

NexUs – NextGen ERP

Business process and system transformation



equinor

Searching for better



Condition-Based Maintenance

A new resource in Equinor's Maintenance Toolbox

MainTech - April 2025

Tom N. Svennevig – Manager - CBM Implementation

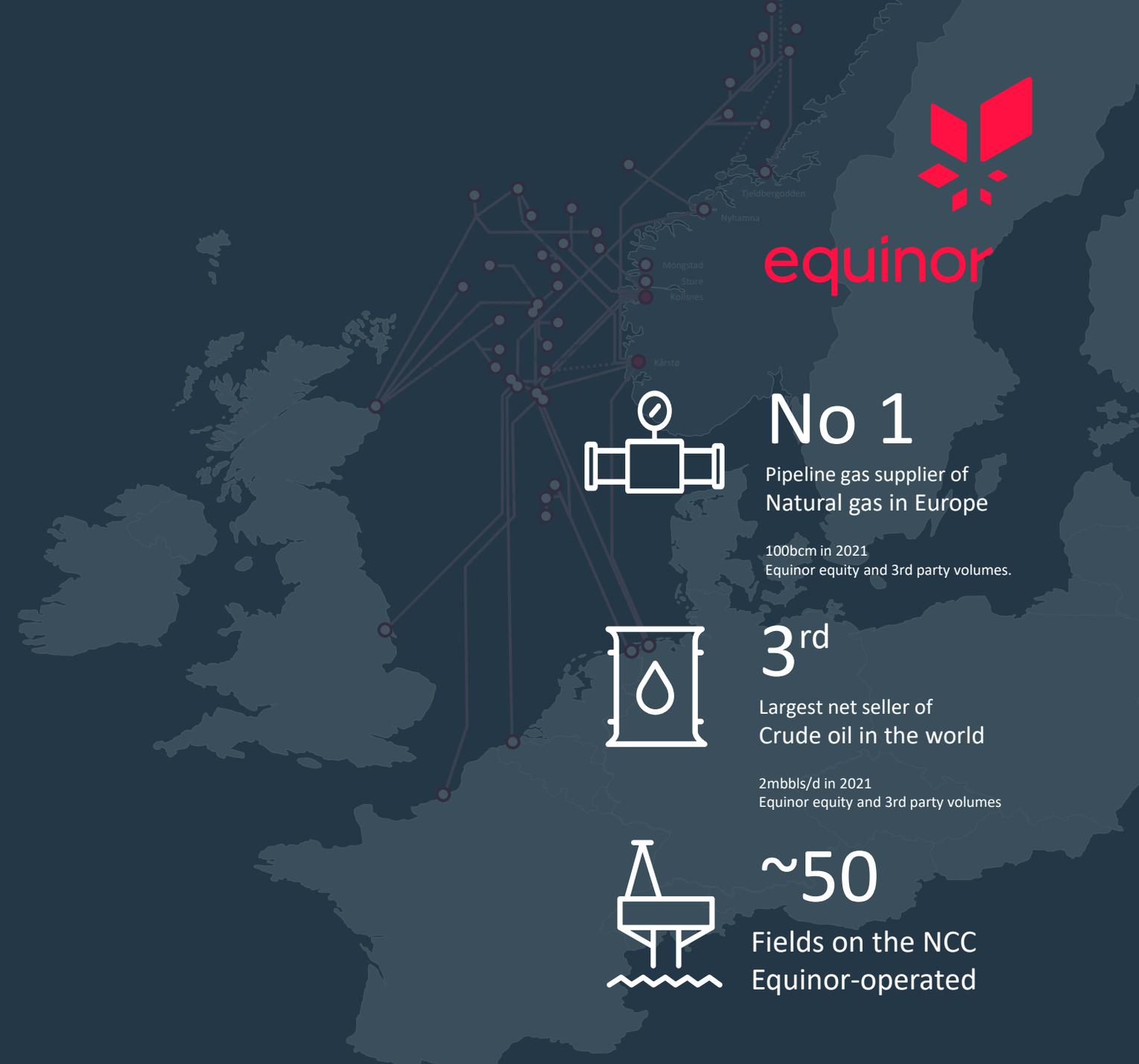
Olav Sørli – Senior Engineer - CBM Implementation

Energising the world, empowering people

- Every day, we energise the lives of over 170 million people
- 22,000 employees in 30 countries.
- For 50 years, we've been **turning natural resources into energy for people and progress for society.**
- World's largest integrated offshore pipeline system



equinor



No 1
Pipeline gas supplier of
Natural gas in Europe

100bcm in 2021
Equinor equity and 3rd party volumes.



