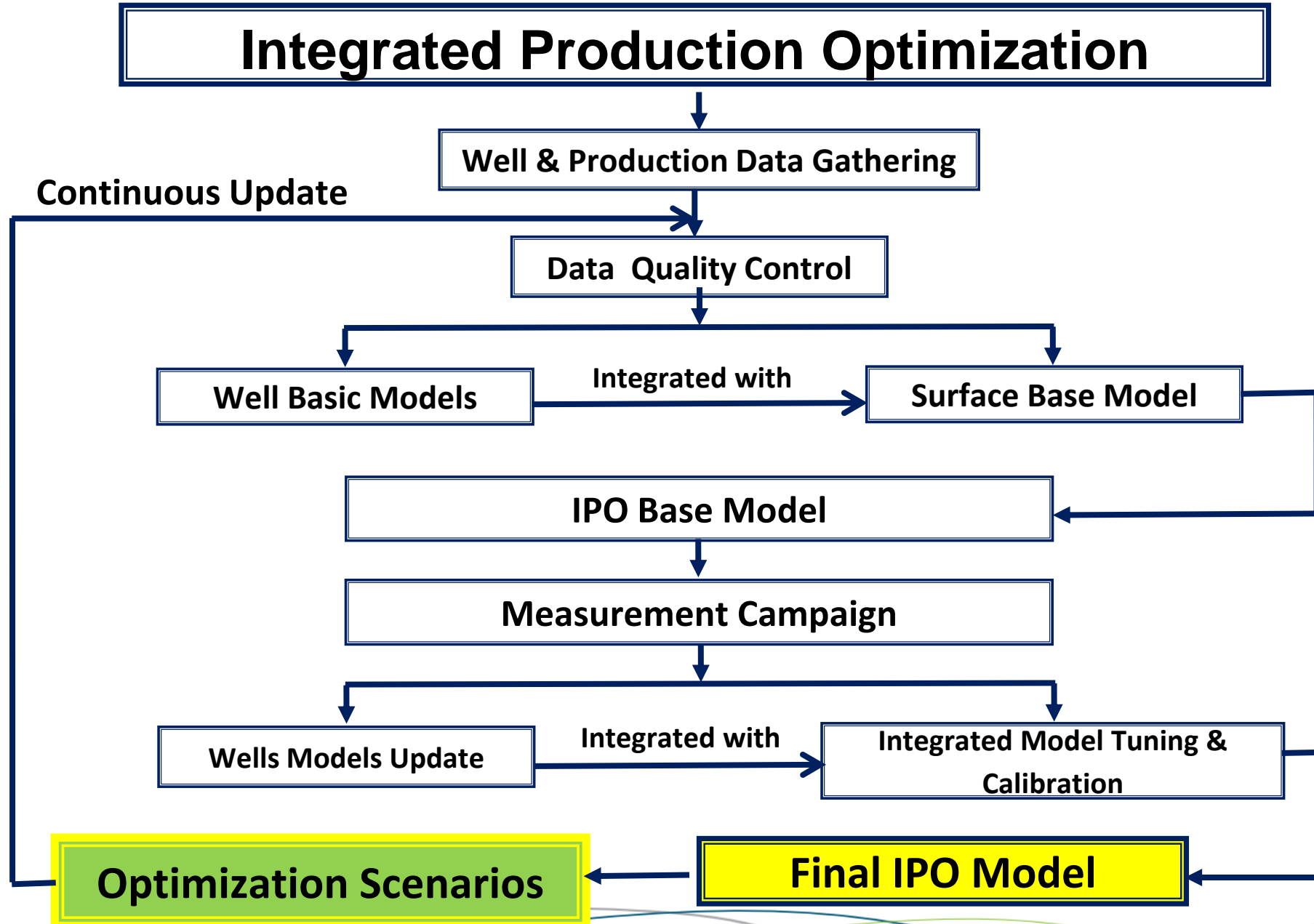
Enabling assessment of field production, ability to optimize network, identifying bottlenecks in the system and opportunities to increase oil production..

## □ **Integrate Real Time Daily Data Monitoring System**

Enabling the offline model to be updated online for production optimization and real time production solutions based on informed decision making .



# Case Study: IPO Process



# Case Study: Data Gathering

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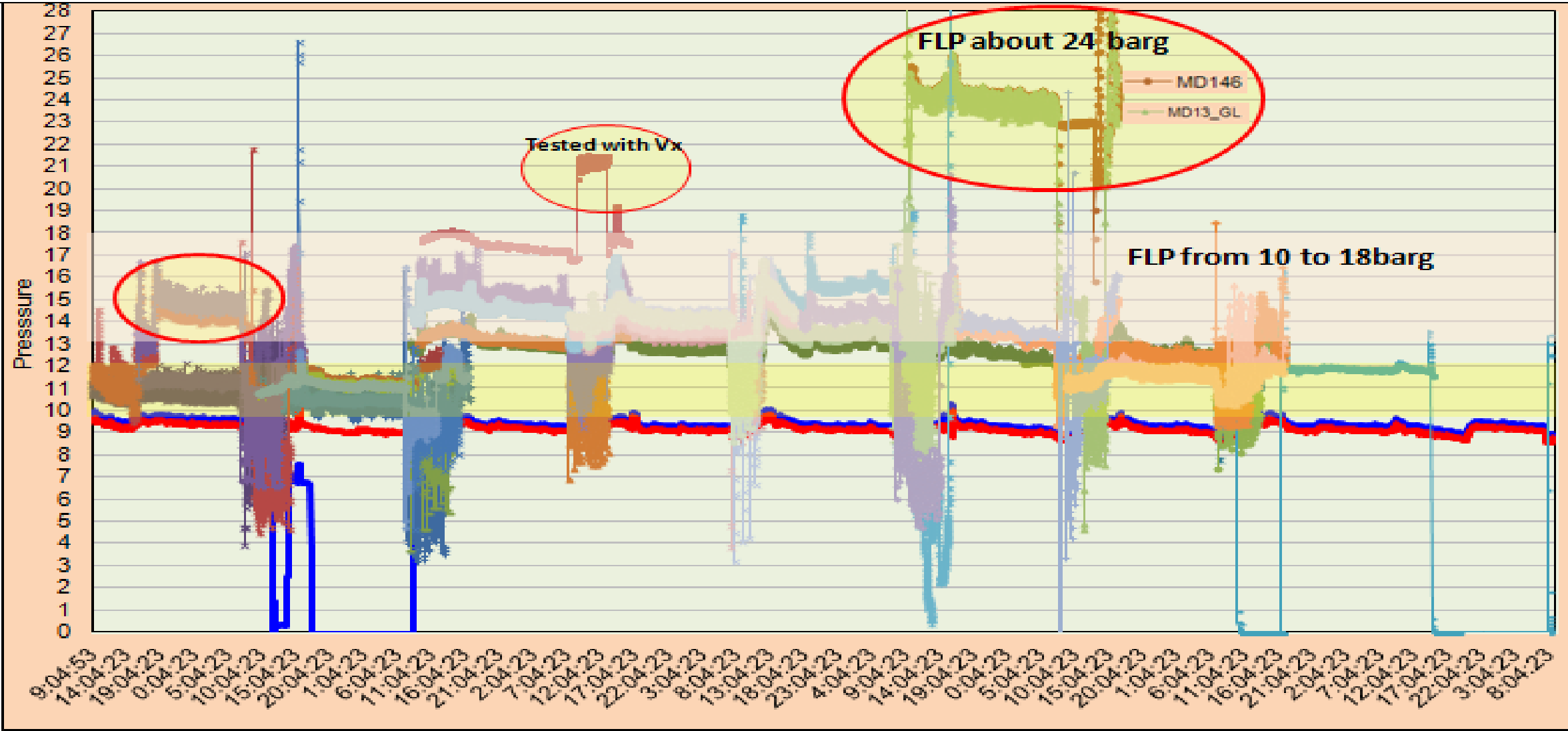
Similar to any project, data collection, preparation and validation have taken a big part of time. It is very important to determine required data, its availability as well as its quality.

