8th WORLD CONGRESS OF MAINTENANCE AND ASSET MANAGEMENT
EXPO MANTENER
22nd Ibero-American Maintenance Congress
27th International Congress of Maintenance and Asset Management
11 · 12 · 13 JUNE · 2025
Convention Center
Cartagena de Indias • Colombia
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Federación Iberoamericana de Mantenimiento
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Asociación Colombiana de Ingenieros

Designing Maintenance Manuals Based on ISO 55000 Asset Management Principles

GFMAM
Global Forum on Maintenance & Asset Management

Janez Tomažin
European Federation of National Maintenance Societies

Let me ask you a few questions:

- does your organization apply an AMS in accordance with ISO 55001 standard in all asset life cycle stages?
- do you strictly follow the maintenance/operational manuals (instructions)?
- who has drawn up these manuals and at what stage of the asset's life-cycle?
- do your manuals indicate the suggested/required baseline, limit, and critical condition values for your assets and define where the boundary between corrective and preventive maintenance is?
- who has identified the locations and numbers of the sensors to be installed to monitor the condition of your assets and at what stage of their life-cycle?
- who monitors the condition of your assets, performs and interprets (laboratory) analyses, and makes proposals for an effective maintenance planning, and scheduling?
- are you confident that you know/use the BAT to achieve your organization's strategic objectives and maximize value from your assets?
- do you consider hydraulic/lubricating oil to be your physical asset?

3.2.1 Asset management

The coordinated activity of an *organization* to realize value from *assets.*

Note: Activity can also refer to the application of the elements of an *asset management system*.

Note: Realization of value normally involves a balancing of costs, *risks*, *opportunities* and p*erformance* benefits.

3.3.28 Value - results from satisfying needs and expectations.

Note: Value represents the result of considering positive and negative impacts, as well as financial and nonfinancial impacts, on stakeholders over a time horizon that includes all such impacts.

3.1.1 Asset - item, thing or entity that has potential or actual *value* to an *organization*

Note: Assets can be physical or non-physical.

Source: ISO 55000:2024

3.2.4 Management

The coordinated activities to direct and control an *organization.*

3.3.4 Management system

A set of interrelated or interacting elements of an organization to establish policies and objectives, as well as processes to achieve those objectives.

Note: The management system elements include the organization's structure, roles and responsibilities, planning and operation.

3.3.7 Objective - result to be achieved

Note: An objective can be strategic, tactical, or operational.

Note: In the context of asset management systems, asset management objectives are set by the organization, consistent with the asset management policy, to achieve specific results.

3.3.5 Asset management system

Management system for *asset management.*

Source: ISO 55000:2024

ISO

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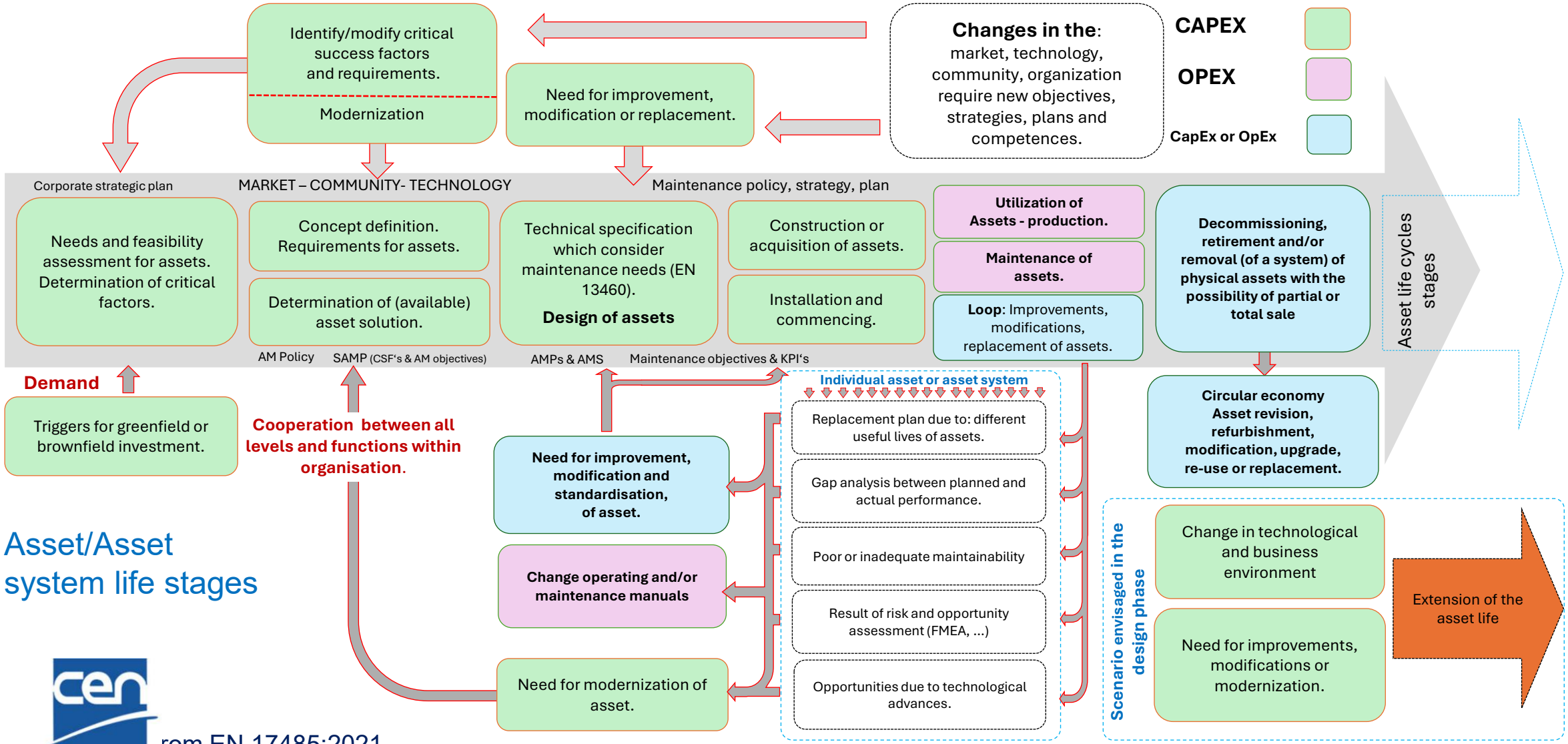
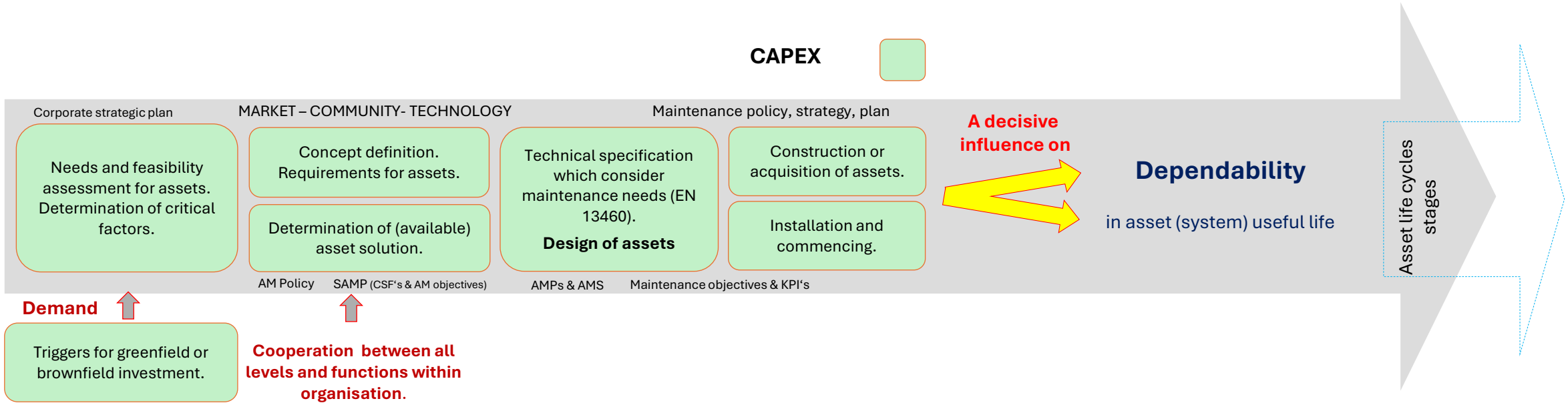
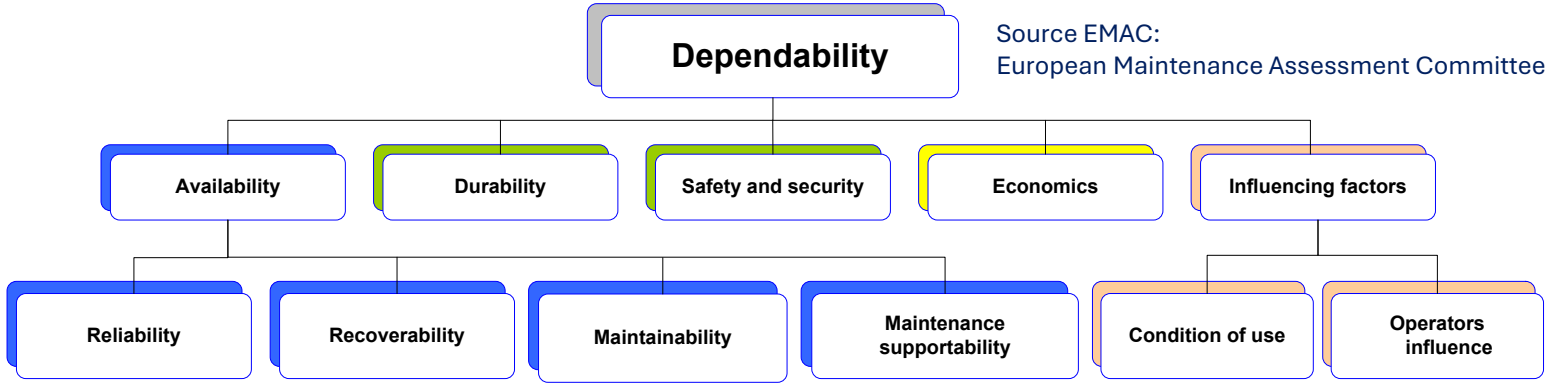
Asset/Asset system life stages