3rd
Largest net seller of
Crude oil in the world

2mbbls/d in 2021
Equinor equity and 3rd party volumes



~50
Fields on the NCC
Equinor-operated

Units online in 2025

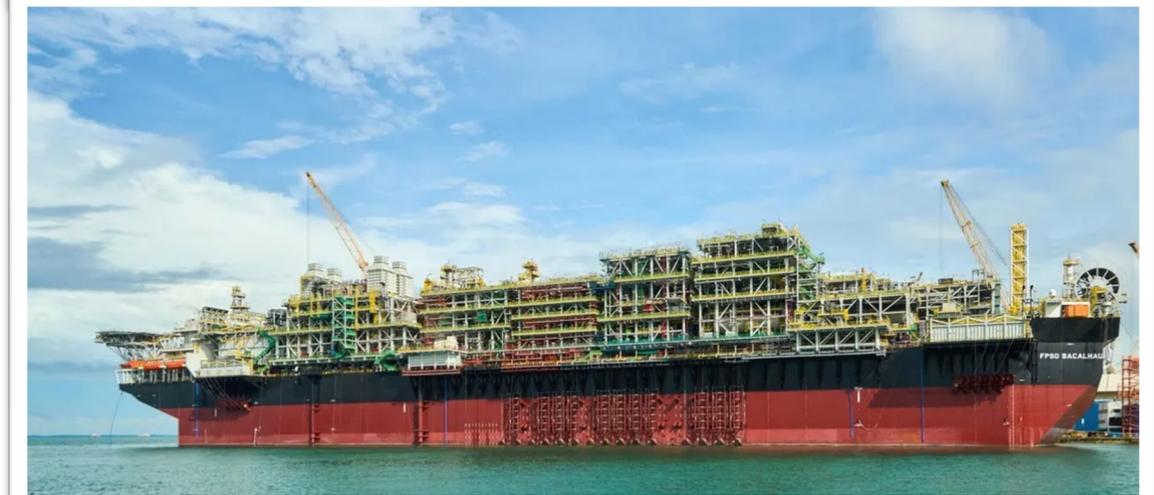
Johan Castberg FPSO

1. Produksjonsstart: 2025
2. Kapasitet 220 000 fat/ dag
3. Lokasjon: Barentshavet

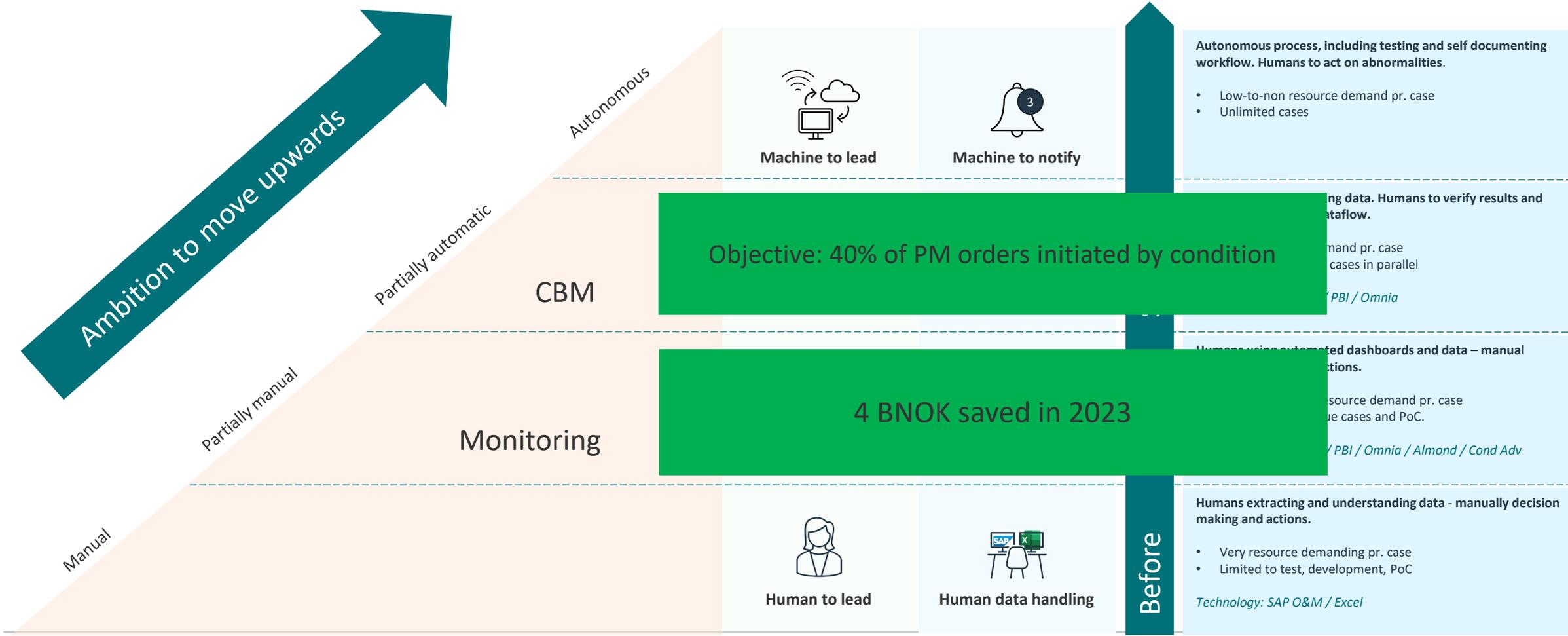