In addition of ordinary data collected for each branch of production chain (reservoir, wells and surface facilities), An integrated measurement campaign was conducted in order to:

- ❑ Simultaneously measure parameters of the whole system
- ❑ Improve the understanding of production system behaviour and
- ❑ Provides reliable measurement for modelling, tuning and calibration of the model.

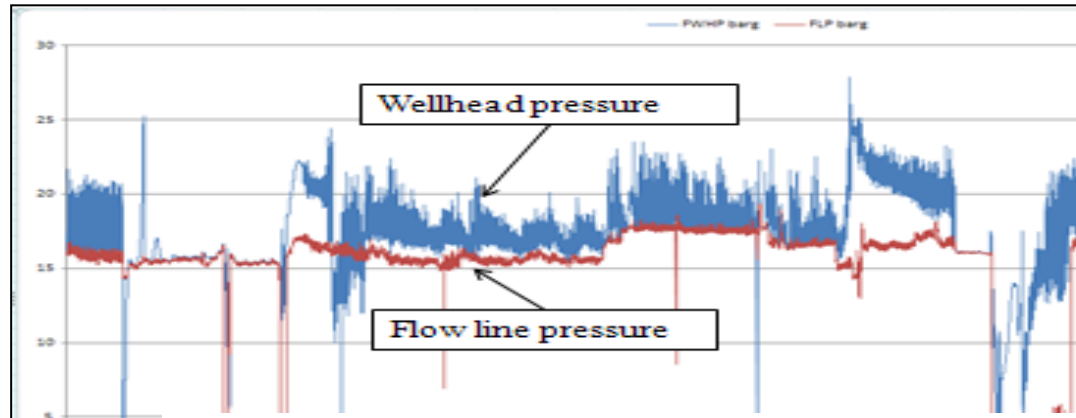
# Case Study: Measurement Campaign Examples

Surface Network Pressures recording (FLP, Manifolds and Separator)

