



2014-11-07 Håvard Devold, ABB

Fra PID til Integreerte Operasjoner

60 år
Kybernetikk
1954-2014



NTNU

Power and productivity
for a better world™

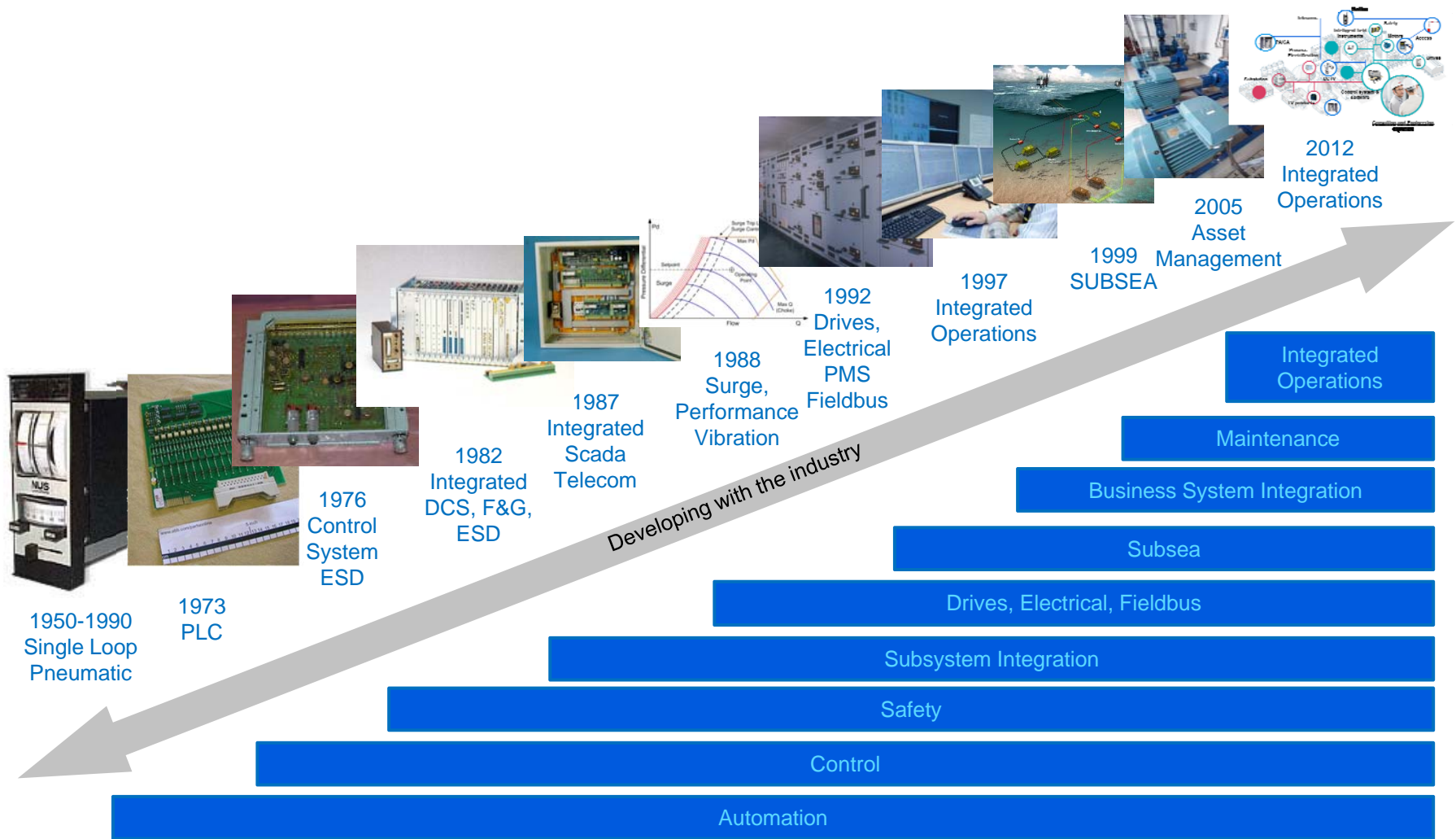


1982

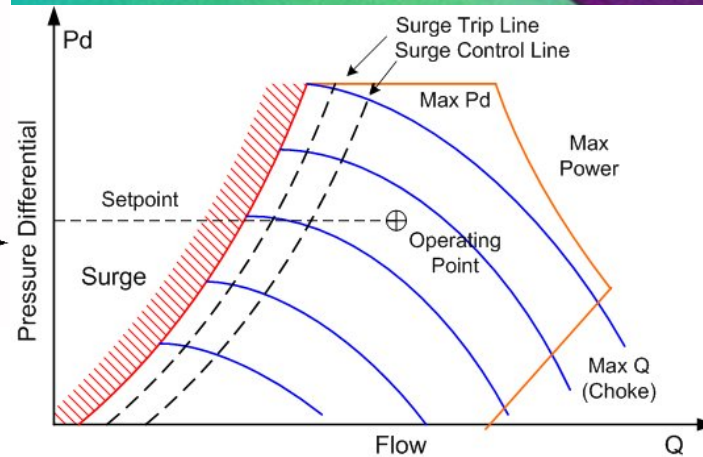
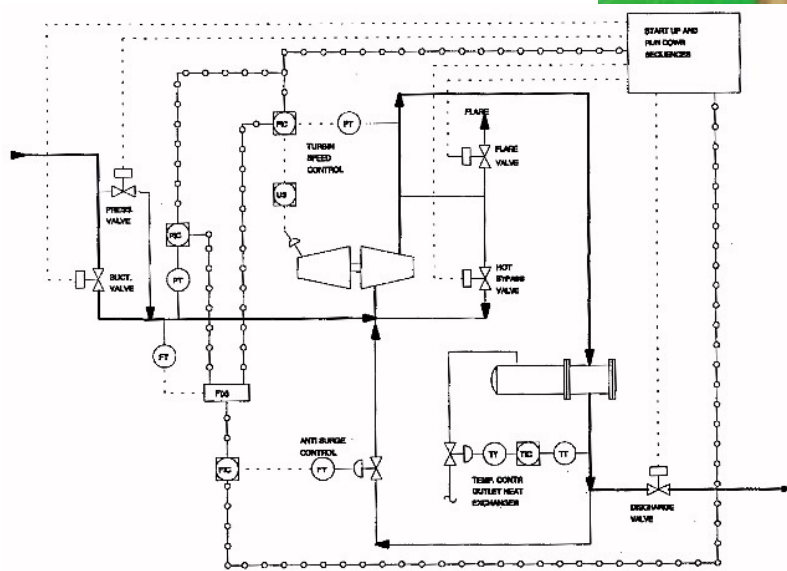
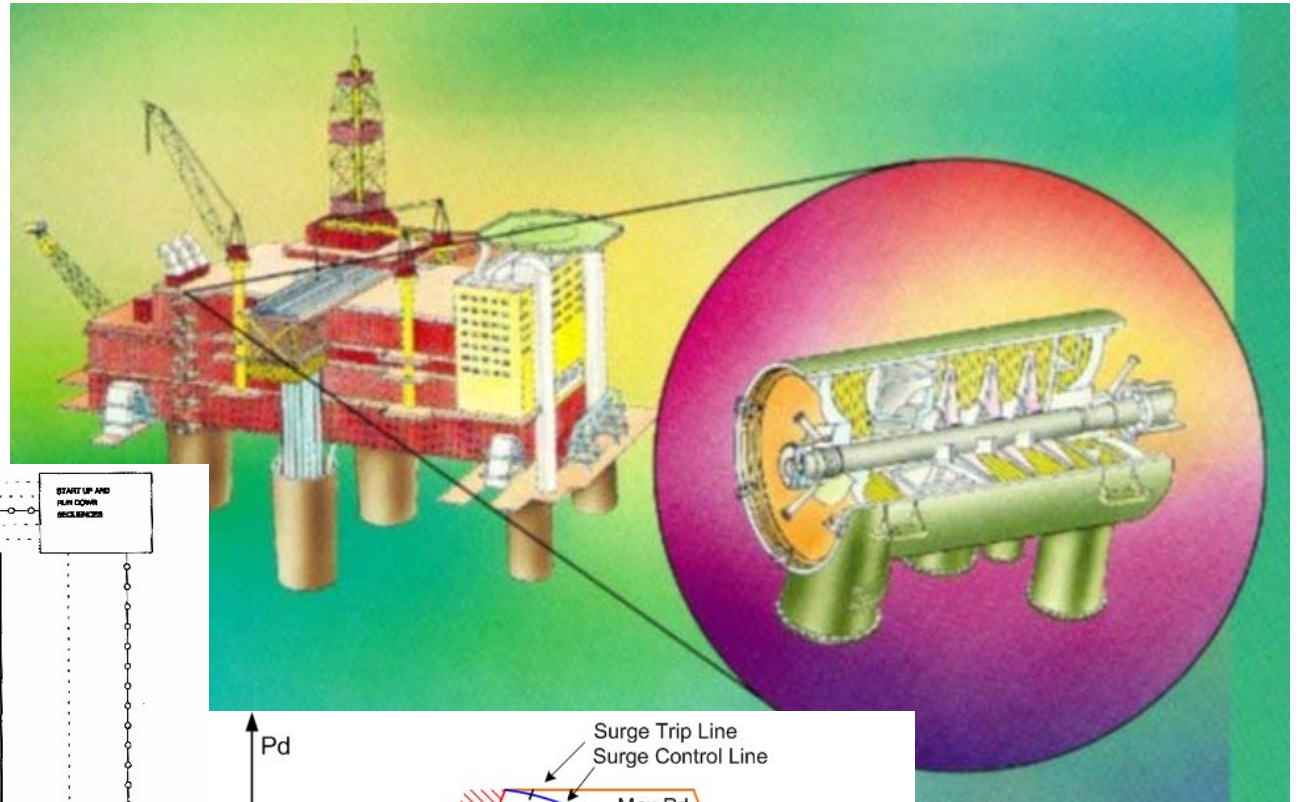
PID for
ASEA
MASTER
PIECE