Bacalhau FPSO

1. Produksjonsstart: 2025
2. Kapasitet 220 000 fat/ dag
3. Lokasjon: Santos Basin, São Paulo



CBM and *PdM Roadmap – Maintenance Management View

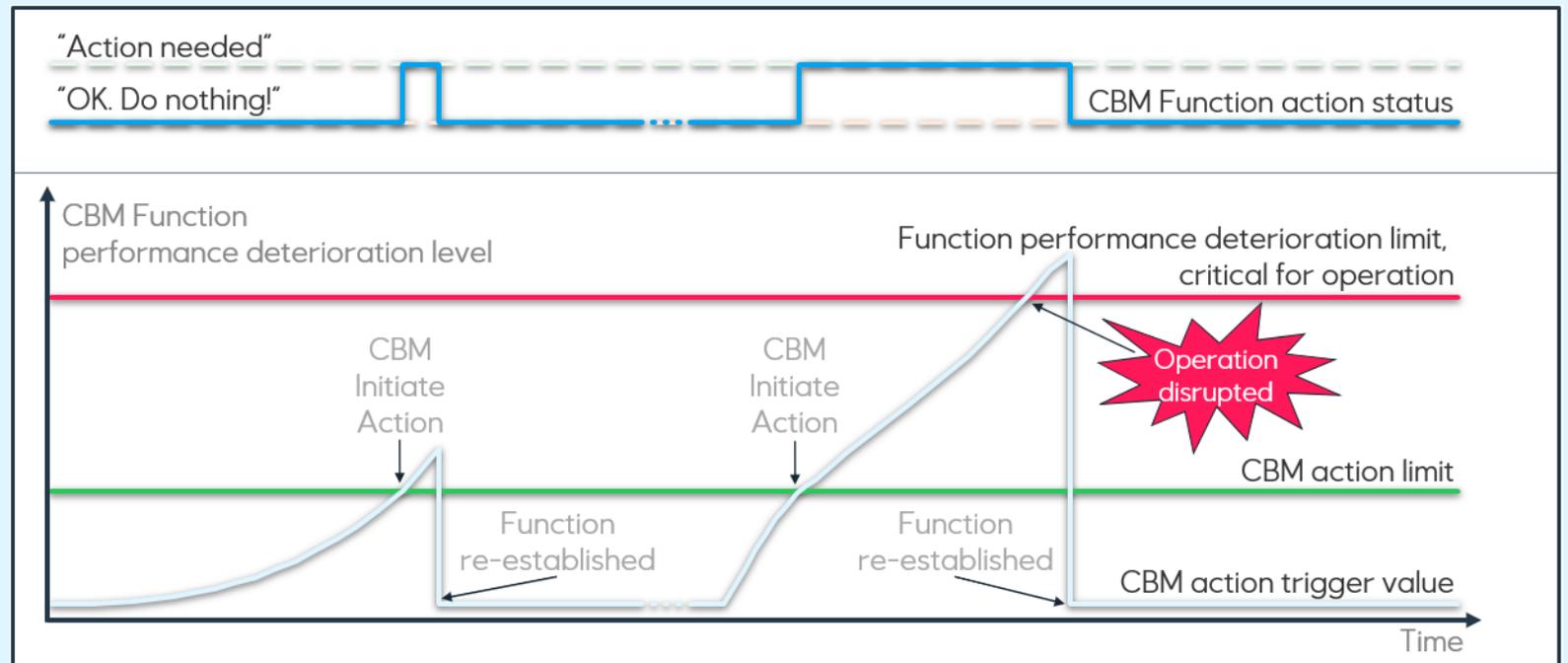


CBM – the principle

The primary purpose of Condition Based Maintenance is to provide confidence for continued safe operation and to avoid disruption of operation.