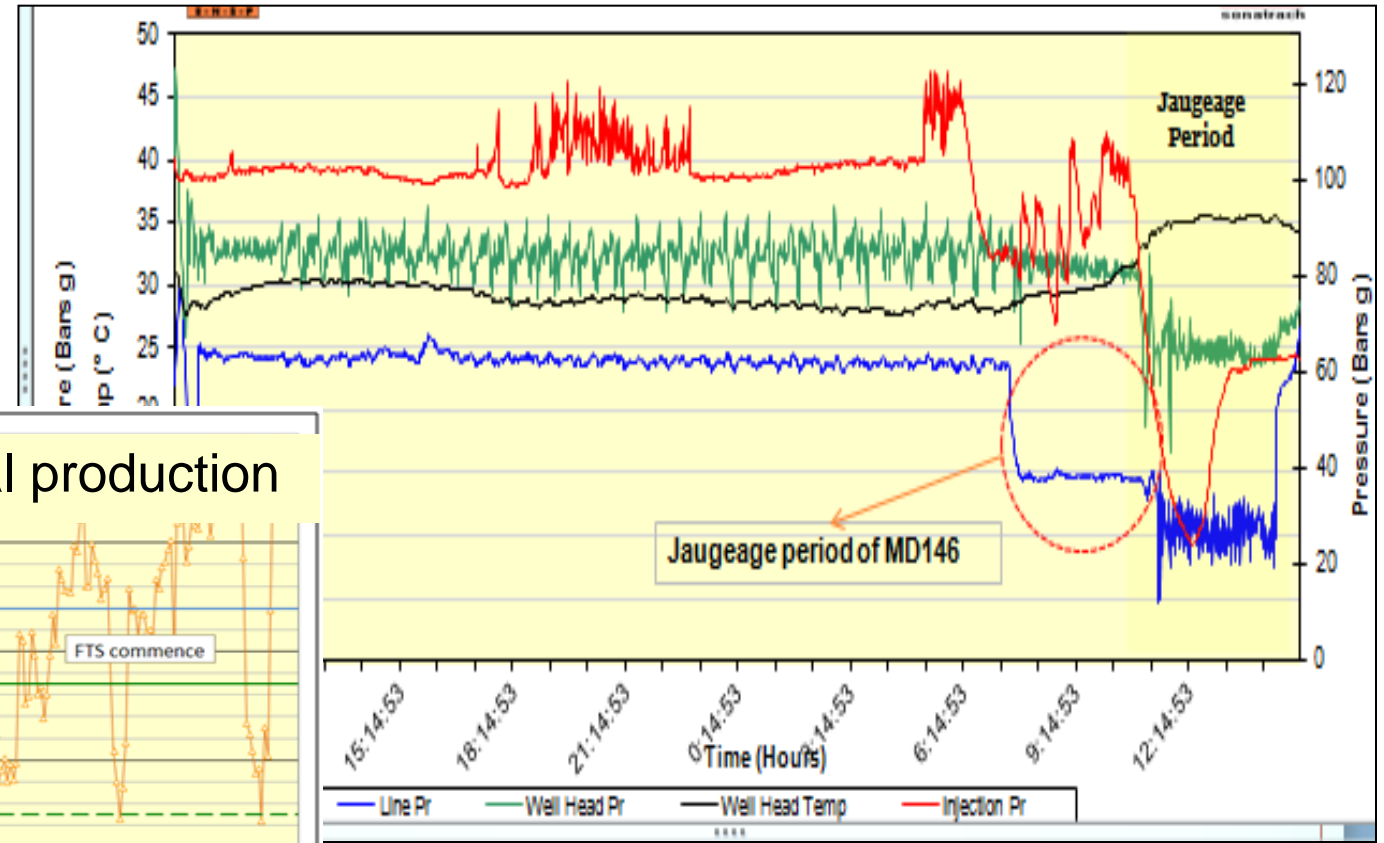


# Case Study: Measurement Campaign Examples

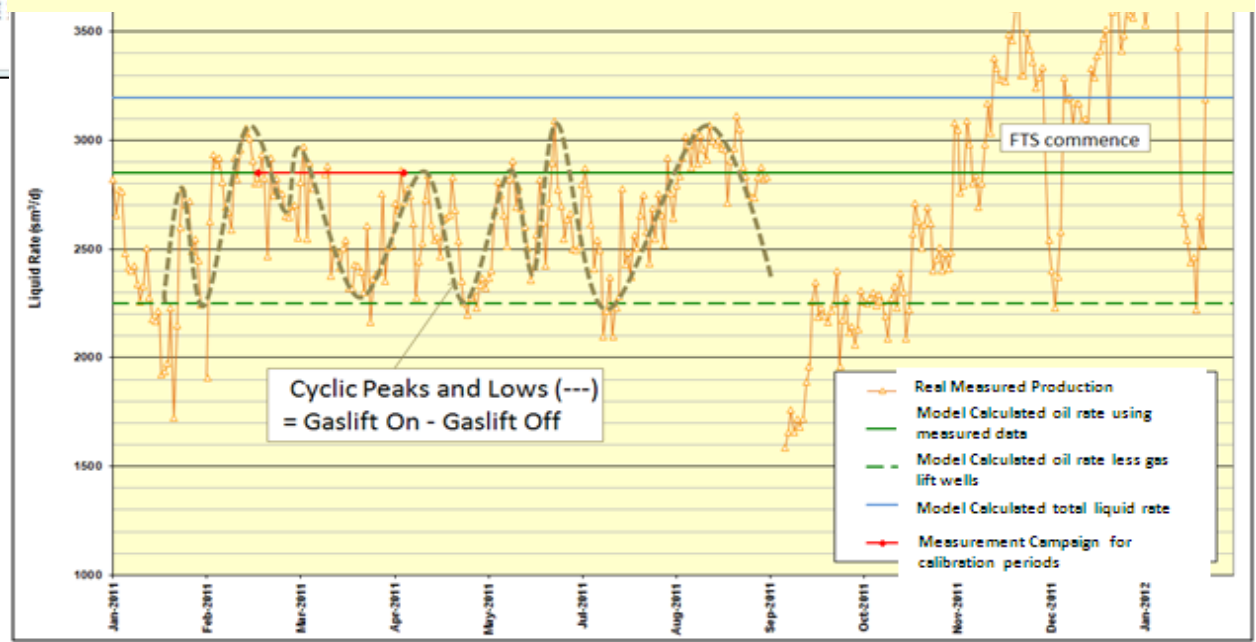
Well with Salt deposit problem



Back Pressure Impact \_High GOR Well on GL Well



Impact of Hydrate for GL wells on total production

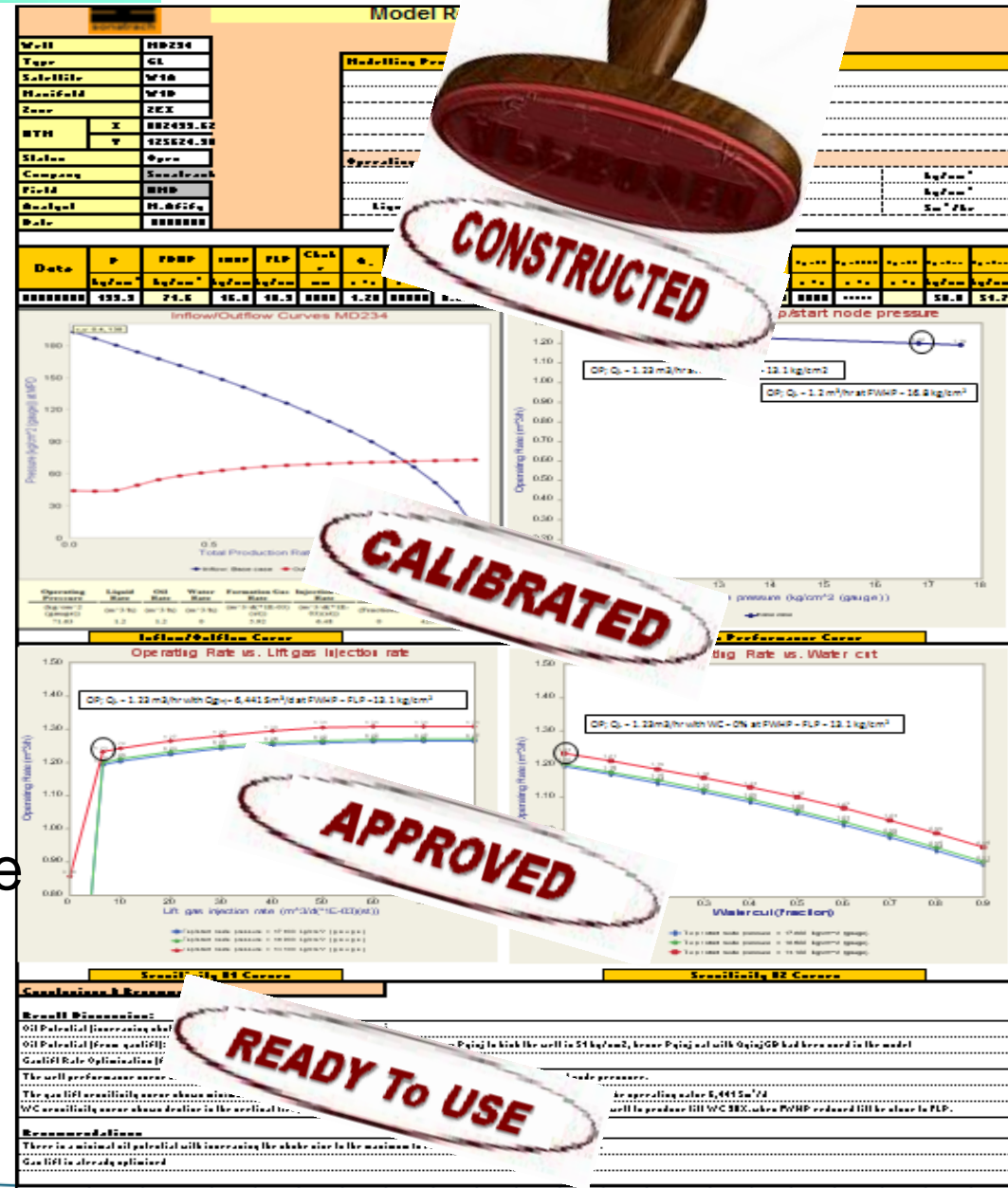


# Case Study: Well Modeling

More than 1000 wells (GL and NF) were modelled and integrated with surface network model.

A Single well potential was assessed due to :

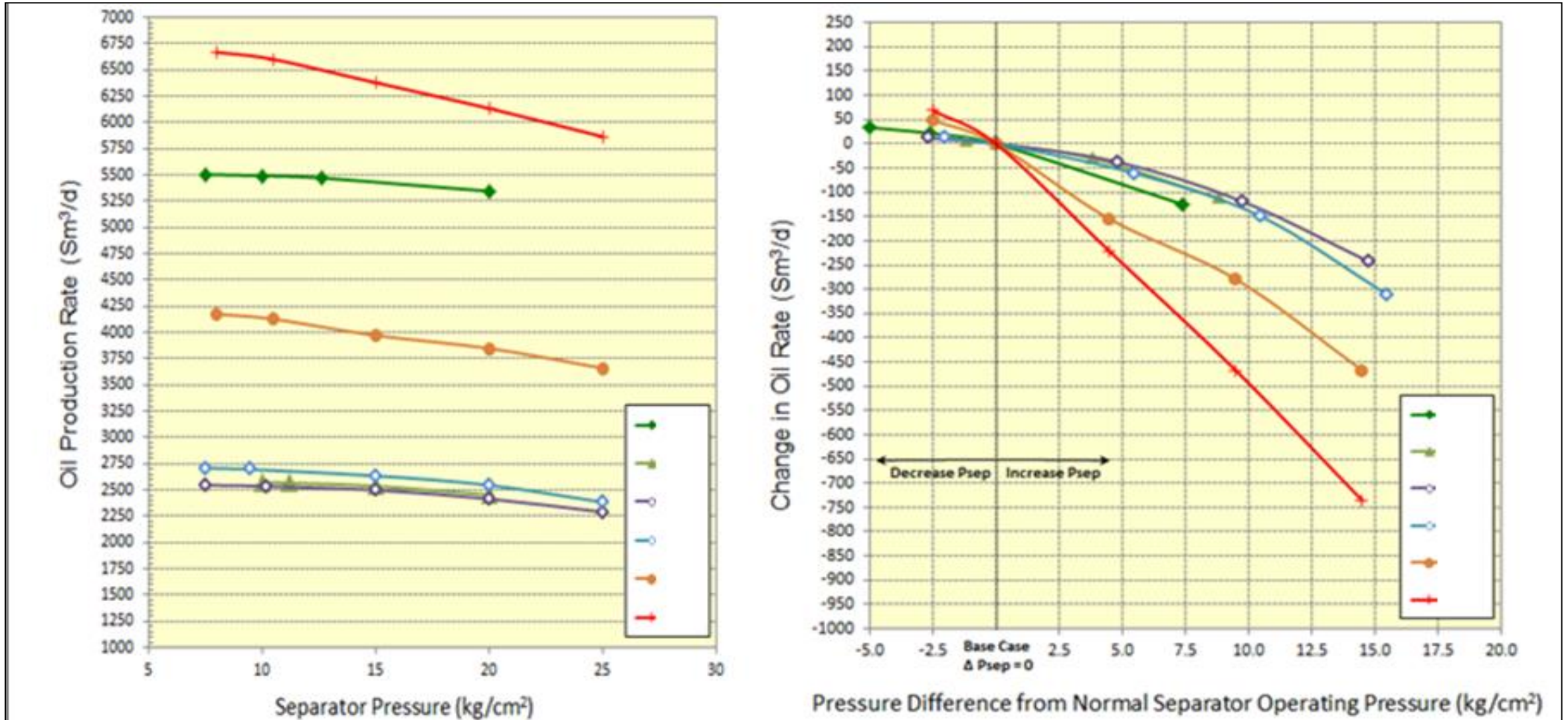
- Set guidelines and constraints for the production forecasts.
- Conduct performance prediction using various variables such as GOR, Wc and Reservoir pressure
- Evaluate the inflow and outflow well performance
- Run the scenarios cases as requested





# Case Study: Integrated Modeling

## Separator Pressure Sensitivities



# Case Study: Integrated Modeling- *Model Use Opportunities*

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- ❑ Reflects field setup and reality (Field Mirror Image)
- ❑ Production Re-allocation.
- ❑ Optimize production directions for new and existing wells.
- ❑ Run any scenarios for field management to “Avoid Missing Opportunities”.
- ❑ Support decision making on major investments (check planned modifications before field implementation)
- ❑ Improve understanding of system behaviour (interaction between wells and network. i.e. backpressure)
- ❑ First step towards Real time (pending telemetry)
- ❑ Keep model updated to get reliable answers.