Automation and Control Evolution

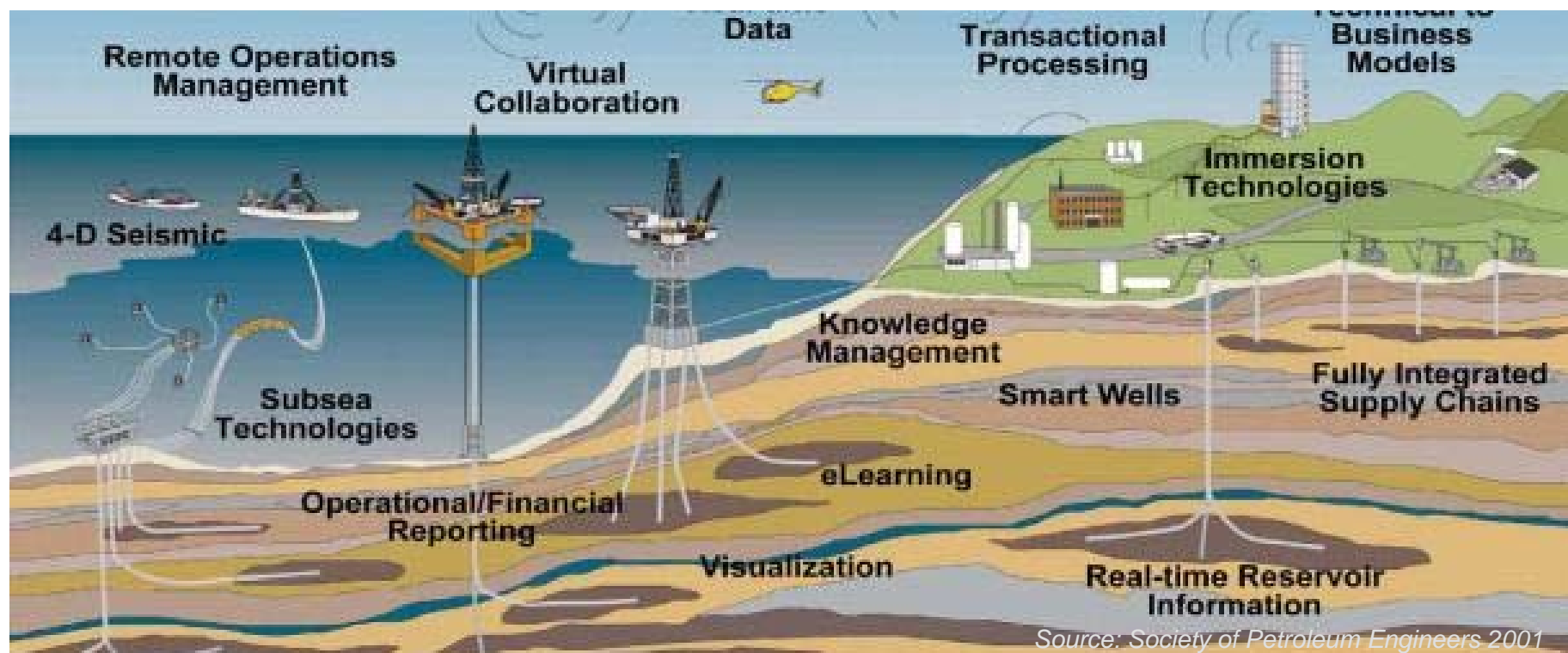


1992 – Compressor Control



2002

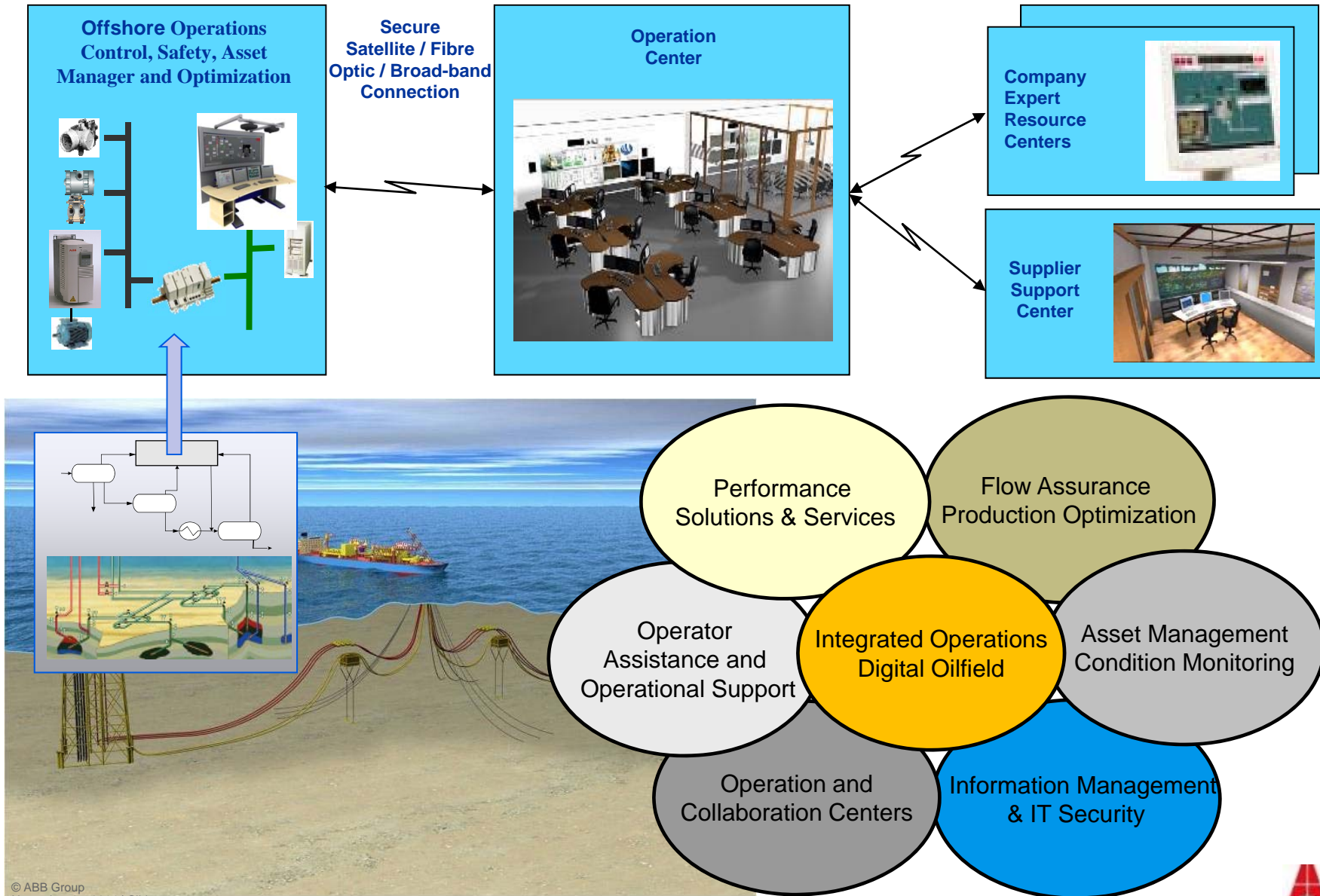




In5egreerte Operasjoner

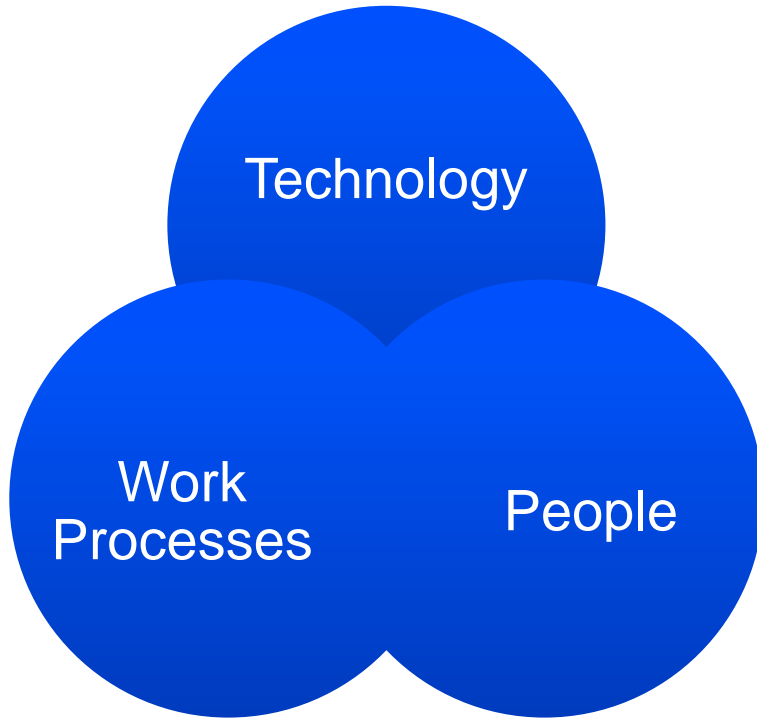
Digital Oilfield

Digital Oilfield Structure



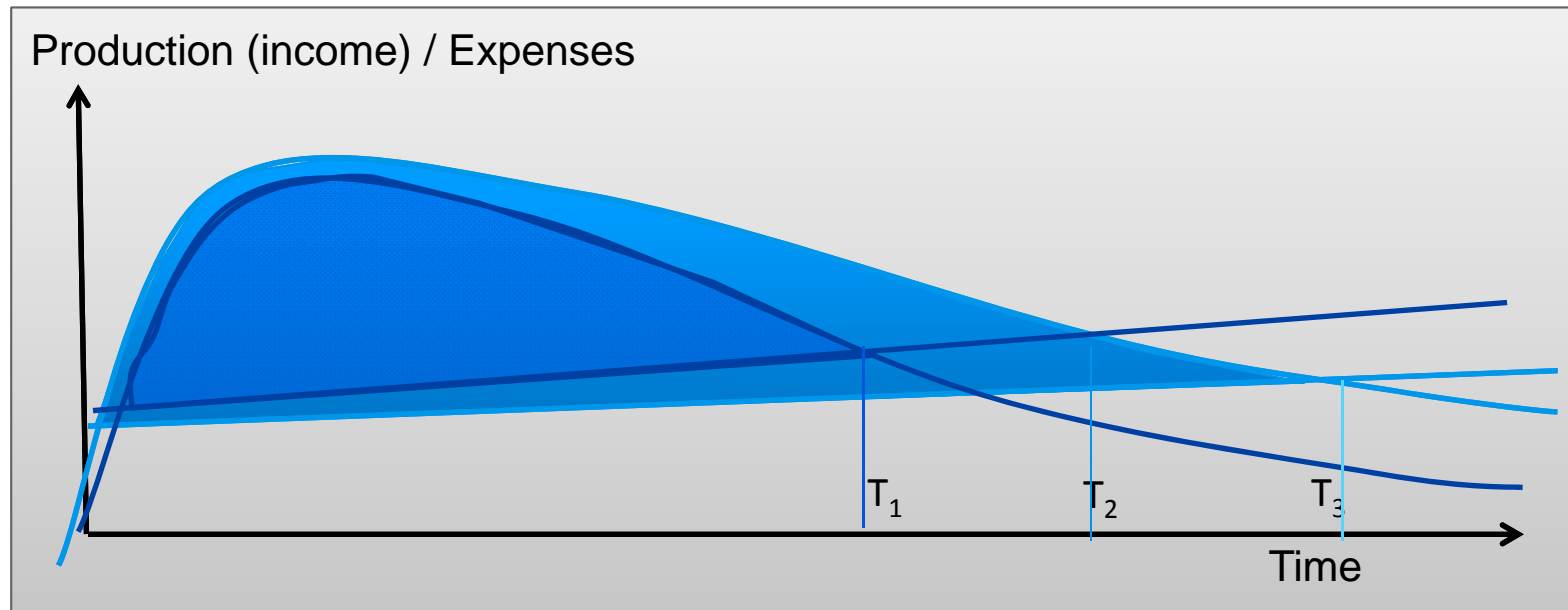
Integrated operations

Safe, better and faster decisions



Before	Now
Serial	Parallel