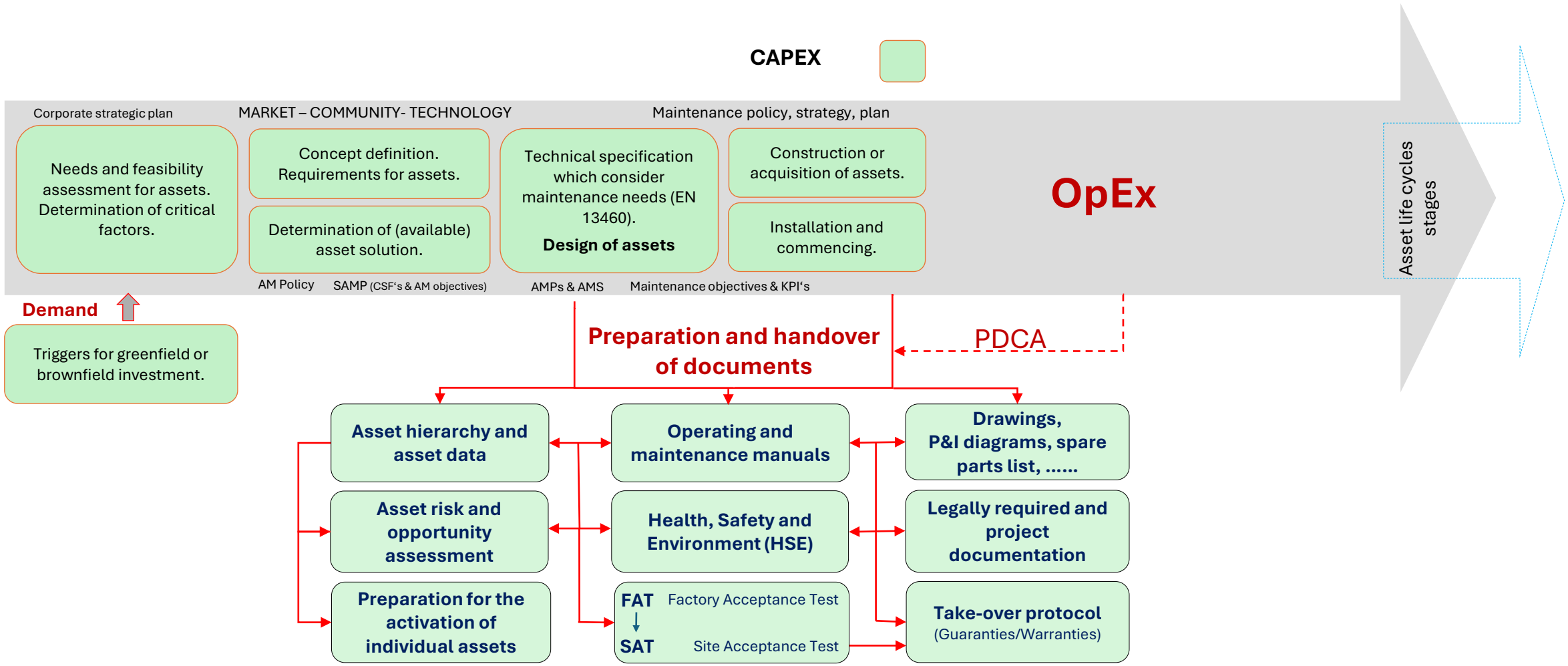
rom EN 17485:2021





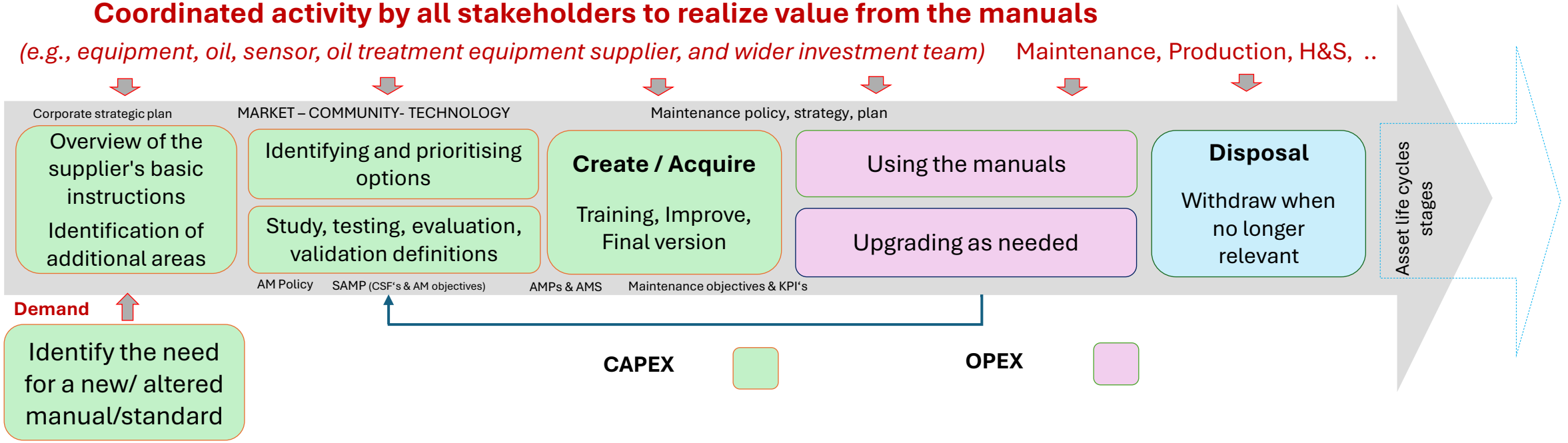
Source EMAC:
European Maintenance Assessment Committee