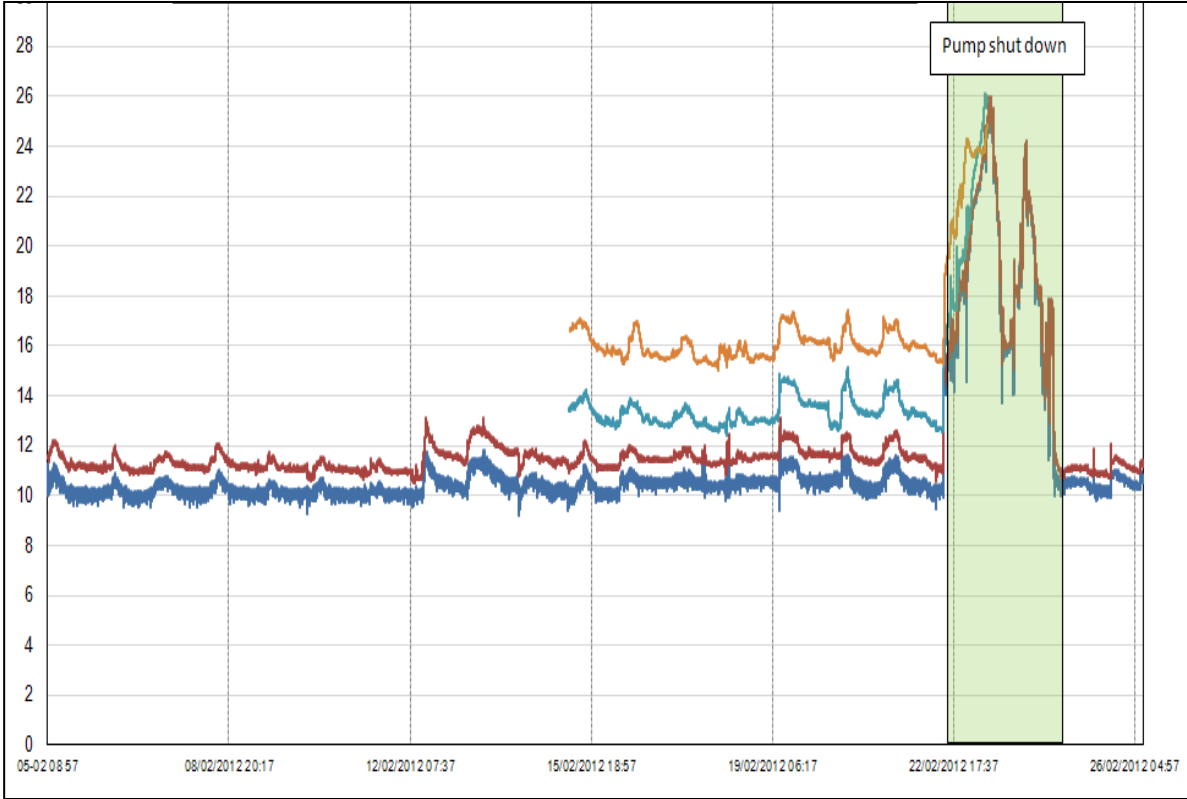


## Case Study: Integrated Modeling- Value added so far

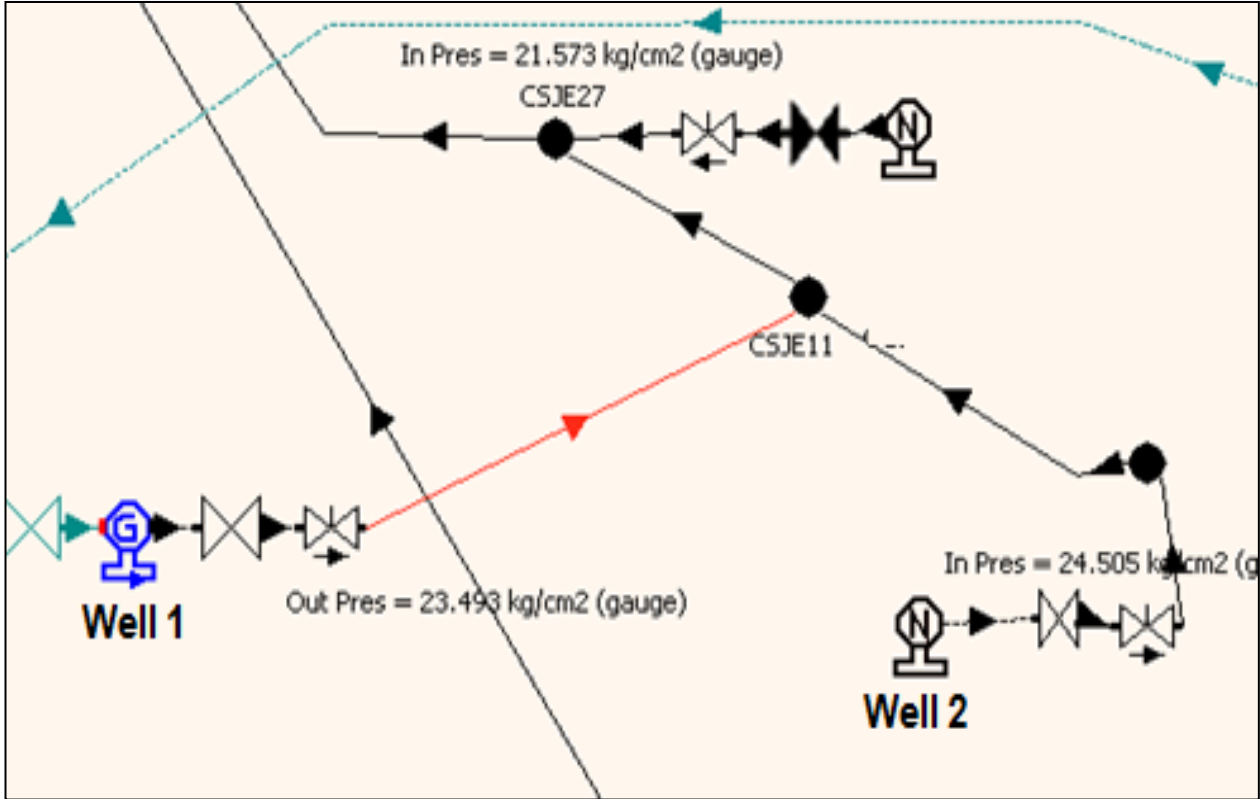
- ❑ Ability to answer production performance questions using Integrated Model.
- ❑ Important well potential observed with the lowest risk criteria.
- ❑ Initiated and promoted continuous well and system monitoring approach.
- ❑ Identified main problematic points in production accounting and reporting.
- ❑ Quantify the effect of back pressure on well production