Single discipline	Multidiscipline teams
Dependent of physical location	Independent of location
Decisions based on experience data	Decisions also based on real-time data
Reactive	Proactive
Classic Startup	Operational readiness

Digital Oilfield: Value Potential

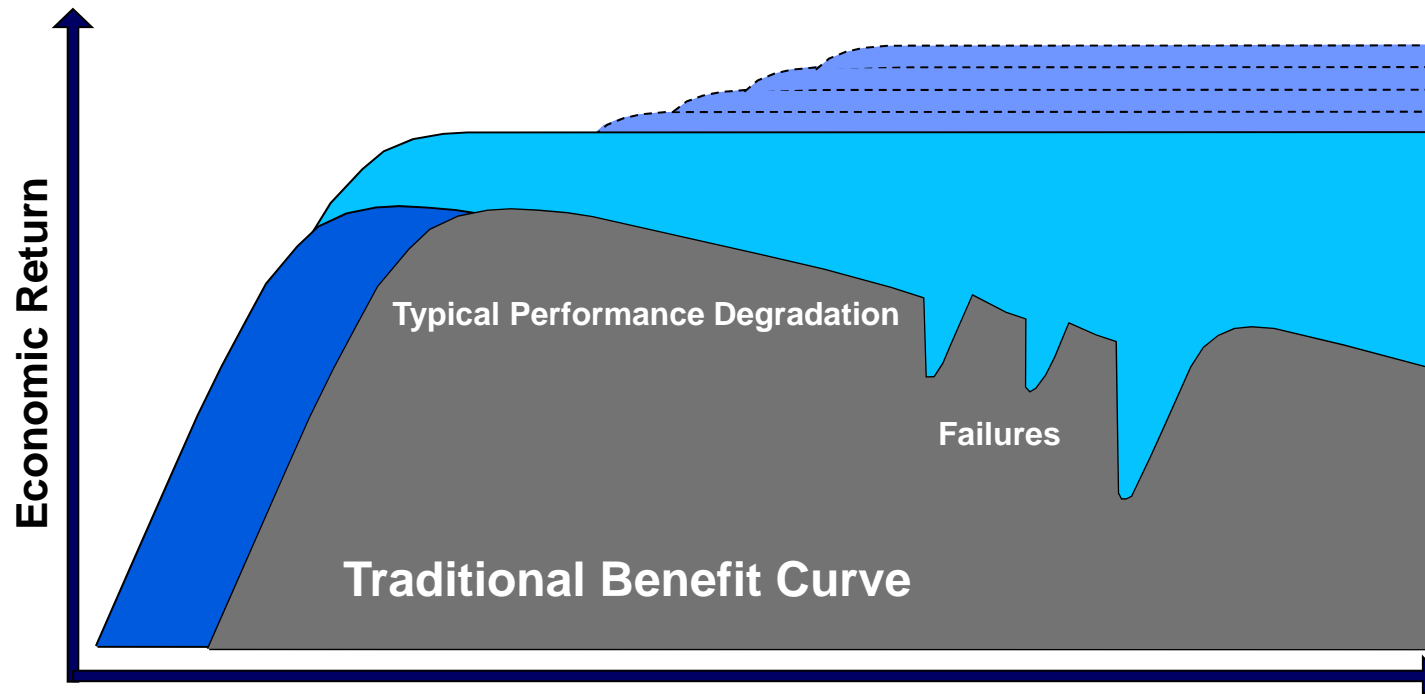


- Increased production (3-5%)
- Reduced production losses (20-40%)
- Reduced operation and maintenance costs (15-30%)