Adapted from EN 17485:2021


CAPEX
Corporate strategic plan
MARKET – COMMUNITY- TECHNOLOGY
Maintenance policy, strategy, plan
Needs and feasibility assessment for assets. Determination of critical factors.
Concept definition. Requirements for assets.
Determination of (available) asset solution.
Technical specification which consider maintenance needs (EN 13460).
Design of assets
Construction or acquisition of assets.
Installation and commencing.
OpEx
Asset life cycles stages
AM Policy
SAMP (CSF's & AM objectives)
AMPs & AMS
Maintenance objectives & KPI's
Demand
Triggers for greenfield or brownfield investment.
Preparation and handover of documents
PDCA
Asset hierarchy and asset data
Operating and maintenance manuals
Drawings, P&I diagrams, spare parts list, ...
Asset risk and opportunity assessment
Health, Safety and Environment (HSE)
Legally required and project documentation
Preparation for the activation of individual assets
FAT Factory Acceptance Test
SAT Site Acceptance Test
Take-over protocol (Guaranties/Warranties)

Coordinated activity by all stakeholders to realize value from the manuals

(e.g., equipment, oil, sensor, oil treatment equipment supplier, and wider investment team) Maintenance, Production, H&S, ..



Statement: Maintenance/Operational manuals are important assets.

They create value at all stages of their life cycle.

AGREE?

DISAGREE?

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Desing

Definition:
- asset (oil) quality,
- oil quality thresholds,
- monitoring options,
- maintenance manuals,
- analyses and analytics,
- triggers for maintenance activities.

Mandatory:
- system flushing,
  Achieving targets and report.
- fresh oil filtering,
  Achieving targets and report.
- proper filling of the system,
  compliance with manuals.
- analysis after 24 hours in operation,
  baselines values:
  ISO code oil cleanliness, water content in ppm, viscosity (mm²/s), AN (mgKOH/mg), additive level, …

Installation

Beginning of the degradation

Implementation:
- visual checks:
  foaming, bubbles, opacity, colour, odour,..
- laboratory analyses at appropriate intervals:
  viscosity (mm²/s), AN (mgKOH/mg);
  ISO code, MPC, FTRI, RPVOT, additive level, colour, water content in ppm, RH, oxidation index,…,
  Oil quality monitoring
- online monitoring;
  trends, analyses, alarms, …

Potential failure

Target value

Monitoring methods

Functional failure

Degradation

Preventive maintenance
Condition Based Maintenance

Limit value

Filtration, dehydration, chemistry management, oil top-up, oil change, flushing, …