# Case Study: Value Added-Back pressure Identification

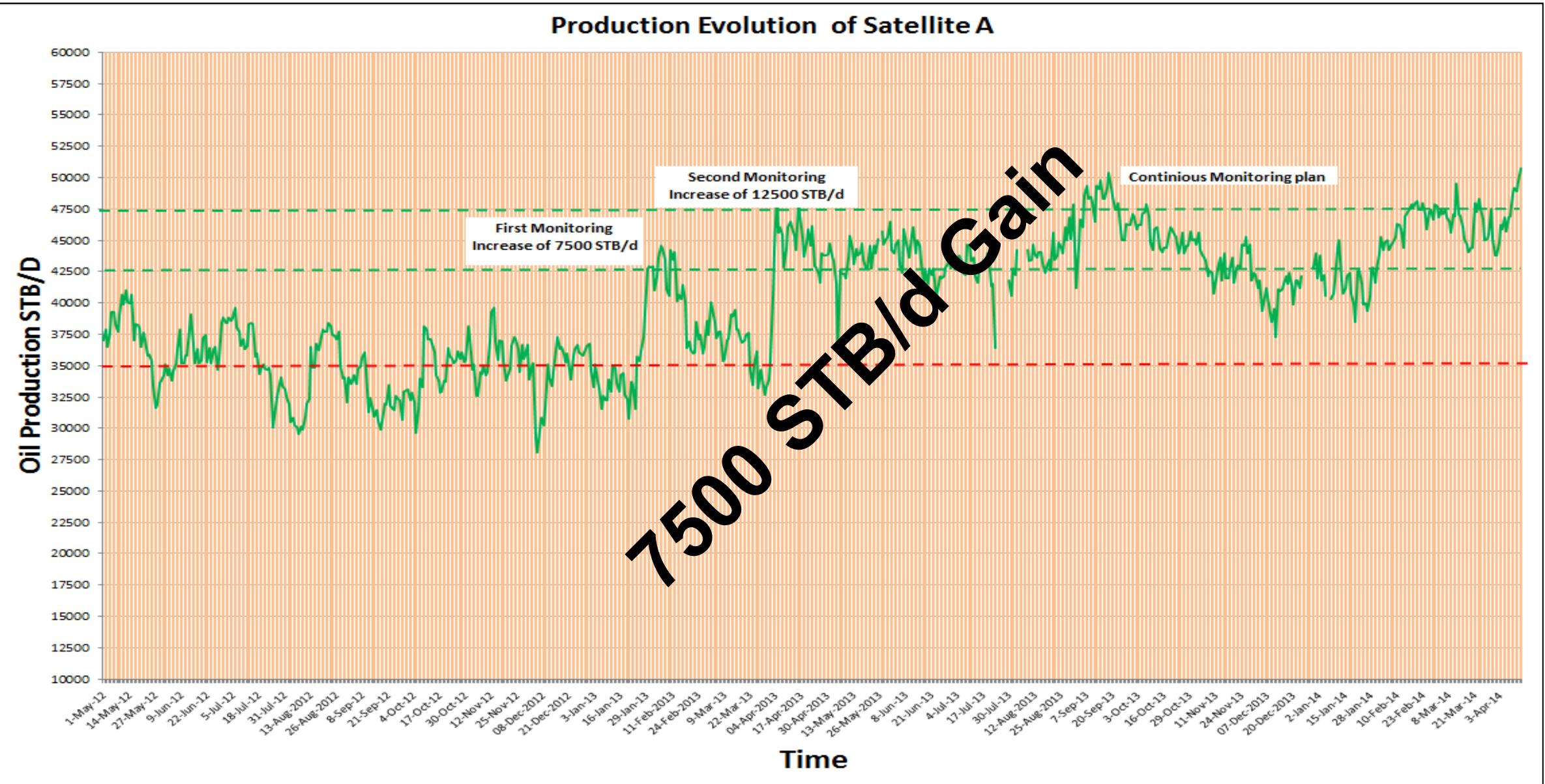
Separator pressure increased because of pump shut down



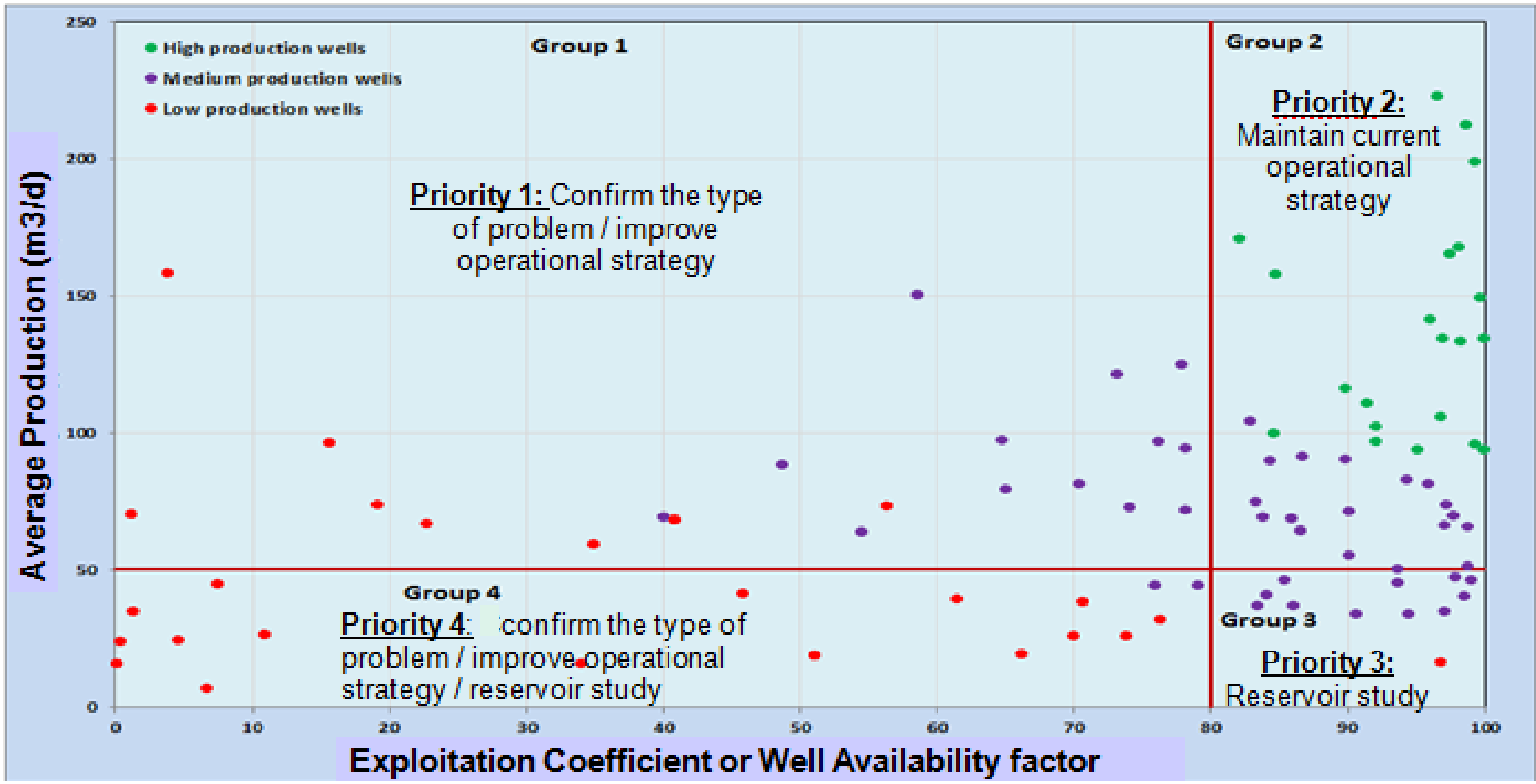
Back pressure assessed by the model in some wells