Source: NPD IO Potential Study for NCS

EICT Life-cycle service

The target



How remote condition monitoring improve availability FPU Gjøa

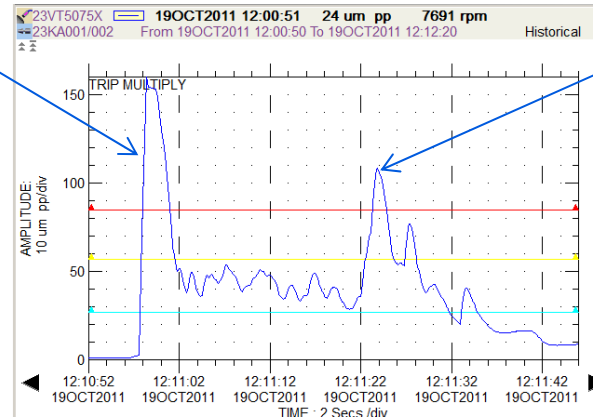


Operational flexibility

Case: GDF SUEZ, Compressor tripping on high vibration

Case

High vibration suppressed due to startup conditions



Compressor trips due to high vibration in gearbox-compressor connection

Sequence of analyses



GDF SUEZ
 Mechanical discipline

Performance Monitoring (Turbowatch) excludes surge as an issue

DRESSER-RAND
 Compressor Specialists

Resonans frequencies for the compressor train provided

GE Bently Nevada
 Vibration Monitoring

Indications of excitations on resonans frequency 14-15 Hz, however this mismatches with compressor RPM (3900)

ABB
 Drive / Electrical Monitoring

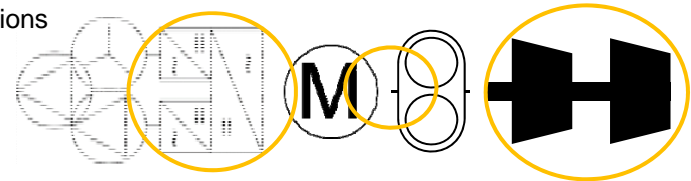
VSD monitoring reveals tourque torque fluctuations on 14-15 Hz in motor when motor RPM is 800-900, Drive excluded as possible cause

Operational flexibility

Case: GDF SUEZ, Compressor tripping on high vibration

Root cause and solution

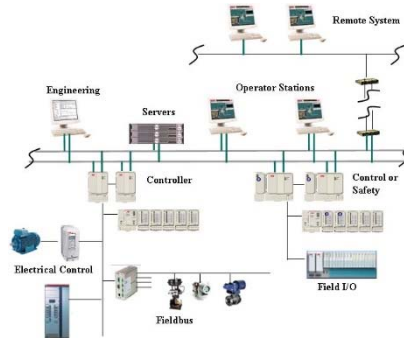
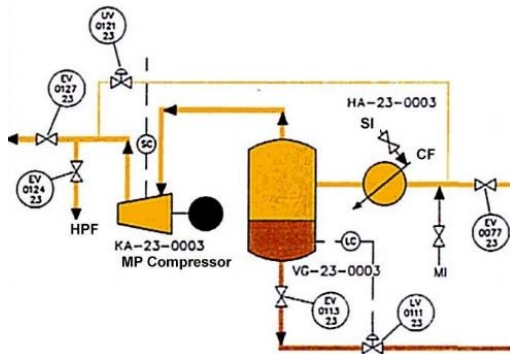
- Trip caused by vibrations in 14-15 Hz regime
- Resonance frequency of the compressor train in 14-15 Hz domain
- Resonance frequency exited when motor RPM is 800-900
- Detection of critical rotation speed via the VSD monitoring analyzing torque fluctuations
- Solution:
 - Fast acceleration through the critical rotation speed interval
 - Trip-multiply implemented from onshore location
- Result
 - Minor changes in the protection system eliminate the problem. The platform can continue operating with minimal downtime



Enablers

- GFD SUEZ strategy for Integrated Operations, **C097-AKE-A-FD-0013, Integrated Operation Strategy:**
 - "Based on criticality classification, all equipment and systems shall be designed for real time condition monitoring."
 - "The data shall be made available both onshore and offshore using high quality data/information transfer"
- GFD SUEZ Operational philosophy
- Access to information for internal and external users and extensive use of service partners
- Instrumentation to cater for condition based maintenance as a part of the project delivery
- All relevant parameters for the compressor was monitored:
 - The process conditions and performance
 - Vibration analyzes
 - The electrical parts of the system monitored as a part of the compressor solution.
- ABB service Environment™ provided easy access to experts for discussions, analyzes, data collection and problem solving.

Lifecycle simulator



Planning

Design

Engineering

Production start

Operation

Modifications



Design & Engineering Simulator

Control System Test

Operator Training Simulator

Training of new operators, hazard training

Process optimization and modification studies

Process Performance Case: Problem description

Design objective

Who
Where
What
How
Results
Conclusion

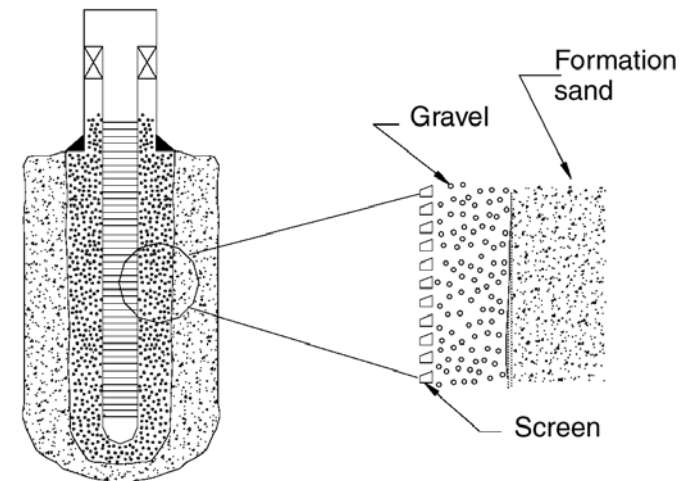
The wells at Ormen Lange are completed with a gravel pack. An increase in the gas rate must be slow and controlled in order to avoid disturbances in the natural pack.