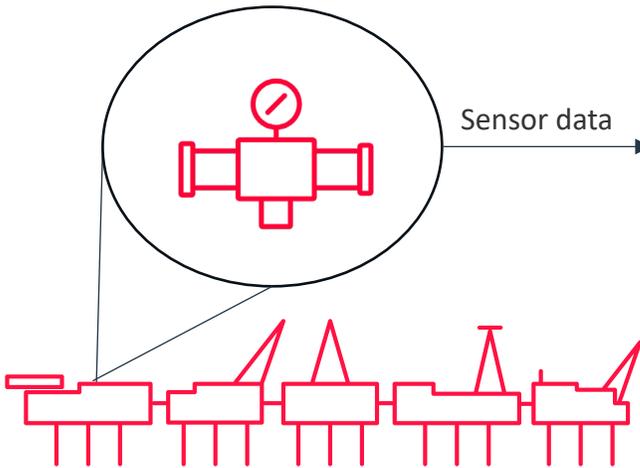
“If it works – don’t fix it”

This is achieved by **monitoring** safety and process critical functions and preferably **re-establishing** a function to its required performance level before deterioration/degradation of the function becomes critical for operation, by **initiating** and **executing** necessary (maintenance) actions

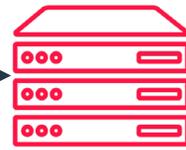


CBM Process Flow

From signal to action

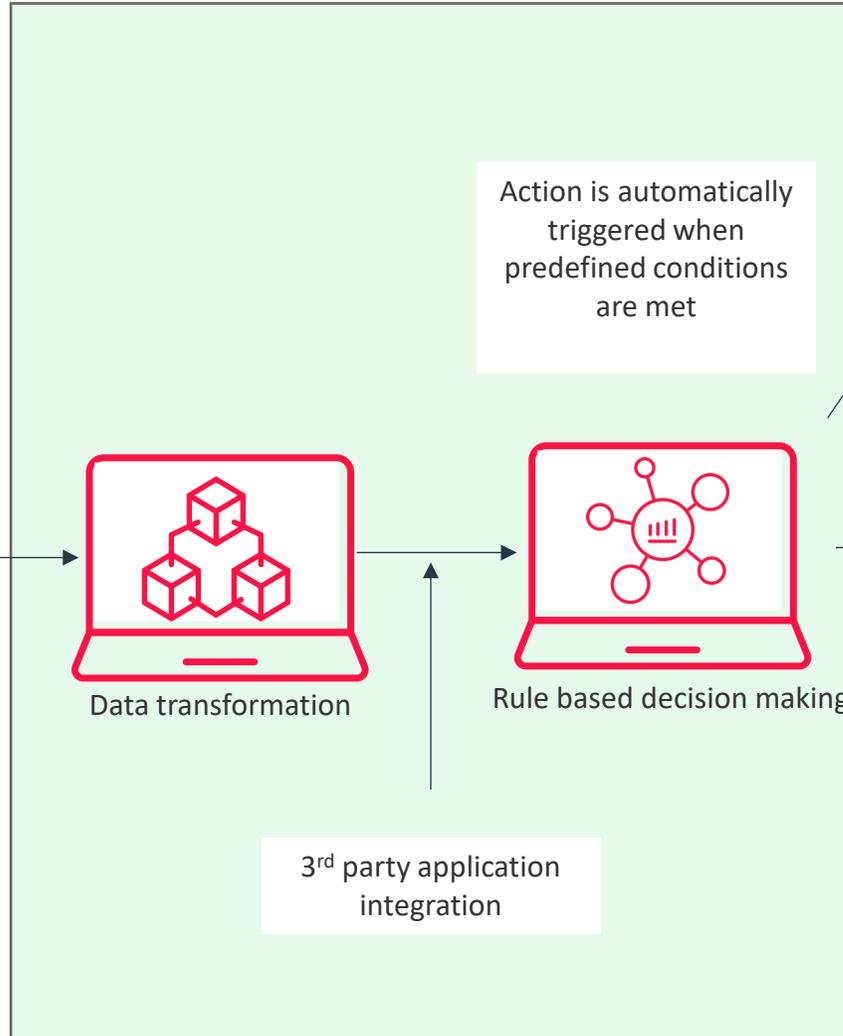


Sensor data



Omnia

SAP APM



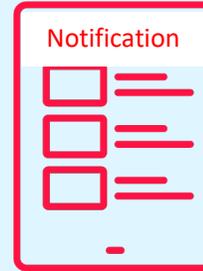
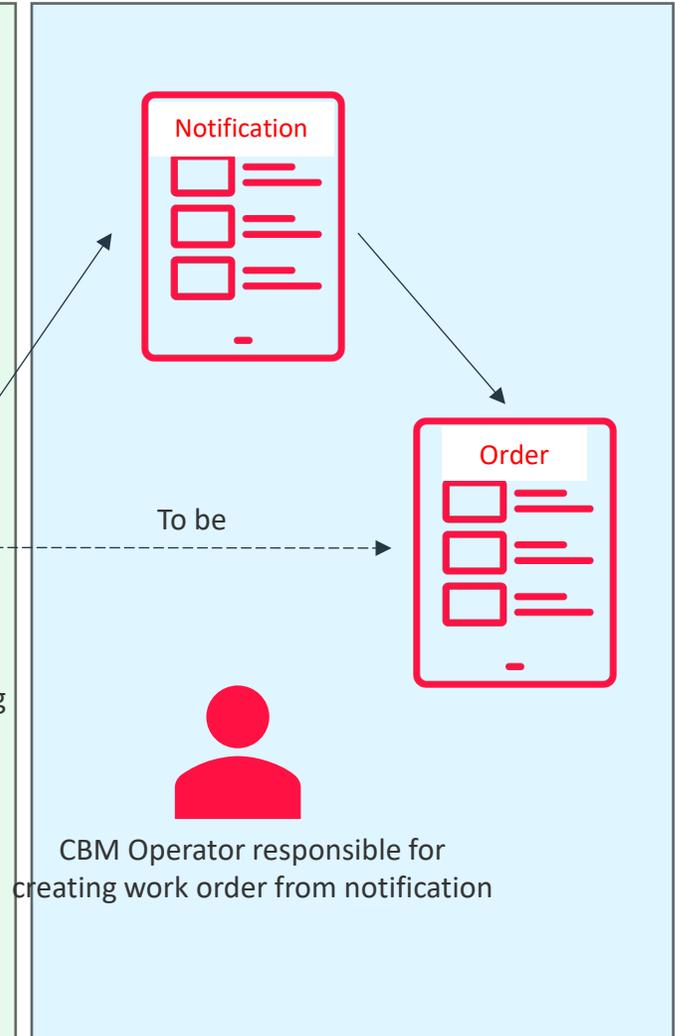
Action is automatically triggered when predefined conditions are met