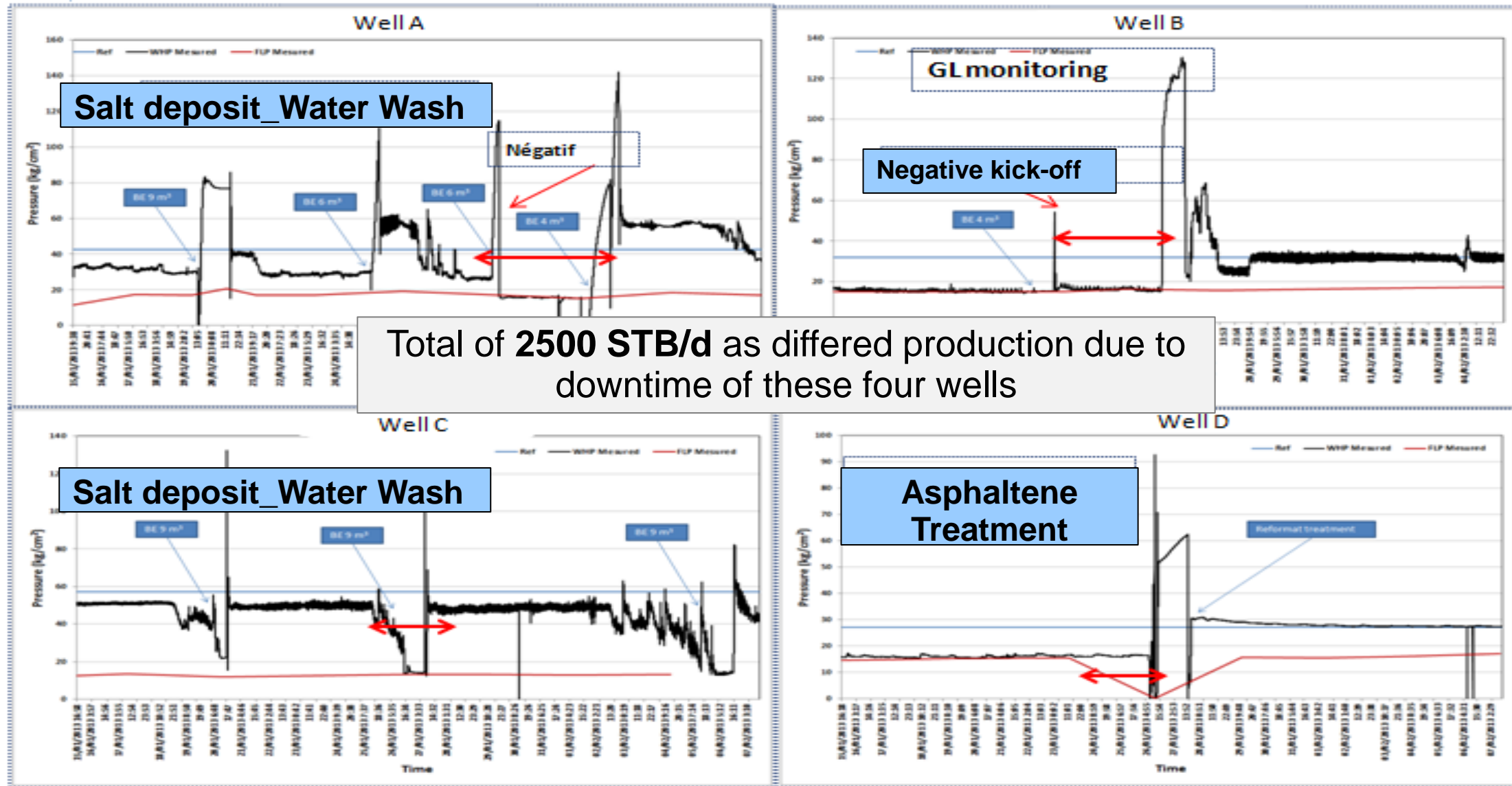
# Case Study: Value Added-Well Monitoring