Design objective:

Protect the integrity of the wells:

- Keep pressure drops less than 4 bar/h
- Keep drawdown less than 25 bar
- Keep flow rate less than 10 MSm³/d

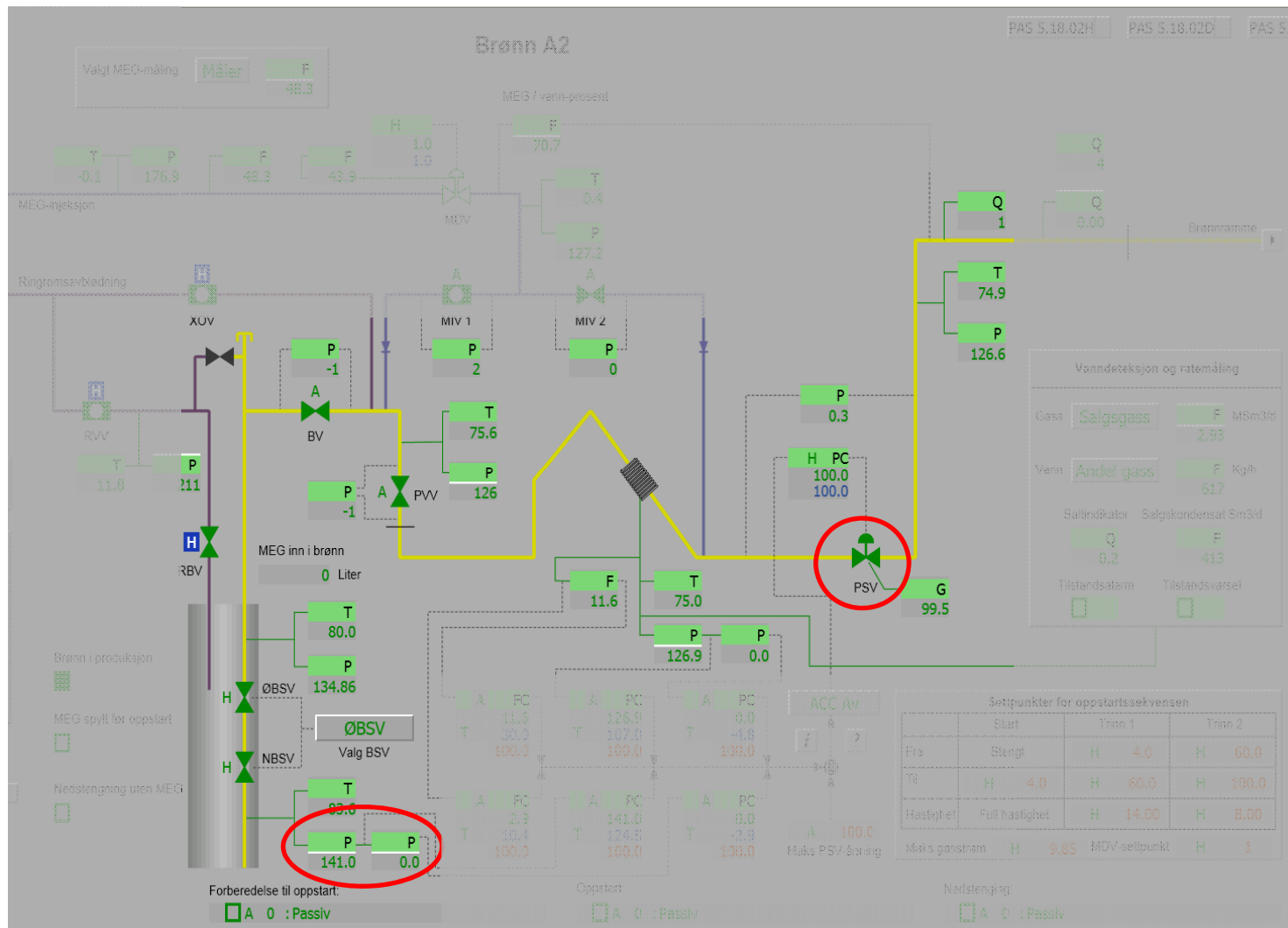
This was previously solved by: Assuming worst-case conditions and opening the valve with a predefined, fixed speed.



Problem description

Instrumentation and valves

Who
Where
What
How
Results
Conclusion

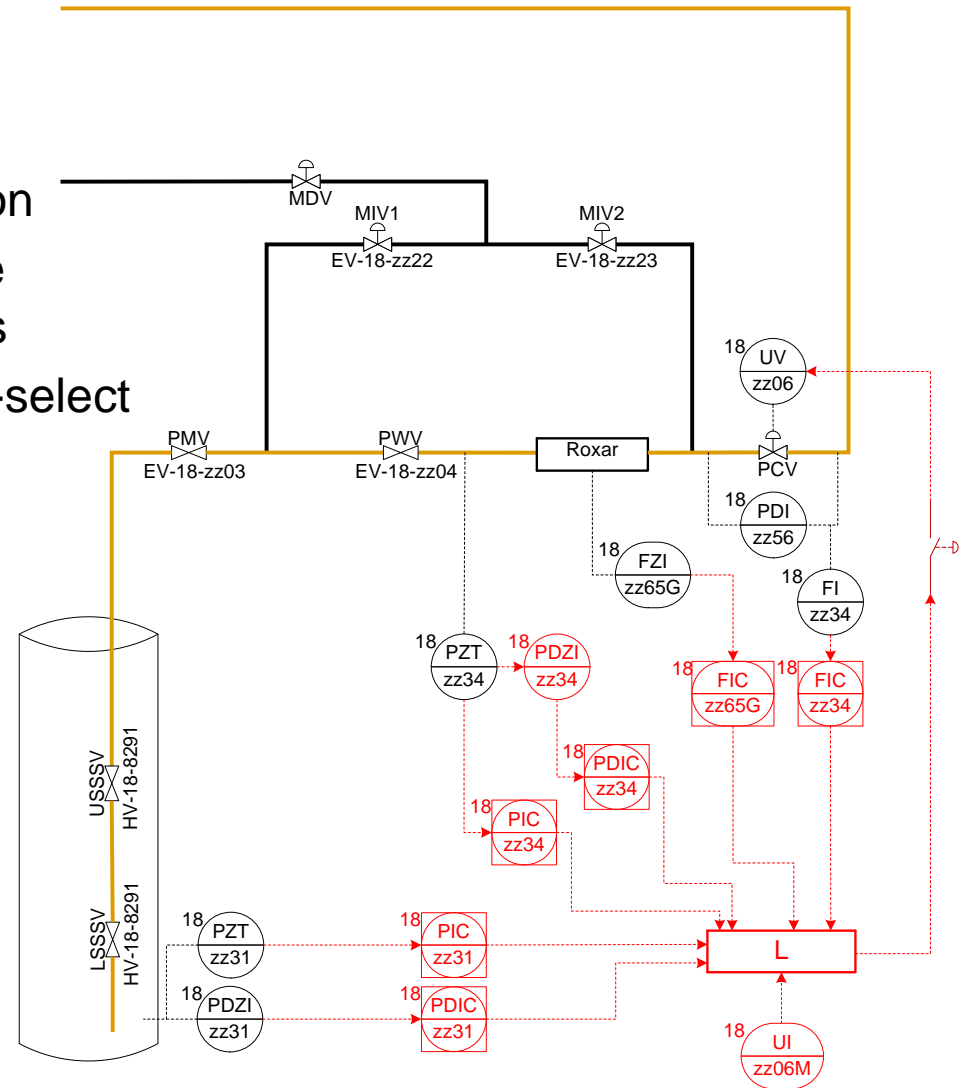


Solution details

Implemented control solution

Who
Where
What
How
Results
Conclusion

- One controller per restriction
- Duplicates of the downhole transmitters and controllers
- All controllers enters a low-select
- On/off-switch