Data transformation

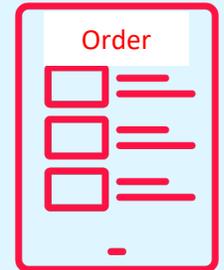
Rule based decision making

3rd party application integration

SAP ECC/ S/4 HANA



Notification



Order

To be



CBM Operator responsible for creating work order from notification

7 rules to manage CBM

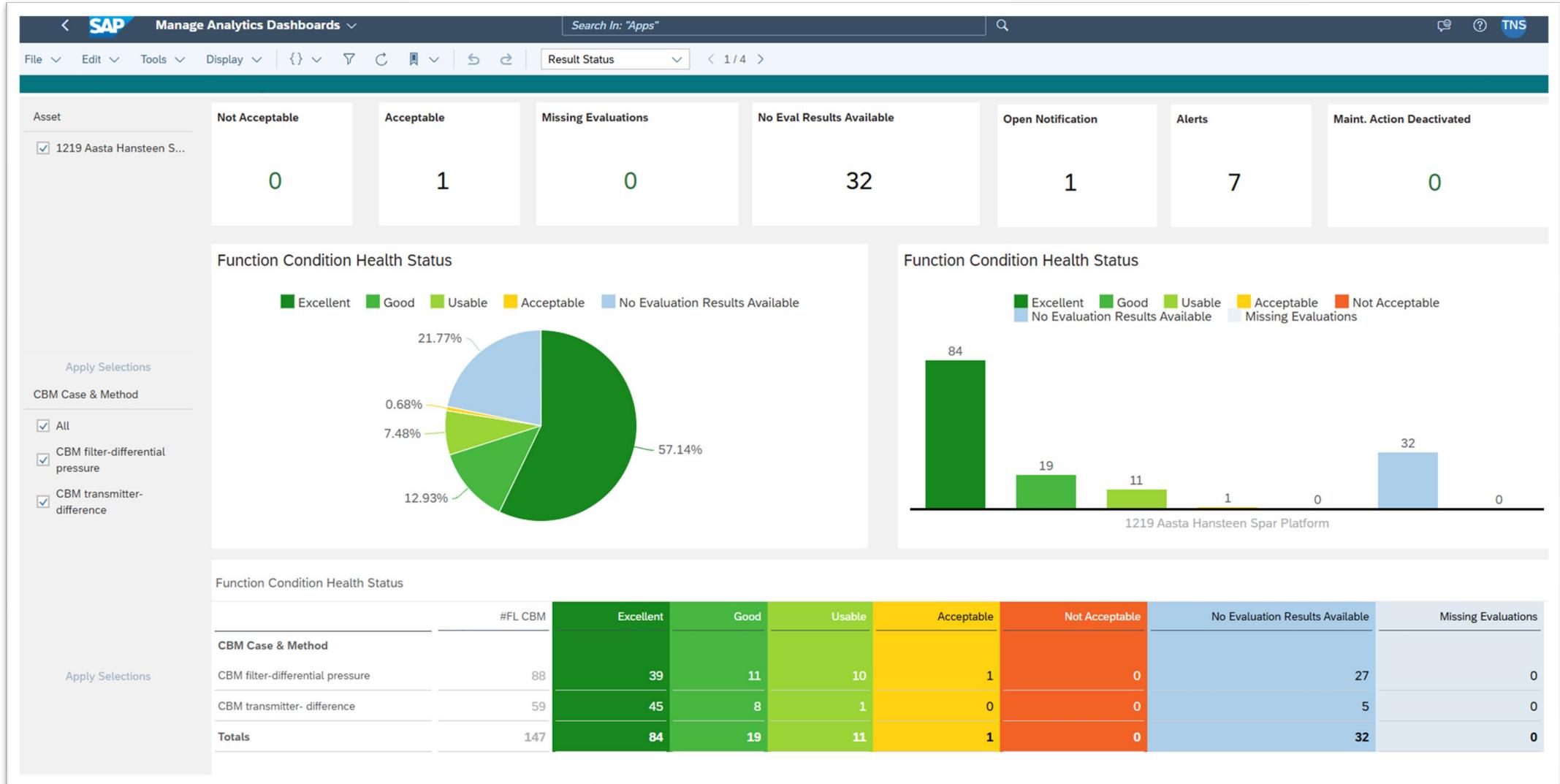
Rule
1. Data Quality evaluation
2. Smoothing time series Data
3. Calculating the «CBM action trigger Value»
4. Converting the «CBM action trigger value to scale of a normalized set