Corrective maintenance

Critical value

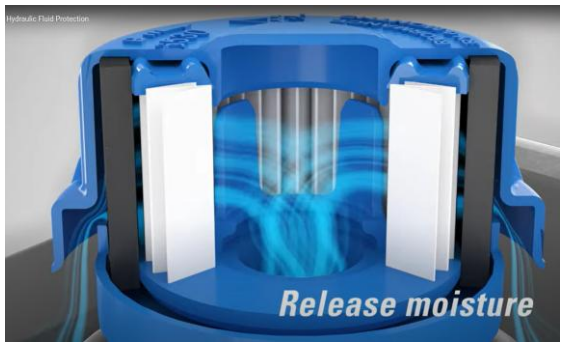
Fault

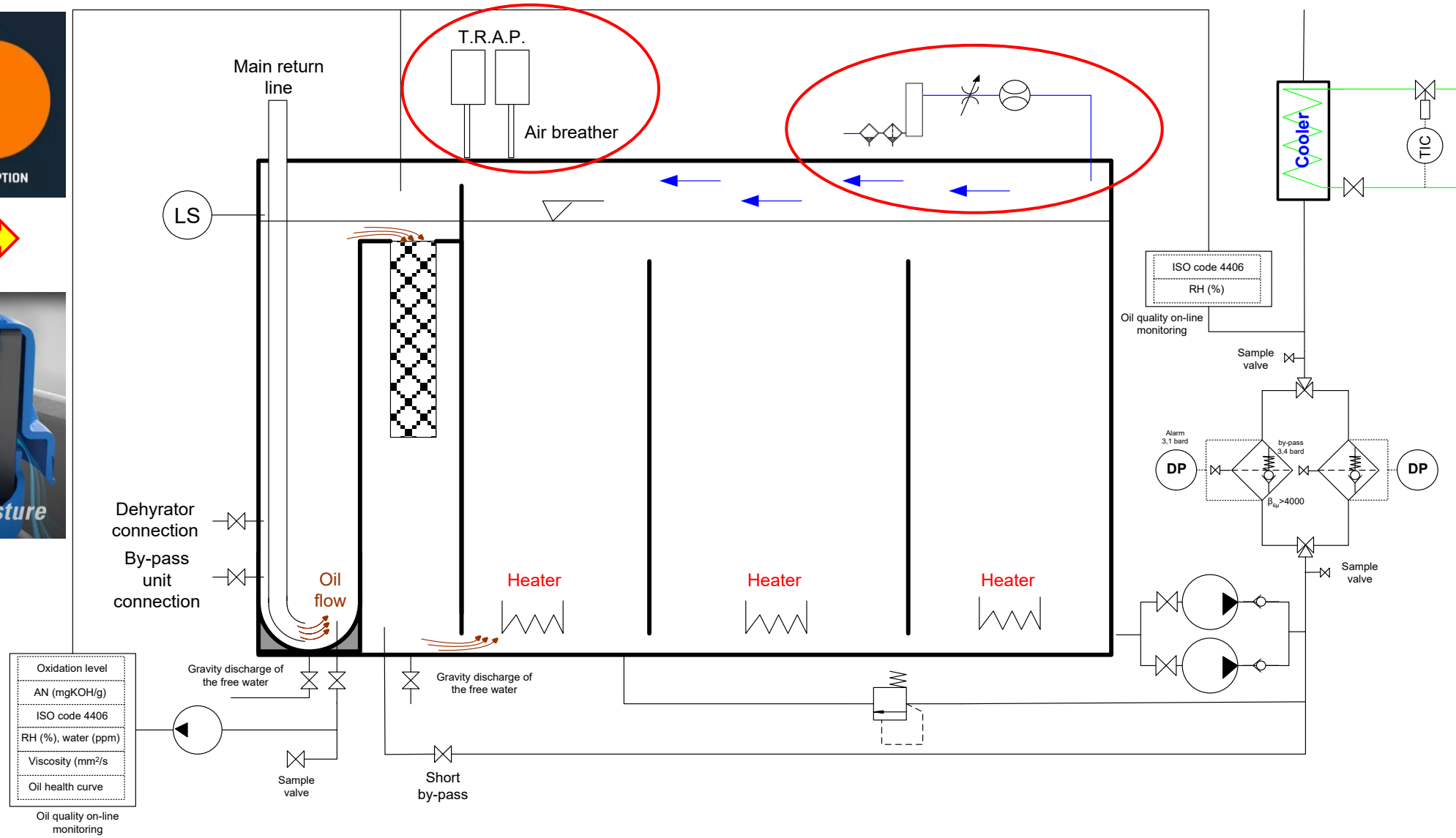
Resistance to failure

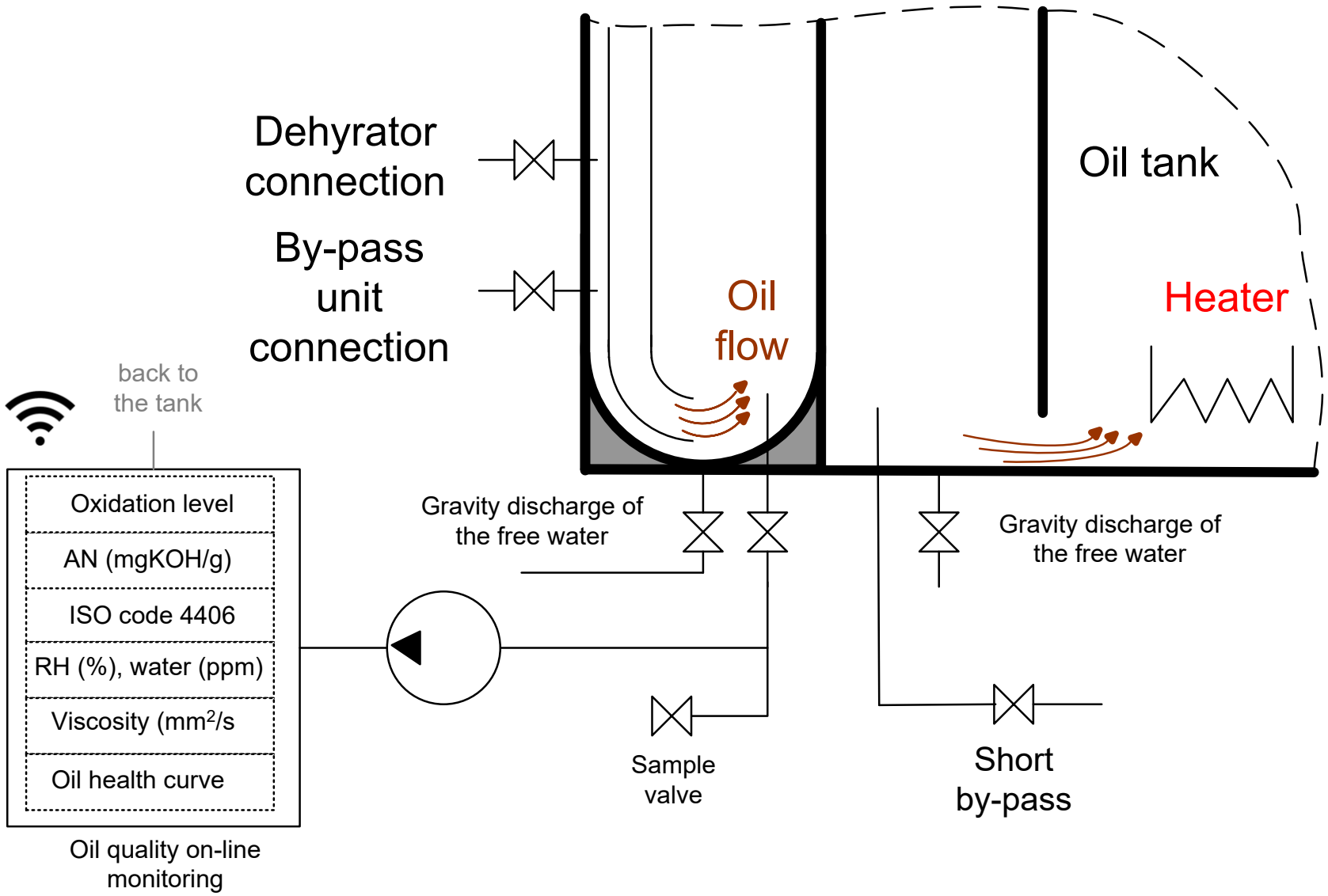

ABSORPTION

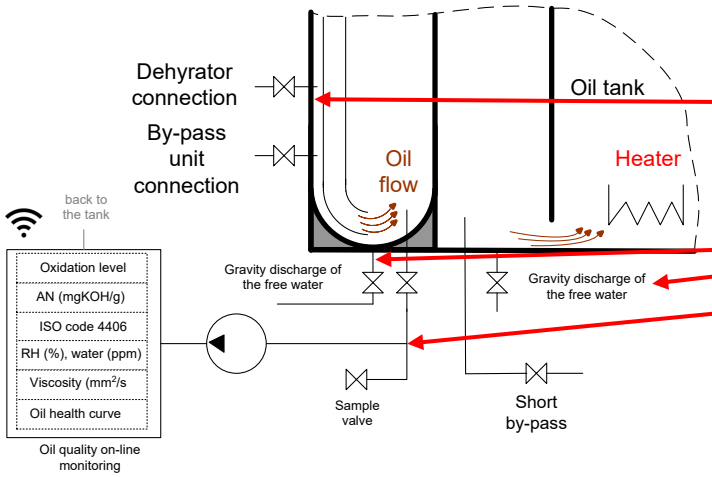

ADSORPTION

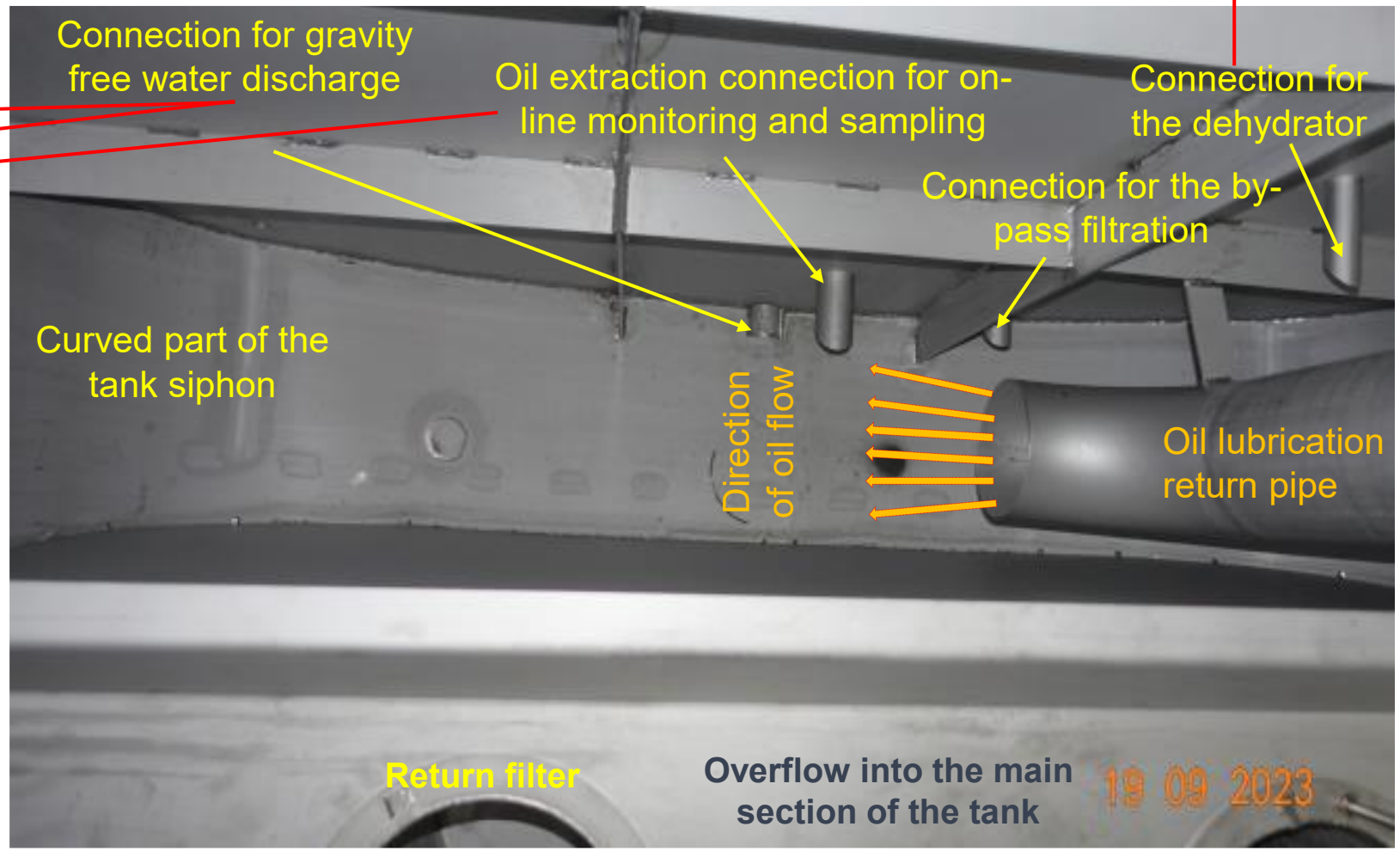
BAT

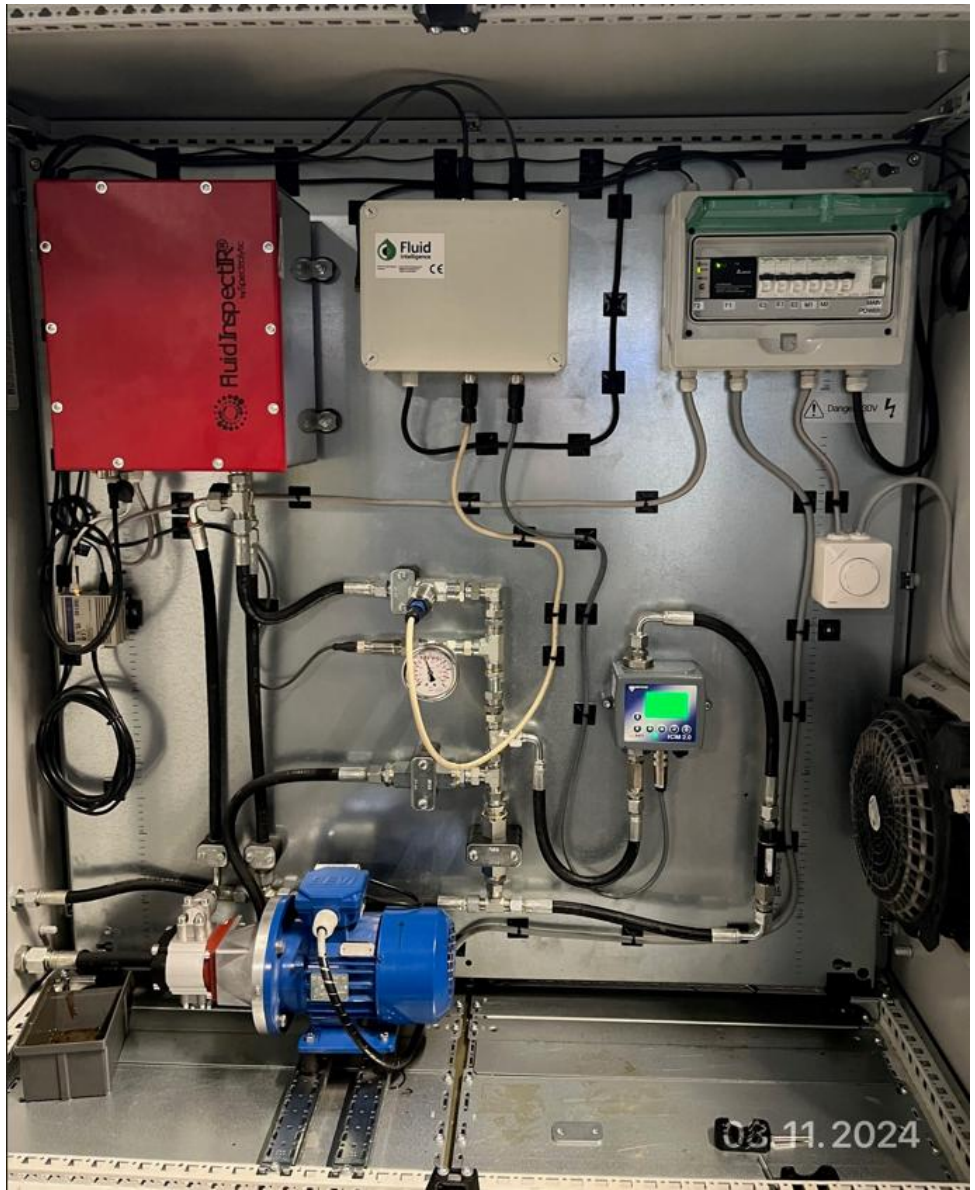

Release moisture


SYSTEM
Pressure line
T.R.A.P.
Air breather
Main return line
LS
Cooler
TIC
ISO code 4406
RH (%)
Oil quality on-line monitoring
Sample valve
Alarm 3,1 bard
by-pass 3,4 bard
DP
DP
$\beta_{6\mu}$>4000
Sample valve
Dehyrator connection
By-pass unit connection
Oil flow
Heater
Heater
Heater
Gravity discharge of the free water
Gravity discharge of the free water
Oxidation level
AN (mgKOH/g)
ISO code 4406
RH (%), water (ppm)
Viscosity (mm²/s
Oil health curve
Oil quality on-line monitoring
Sample valve
Short by-pass


Dehyrator connection
By-pass unit connection
Oil tank
Oil flow
Heater
back to the tank
Oxidation level
AN (mgKOH/g)
ISO code 4406
RH (%), water (ppm)
Viscosity (mm²/s
Oil health curve
Oil quality on-line monitoring
Gravity discharge of the free water
Gravity discharge of the free water
Sample valve
Short by-pass


Dehyrator connection
By-pass unit connection
Oil tank
Oil flow
Heater
back to the tank
Oxidation level
AN (mgKOH/g)
ISO code 4406
RH (%), water (ppm)
Viscosity (mm²/s
Oil health curve
Oil quality on-line monitoring
Gravity discharge of the free water
Gravity discharge of the free water
Sample valve
Short by-pass


Connection for gravity free water discharge
Oil extraction connection for on-line monitoring and sampling
Connection for the dehydrator
Connection for the by-pass filtration
Curved part of the tank siphon
Direction of oil flow
Oil lubrication return pipe
Return filter
Overflow into the main section of the tank
19 09 2023



Fluid (oil) ON LINE monitoring system

CIRCULATION LUBRICATION 2 alerts / 30 days

- Chemical properties
- Fluid Eye Unit
- Oil condition
- Particle Amounts and Cleanliness