# Case Study: Well Monitoring-performance Analysis Result



# Case Study: Well monitoring - Operations frequency determination

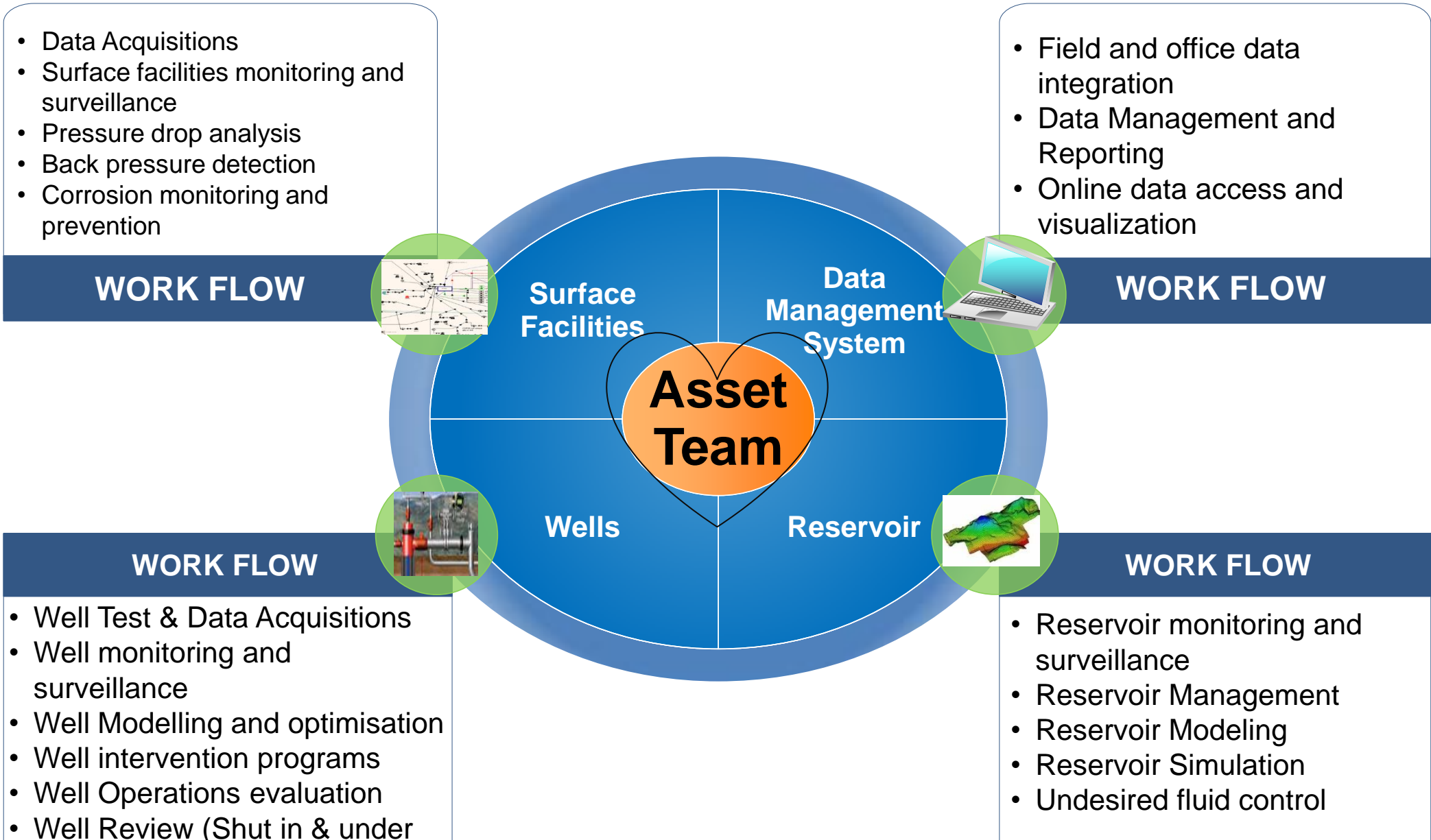


Total of **2500 STB/d** as differed production due to downtime of these four wells

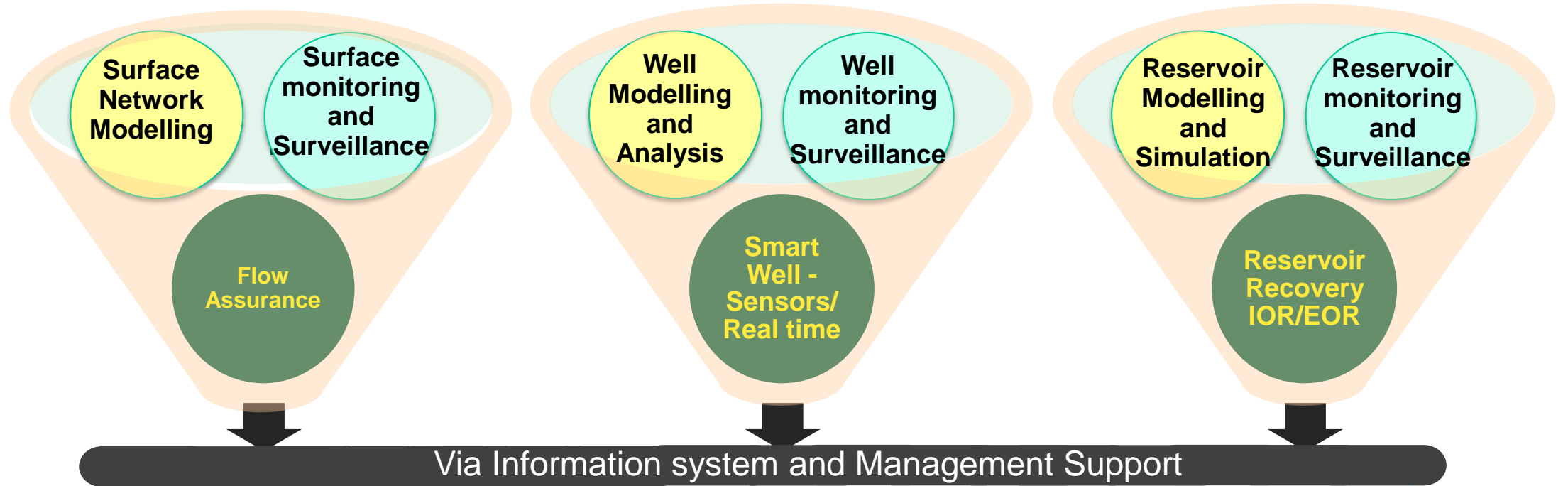


# Summary

# Asset Team Work flow



# Challenges



**Teamwork** share tasks....  
multiplies **Success**







**Thank you for your attention**  
*tak for din opmærksomhed*  
**Your Questions are welcome**