5. Set CBM function health status
6. Initiate maintenance action
7. Initiate data quality action

Initiate Data Quality Action could be by:

- email action
- issue a Service Request

Still to be decided...

CBM – Results Status Dashboard - SAC



CBM – Indicator Monitoring

HEATING MEDIUM FILTER

1219-41CB001



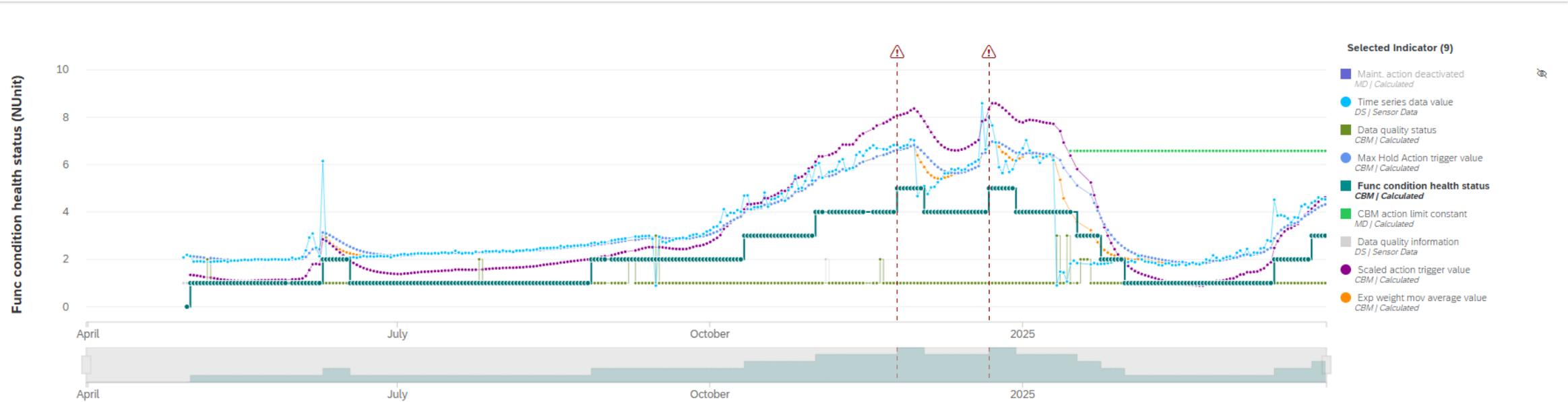
Category: Main equipment (M)
Class: Main Equipment (MAIN_EQUIPMENT) and 3 more
Object Type: Filter, NonReg (FB0301)