Thorough cleaning of the inside of the tank

Preparing for the first start-up

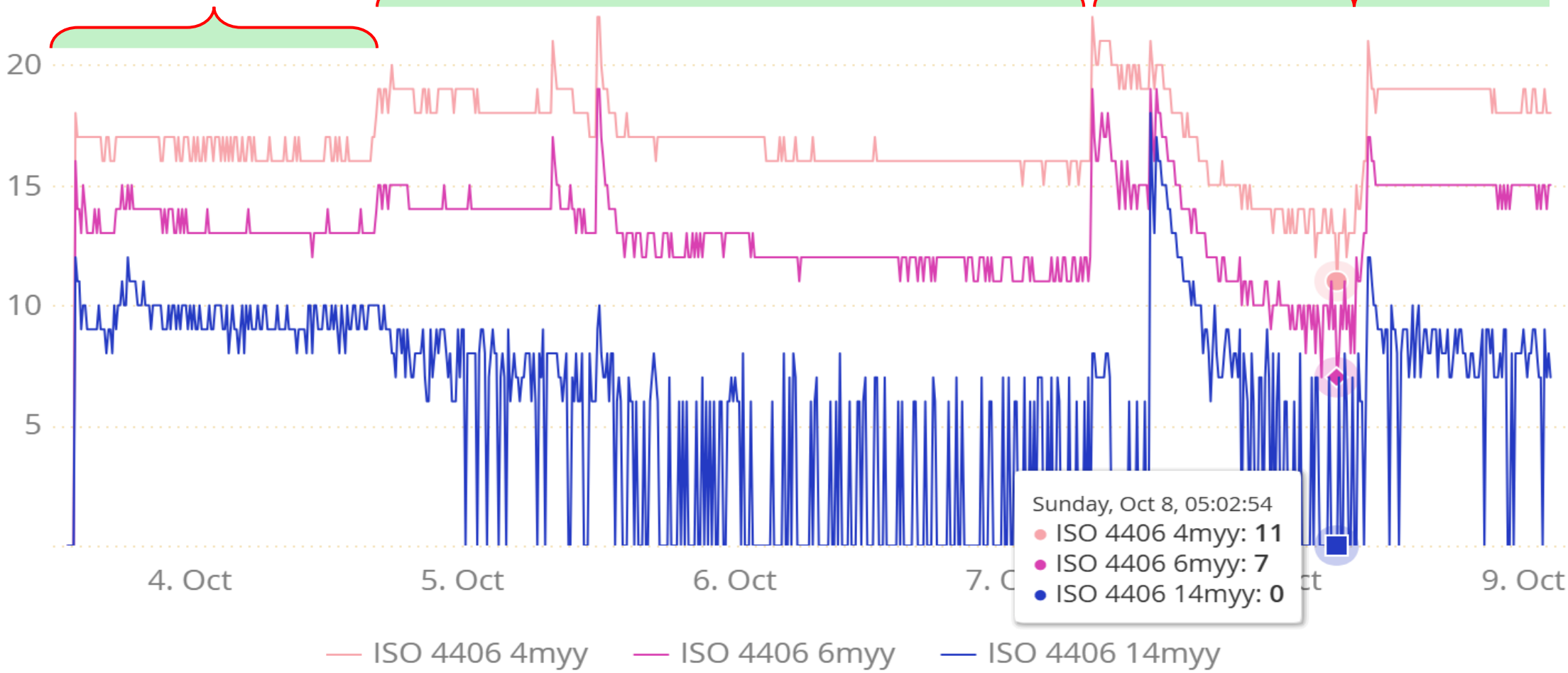
ISO 4406:1999 cleanliness class 1W 1M 6M Select Events

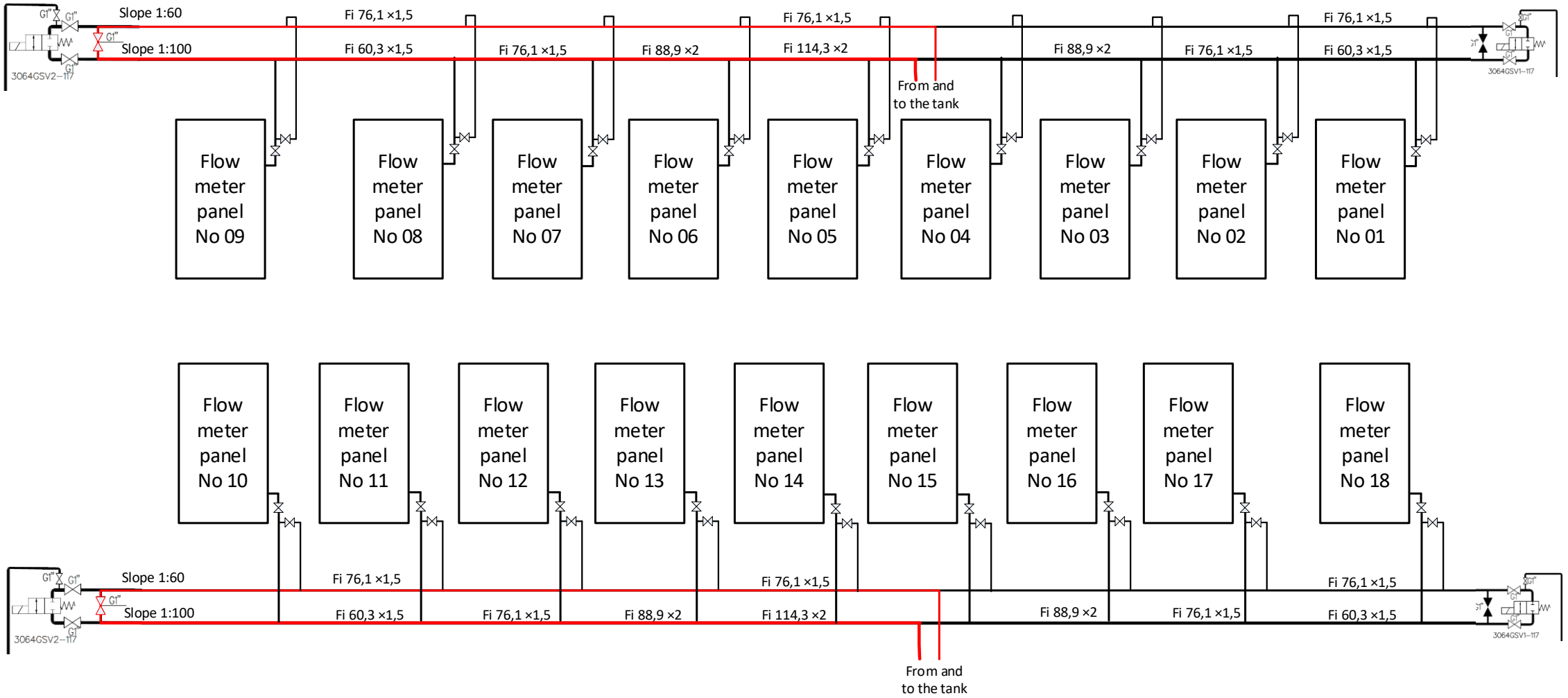
On-line analysis before the first start-up of the system pump.

Cleaning of the tank and the short circuit

First line flushing

Second line fl.