Solution details

Tuning of controllers

Who
Where
What
How
Results
Conclusion

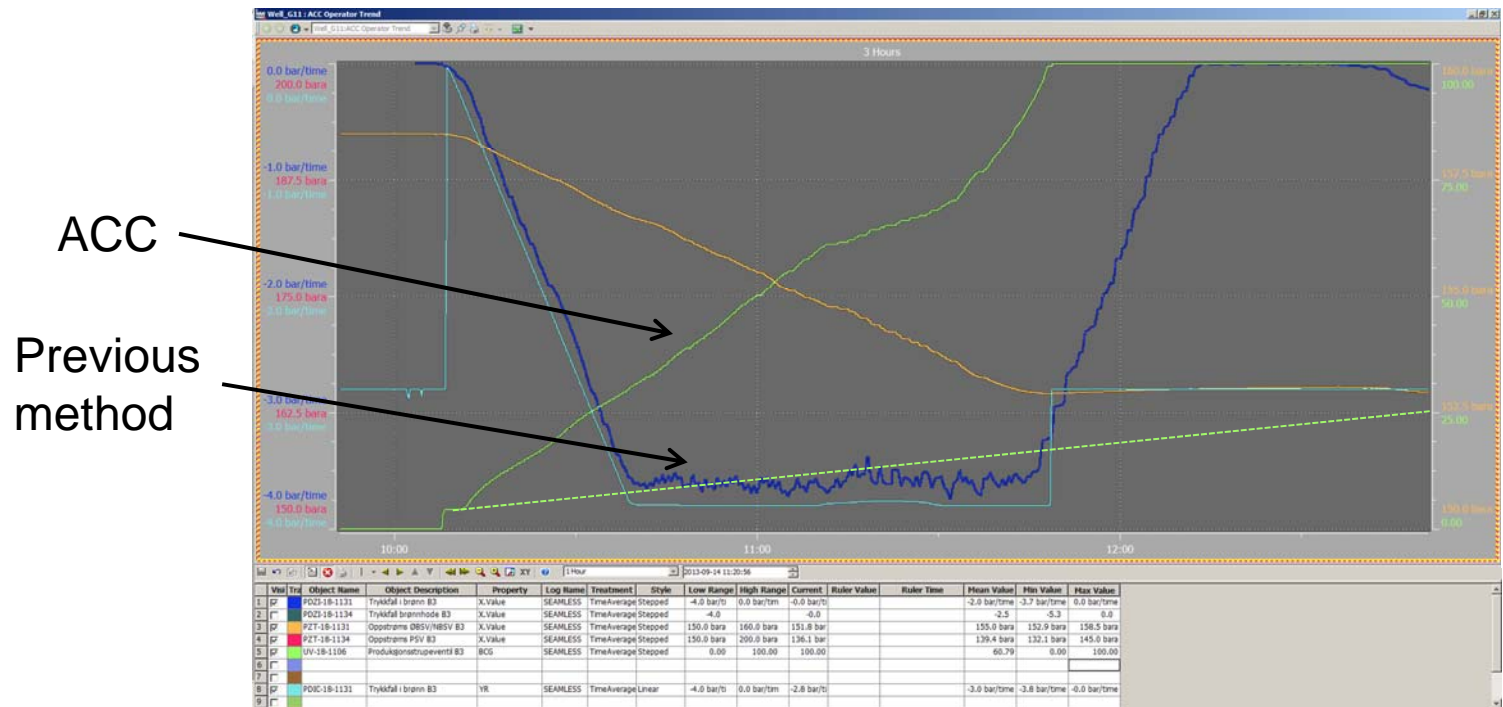
- We created a model that estimates the process behavior, based on:
 - The opening of the choke valve
 - The pressure-drop over the valve
- We implemented Skogestad's tuning-rules in the control system
 - The tuning of the controllers are dynamically updated, based on the estimated process behavior

Customer value

A side-effect of the solution: Much quicker startup

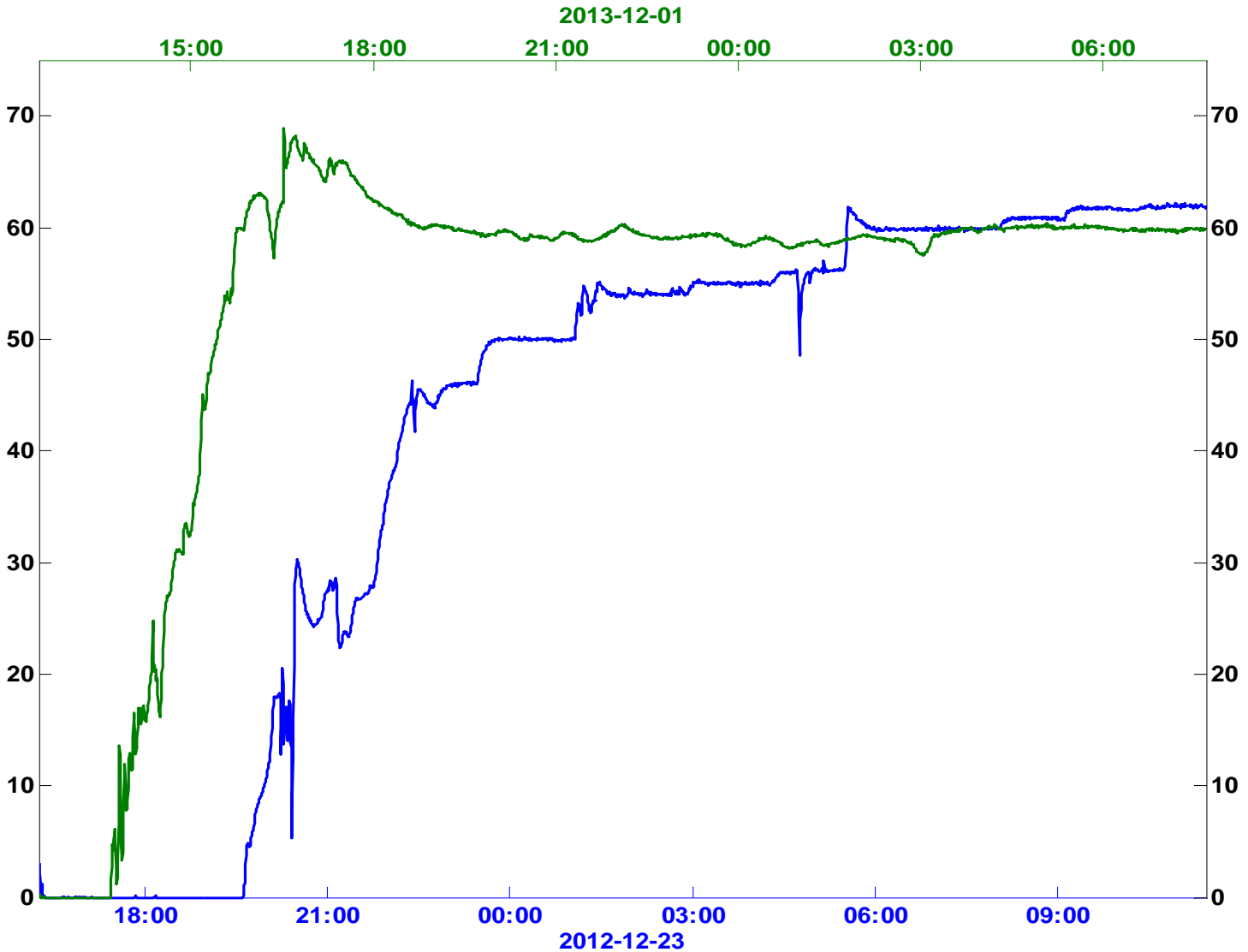
Who
Where
What
How
Results
Conclusion

- Ramp-up of well B3, with aggressive tuning
- ACC used 1 hour and 40 minutes to ramp-up the well
- Previously would have used 9 hours