Risk Score
Criticality
Status
Crit.=M & Red.=A (2) Created

Information | Class – Characteristics | Indicators | **Indicator Monitoring** | Analytics

My Standard past year* | Duration: Past 1 Year(s)

Select Indicators | Last refreshed at: 11:56AM





CBM | Implementation

How to implement CBM in Equinor

EQUINOR | CBM Escalation Focus areas

- ❖ Strategy
- ❖ Organization
- ❖ Standardized work processes
- ❖ Communication and training

Strategy for Maintenance Management

Ensure commitment

- ❖ CBM is one of four development areas in the strategy for maintenance management
- ❖ Strategy for maintenance management is aligned with upper management
- ❖ Ongoing work to update strategy for 2026-2030

Strategy for Maintenance Management 2023 – 2025

Right maintenance

- at the right time
- with the right effort

Condition-based and predictive maintenance (CBM/PdM)

Strategic development

Within condition-based and predictive maintenance, we have identified four technology levels to describe status, maturity and ambitions. These levels of technology indicate the degree of human involvement as well as the use of data, automated analysis techniques, robotics and artificial intelligence. As of 2022, our most common form of condition monitoring is still periodic condition monitoring controlled by maintenance programs in SAP.

The exploitation of this technology will help to:

- prevent equipment breakdowns by detecting fault development at an early stage
- provide stable production through lower need for planned downtime
- reduce personnel risk
- reduce the cost of maintenance

Strategic development of condition-based and predictive maintenance in Equinor has two main axes

- a planned effort to map opportunities in sensor data at our existing facilities in order to raise our level of CBM/PdM to the highest possible practical level. System and equipment groups will have different maturity and different optimal levels, which may change as technology develops. Development to the optimum level will go step by step for the individual equipment group as part of learning and developing algorithms.
- to actively contribute to solutions that utilise technology and data on new installations. Especially for unmonitored and low-monitored facilities, as well as subsea installations, the highest levels of technology will be crucial contributions for stable delivery of safe and efficient operations in line with the company's sustainability goals.

Technology Level	Description	Human Involvement	Data Usage
Autonomous	Autonomous process that includes self-documenting workflow. Humans intervene in the event of deviations.	Machine leads	Machine leads
Partially automated	Automated process based on data. People verify results and ensure the integrity of dataflow.	Machine leads	Human verifies
Partially manual	Humans use automated workspaces and data manual decision-making and implementation.	Human leads	Automatic data
Manual	People extract, interpret and understand data manual decision-making and implementation.	Human leads	Human processing data

Periodic condition monitoring without data capture

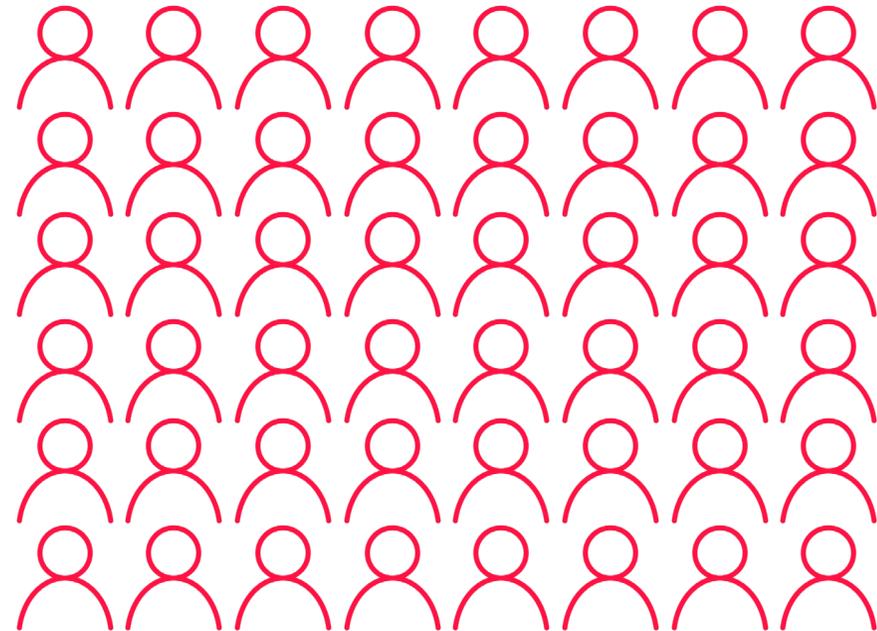
People assess condition based on a periodic maintenance program and take action directly or via M2 notification. No systematic collection and processing of data.