Slope 1:60
Slope 1:100
Fi 76,1 ×1,5
Fi 60,3 ×1,5
Fi 76,1 ×1,5
Fi 88,9 ×2
Fi 76,1 ×1,5
Fi 114,3 ×2
From and to the tank
Fi 88,9 ×2
Fi 76,1 ×1,5
Fi 76,1 ×1,5
Fi 60,3 ×1,5
3064GSV2–117
3064GSV1–117
Flow meter panel No 09
Flow meter panel No 08
Flow meter panel No 07
Flow meter panel No 06
Flow meter panel No 05
Flow meter panel No 04
Flow meter panel No 03
Flow meter panel No 02
Flow meter panel No 01
Flow meter panel No 10
Flow meter panel No 11
Flow meter panel No 12
Flow meter panel No 13
Flow meter panel No 14
Flow meter panel No 15
Flow meter panel No 16
Flow meter panel No 17
Flow meter panel No 18
Slope 1:60
Slope 1:100
Fi 76,1 ×1,5
Fi 60,3 ×1,5
Fi 76,1 ×1,5
Fi 88,9 ×2
Fi 76,1 ×1,5
Fi 114,3 ×2
Fi 88,9 ×2
Fi 76,1 ×1,5
Fi 76,1 ×1,5
Fi 60,3 ×1,5
From and to the tank
3064GSV2–117
3064GSV1–117

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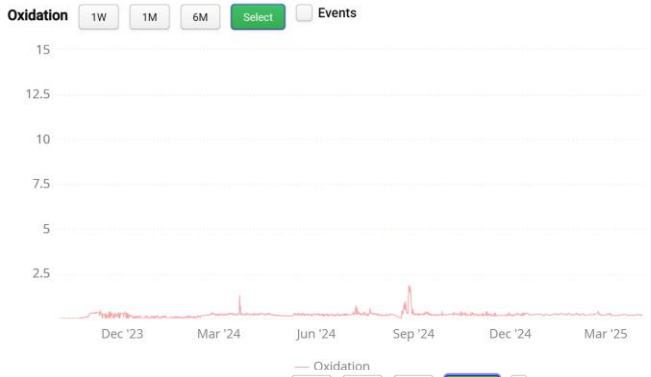
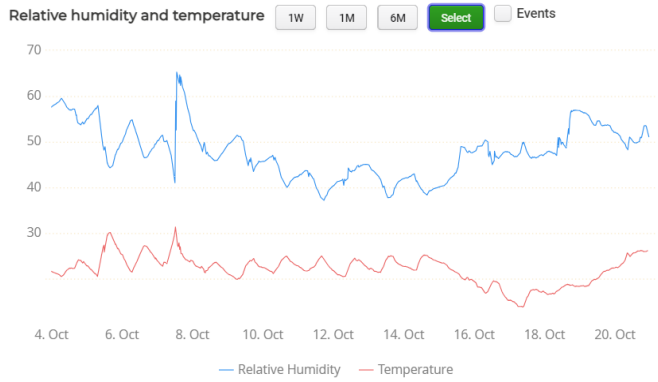
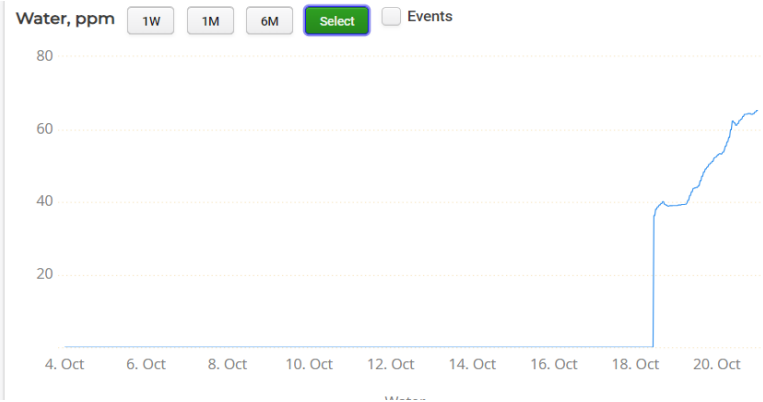
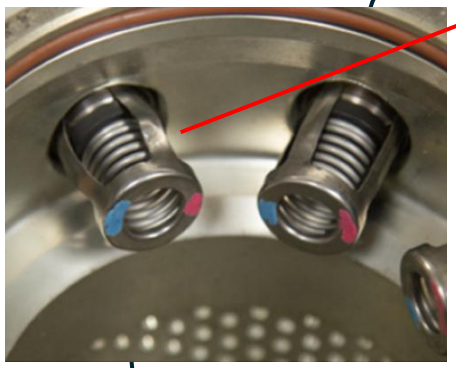
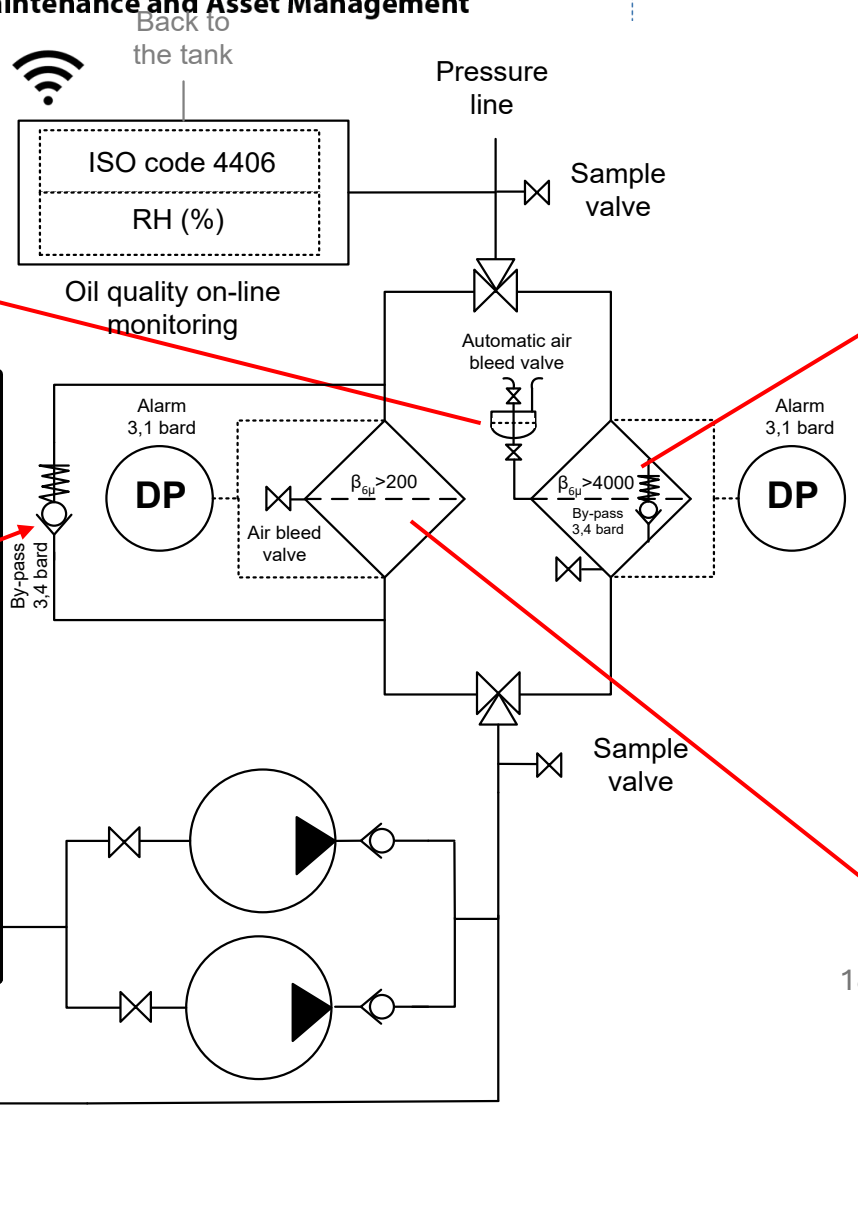