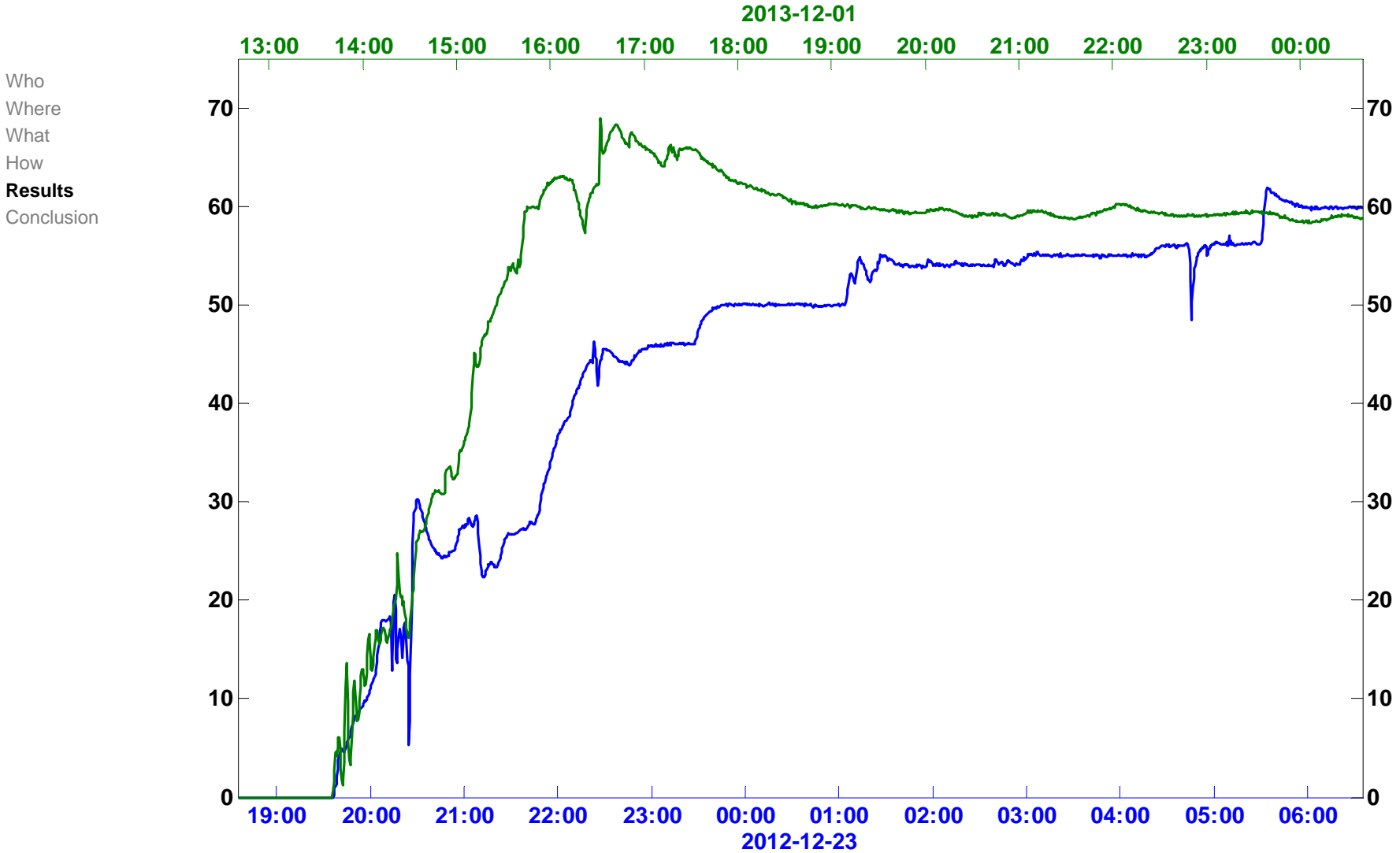
Comparison of flow rates

Difference is approx. 10 MSm³



Comparison of flow rates

Difference is approx. 5 MSm3



Customer value

What is this worth for Shell?

Who
Where
What
How
Results
Conclusion

Production loss:

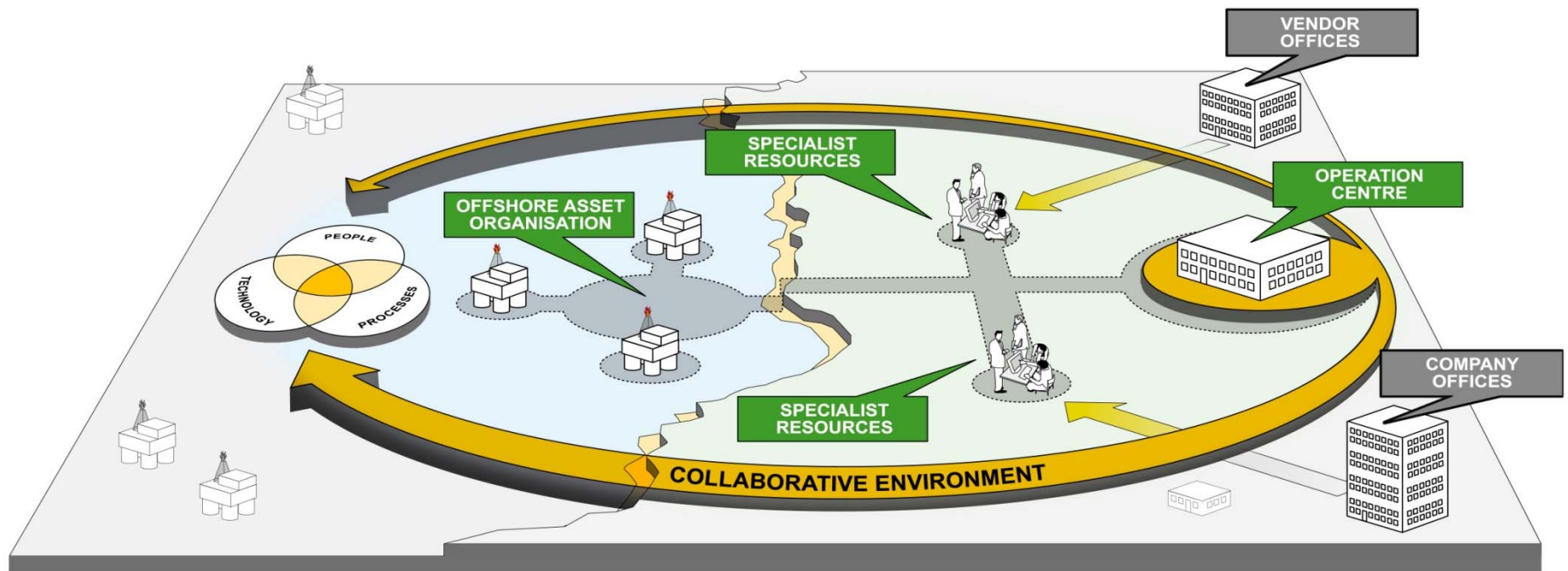
- All the wells have to be shut down 2 times per year, due to integrity testing
- If the onshore facility goes down, the wells have to be shut down within 30-60 minutes

Customer value:

- Previously, a ramp-up of a high-pressure well took 15-20 hours (up to 30 for some new wells)
- With ACC, the same well takes 4.5 hours
- The gained production is 5-10 MSm³, per plant startup
- For high-pressure wells: Can be as high as 1MSm³ per well per startup

ABB Integrated Operations

From technical to operational integration



Integrated Operations Structured Safety and Alarm Management

Alarm Manager

Alarm Manager | Alarm Analysis | Alarm Change History | Block Log | Alarm and Event Log

View All Site Content

- Documents
- Lists
- Discussions
- Sites
- People and Groups
- Recycle Bin

Performance Level

Top 10 load: 92.93%
 Top 20 load: 99.66%
 Average rate (avg): 71 alarms/h
 Standing alarms: 142
 Time in upset condition: 12%

Frequent Alarms

Name	Description	Number
G35XB__6106A	GW MCS ModemPair X/Y	9132
G35XB__6106B	RS MCS ModemPair X/Y	8856
C11LA__0032_	SJEKK C11LT__0032	6111
U86XB__6124A	HP Duty Pump Permiss	3237
U86XB__6124B	LP Duty Pump Permiss	1764
W21XB__1072_	FILT.A BW I DRIFT	1029
W21XB__2072_	FILT.B BW I DRIFT	1029
W21XB__3072_	FILT.C BW I DRIFT	1026
W21XB__4072_	FILT.D BW I DRIFT	1023
A51XB__8621A	D1 LP SUP INTERLOCK	846
A51XB__8628A	E2 LP SUP INTERLOCK	786
A51XB__8622A	D2 LP INTERLOCK	750
K11NGB__6520E	KRAN I DRIFT	627
A21LICA__0190_	1ST SEP_TRAIN2 VANN	618
A51XB__8623A	D3 LP INTERLOCK	594
A51XB__8629A	E3 LP INTERLOCK	564
W22XZY__2202B	W1 P200 FELLES AL	558
A51XB__8627A	E1 LP SUP INTERLOCK	531
A41KJI__0103A	LINE MAX FLOW T.SEP	498
G35XA__6115A	Modem Pair1 Line A	495

Alarm Manager

Successful alarm management ensures optimal working conditions for operators while ensuring safe and predictable alarm and safety system behavior.

The Alarm Manager provides a complete toolset for operators and alarm experts, ensuring plant integrity and meeting government requirements and industry guidelines. This product is part of the Integrated Operations portfolio.

An alarm system should release an alarm only when the plant condition requires operator action. However, most alarm systems are not optimally configured which leads to both insufficient alarming and a high number of nuisance alarms. As a result, the operator stress and work load increases significantly.

The Alarm Manager is the ideal tool for day to day follow-up of an alarm system as well as being a toolset well suited for alarm system improvement projects.