*PcC = Proof of Concept

EQUINOR | CBM Escalation
Organization

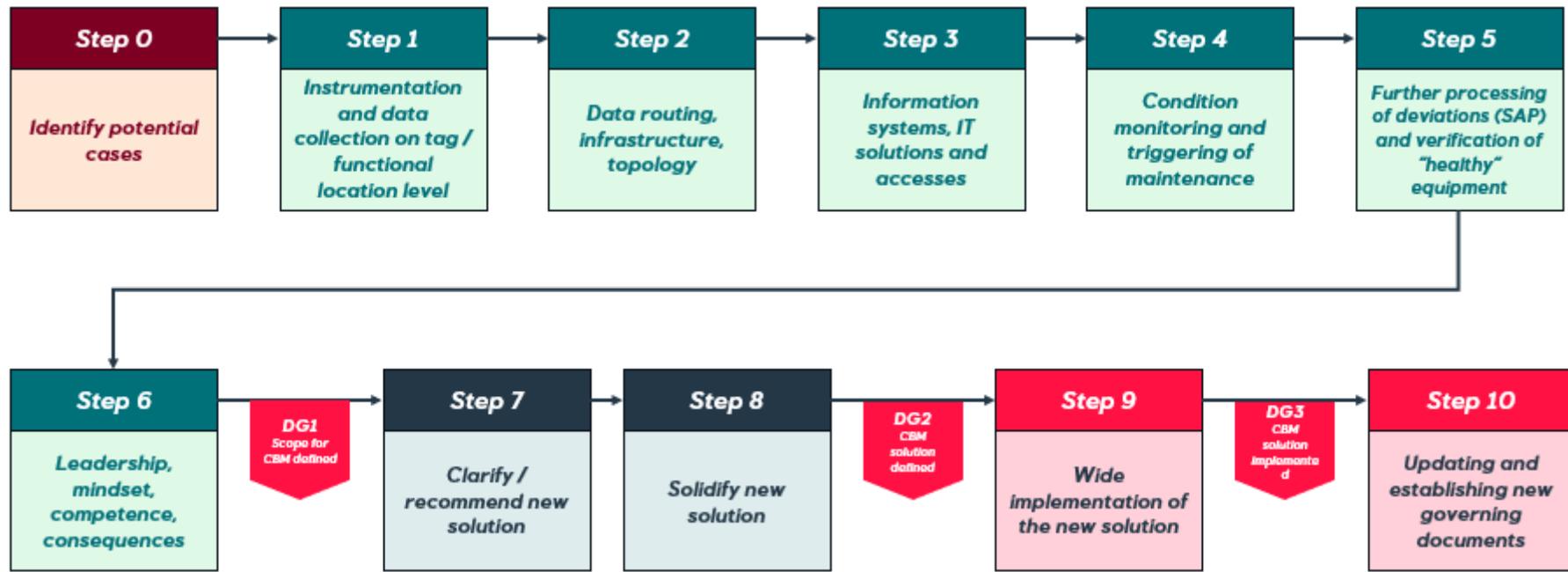
Use the organization

- ❖ Large matrix organization
- ❖ Stakeholder management
- ❖ Understanding roles and responsibilities
- ❖ One project team responsible for implementation across all assets
- ❖ Project team responsible for enabling collaboration between different departments in Equinor



EQUINOR | CBM Escalation

Standardized work processes



EQUINOR | CBM Escalation Organization

Communication and training

- ❖ Broad information campaign across Equinor – increased understanding of what CBM is
- ❖ Specialized training program for personnel involved in maintenance management loop
- ❖ Standardized DAP (Digital Adaption Platform) tool for training