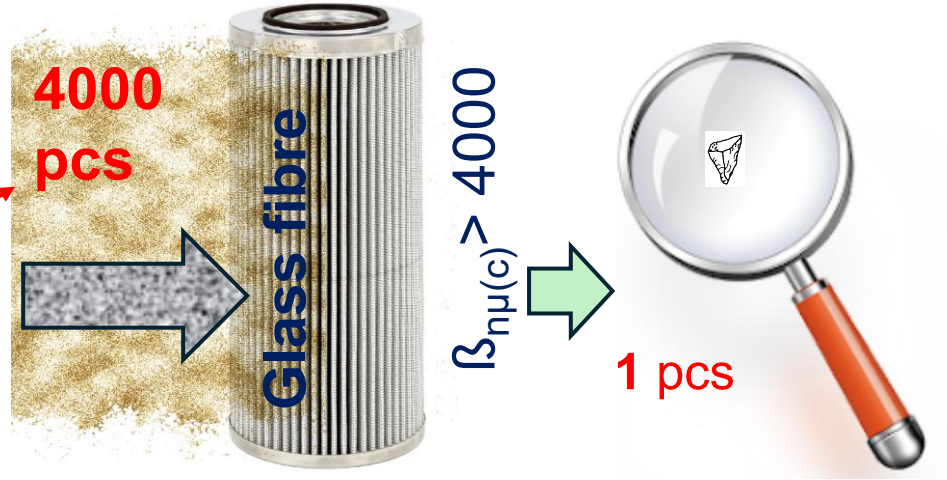


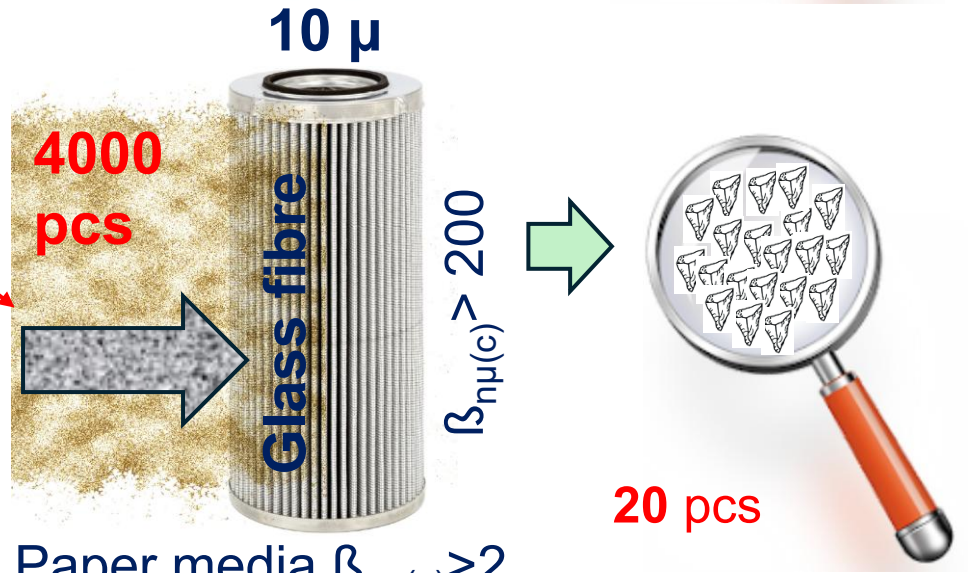
Pressure line





DFE





Paper media $\beta_{n\mu(c)}$>2

The added value of an asset, such as accurate, understandable, and visible maintenance manuals, prepared for specific users and their environments, and created in a multi-stakeholder collaboration, including maintainers during the design phase of the asset system, is invaluable.

Such manuals are genuinely accepted by maintainers, trusted and followed, and are more easily upgraded with experience over their useful life. This leads to:

- increased satisfaction,
- effective training,
- better traceability of documentation,
- increased safety,
- standardization of processes,
- greater efficiency in operations and resource management,
- increased reliability and
- longer useful life of the assets.

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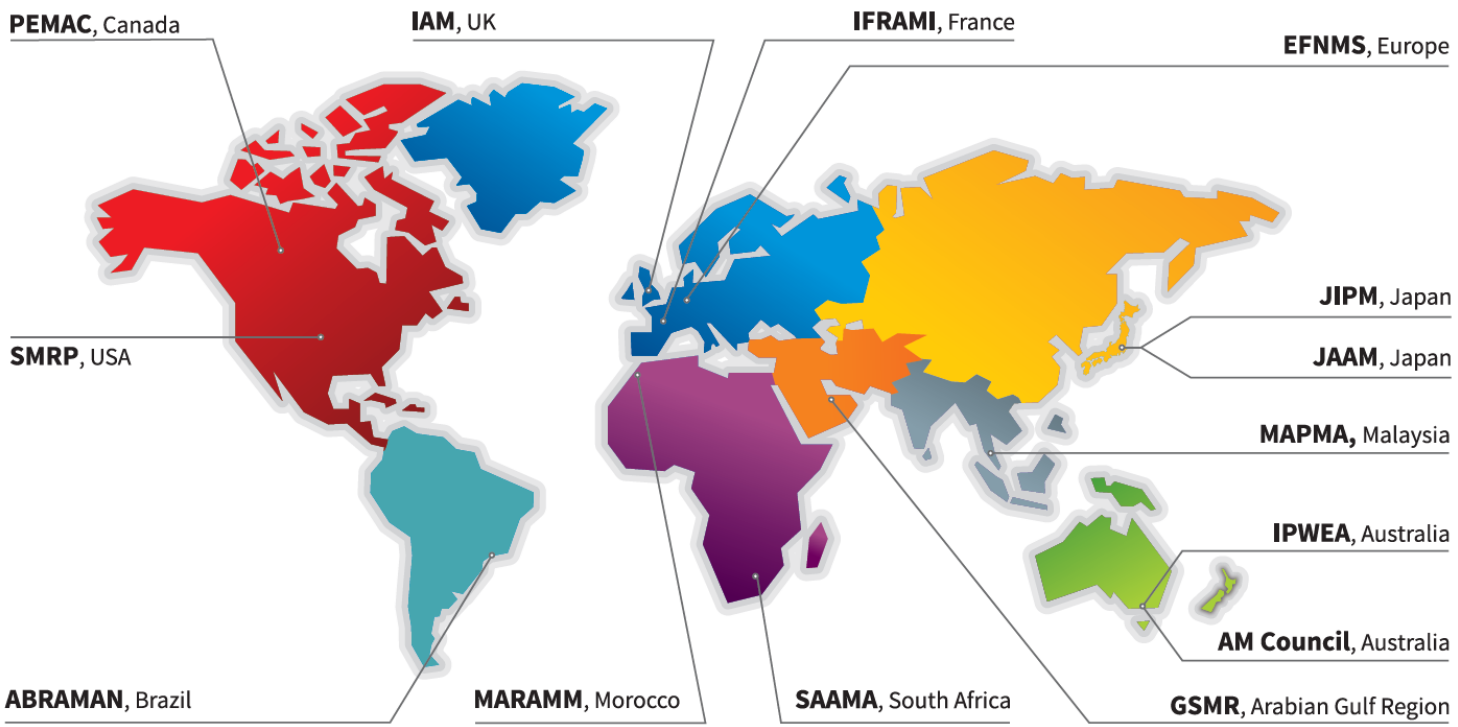
SMRP
Society for Maintenance & Reliability Professionals

SAAMA

ASSET MANAGEMENT COUNCIL



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INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALASIA

efnms
European Federation of National Maintenance Societies vzw

ARAMM

GSMR
الجمعية الخليجية للصيانة والأعتمادية
Gulf Society For Maintenance & Reliability

MAPMA
THE MALAYSIAN ASSET AND PROJECT MANAGEMENT ASSOCIATION

IAM
The Institute of Asset Management

Thank you

PEMAC

JAAM
一般社団法人 日本アセットマネジメント協会
Japan Association of Asset Management

JIPM