Government regulations as well as company internal alarm philosophy require documentation of current alarm system status and fully documented alarm system design. The Alarm Manager helps keeping track of the alarm system status, improving performance, and automating mandatory reports.

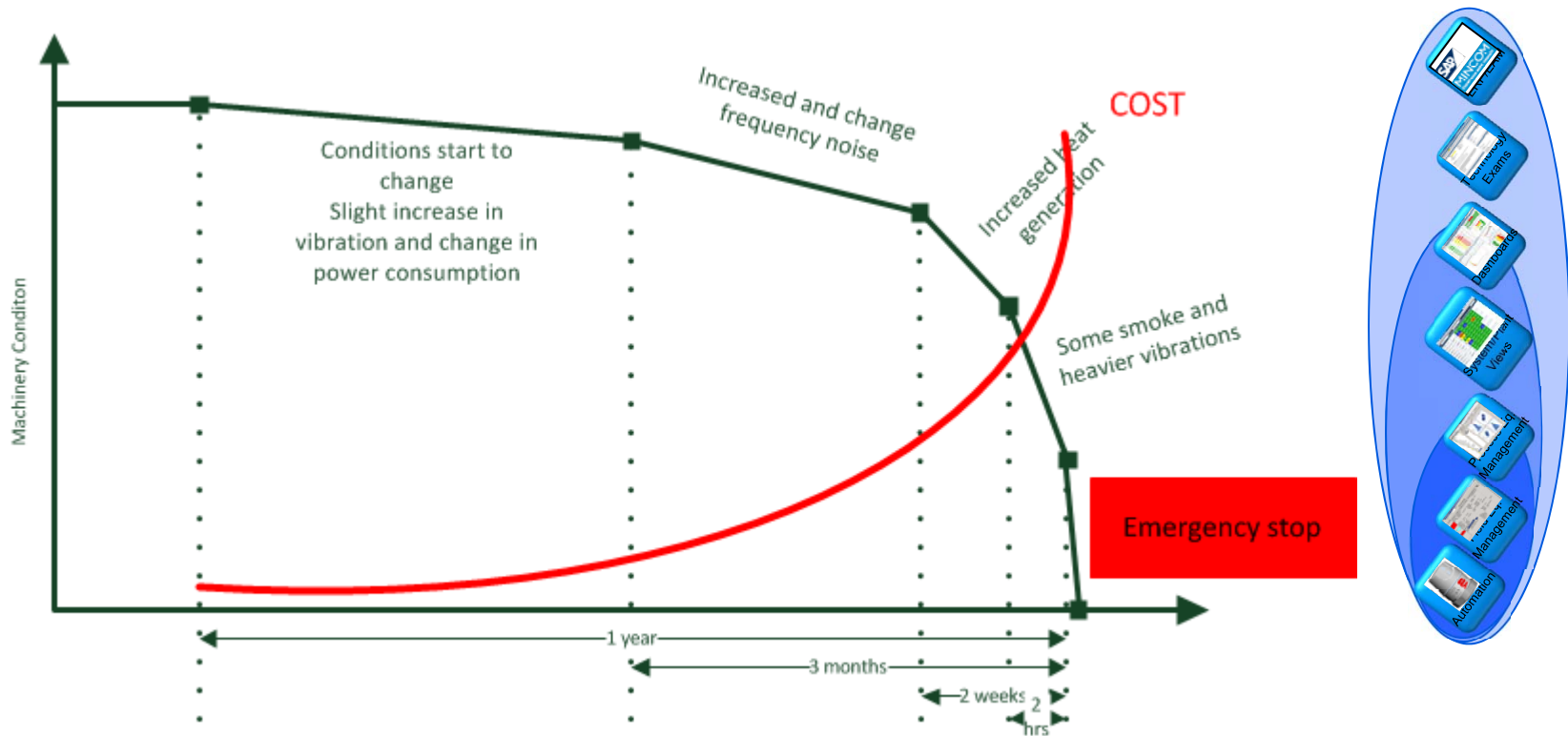
The Alarm Manager is compliant with the standards EEMUA 191, YA-711, and ISA 18.02.

Initiated Alarms

Max value: 9267
 Number of Alarms: 133116
 Average: 964.61

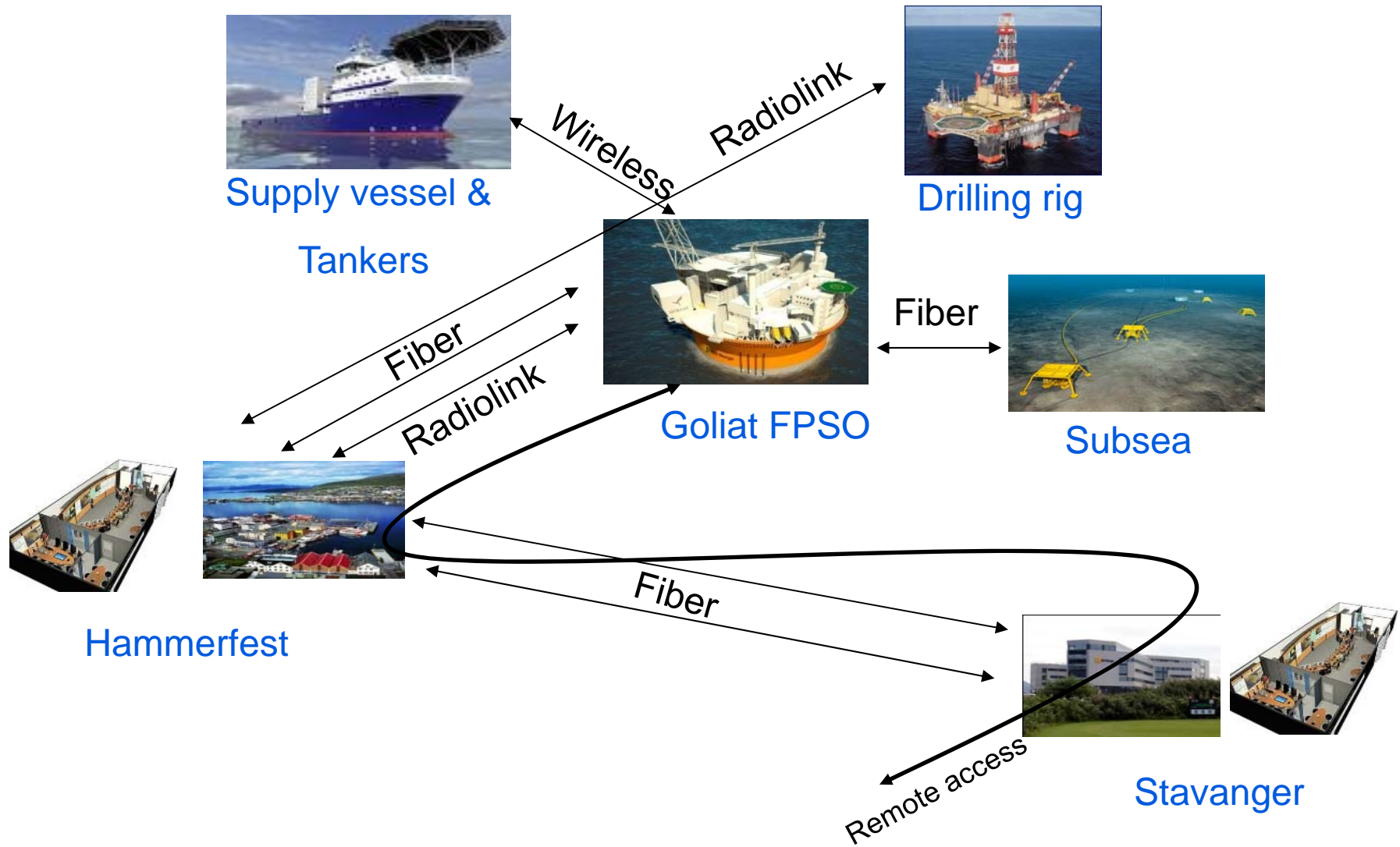
Integrated Operations

Realizing the value of a modern maintenance strategy



An active maintenance strategy with structured work process and modern tools enables early fault detections, reduces costs and avoids expensive breakdowns

Digital Oilfield Topology



Power and productivity
for a better world™

