eralab OCM: Bridging the gap between test reports and maintenance actions

Introduction – The challenge in oil condition monitoring

Oil Condition Monitoring (OCM) has evolved into a cornerstone of industrial reliability. As global markets expand, organizations across every sector are integrating OCM to track lubricant health, contamination levels, and machine wear.
The industry is witnessing a transition: the rise of in-house testing. Asset owners are increasingly bringing analytical capabilities on-site to reduce turnaround times and gain immediate insight. However, this "more data, faster" approach has unveiled a significant bottleneck – the gap between possessing data and executing a meaningful maintenance action.

For maintenance and oil service teams, the challenge is rarely the lack of data, but rather the lack of contextual intelligence. Traditional workflows struggle with inconsistent limits across identical assets and rigid alarms that ignore specific operating environments. This produces raw data without clear guidance, causing analysis paralysis and costly delays.
To address this gap and challenges, era**lab OCM** provides a comprehensive solution for in-house oil condition monitoring that covers the entire process, from asset management and measurements to data evaluation, and finally a report that highlights all findings and provides actionable recommendations as shown in Figure 1

eralab OCM – The comprehensive solution for oil condition monitoring

The true competitive advantage of era**lab OCM** lies in its structured interpretation and predictive maintenance support. Measurements are carried out using era**lab OCM** analyzers, which capture precise physical and chemical oil parameters, together with era**soft OCM**, which provides data evaluation intelligence.

era**soft OCM** acts as the analytical core, transforming raw data into a highly useful diagnostic report. The software automatically flags warnings and identifies anomalies based on predefined rating rules. The objective is to move from displaying numbers and data to enabling informed decisions.

Figure 1: In-house testing with eralab OCM

era**soft OCM** integrates advanced and customizable rating rules based on literature, recognized industry practices, and accumulated operational experience. These rules enable deeper insight into oil analysis results and support the development of application specific knowledge about equipment behavior and lubricant performance.

Customizable rating rules for different use cases

A key limitation in many oil monitoring systems is fixed alarm thresholds. These ignore variations such as:

- Specific type and criticality of a device
- Various load conditions of systems
- Different contamination tolerances across components

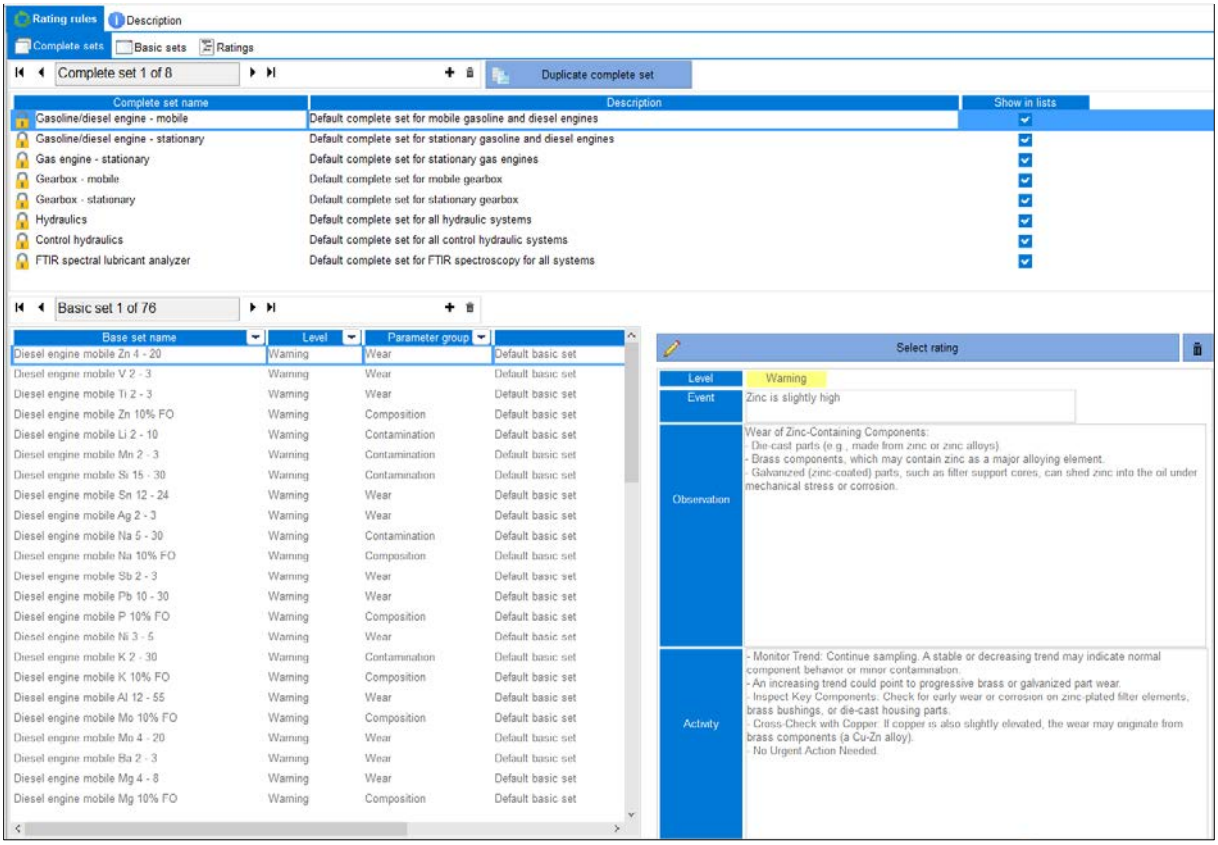
era**soft OCM** addresses this through customizable rating rules. While the software features predefined rating rules, its full flexibility allows teams to define application-specific limits based on equipment age and criticality. By incorporating operational experience, users can adapt these rules to reflect facility-specific failure modes. Furthermore, automating decision logic translates tribal knowledge into digital rules, ensuring consistent, high-level guidance for every technician.

In era**soft OCM**, rating rules are organized into three hierarchical elements:

- Complete sets based on the component type and including the basic sets together with their corresponding ratings.
- Basic sets are part of the complete sets, containing all predefined limits for different parameters and component types.
- Ratings translate the evaluated data into clear, actionable insights in written form.

Each level can be adapted to meet individual operational requirements. Users can define parameter limits and evaluations based on:

- Component type
- Operating environment
- Internal expertise and field experience



This flexibility allows adaptation to various applications. Instead of applying generic limits, evaluation reflects real operational conditions.

From data to actionable maintenance decisions

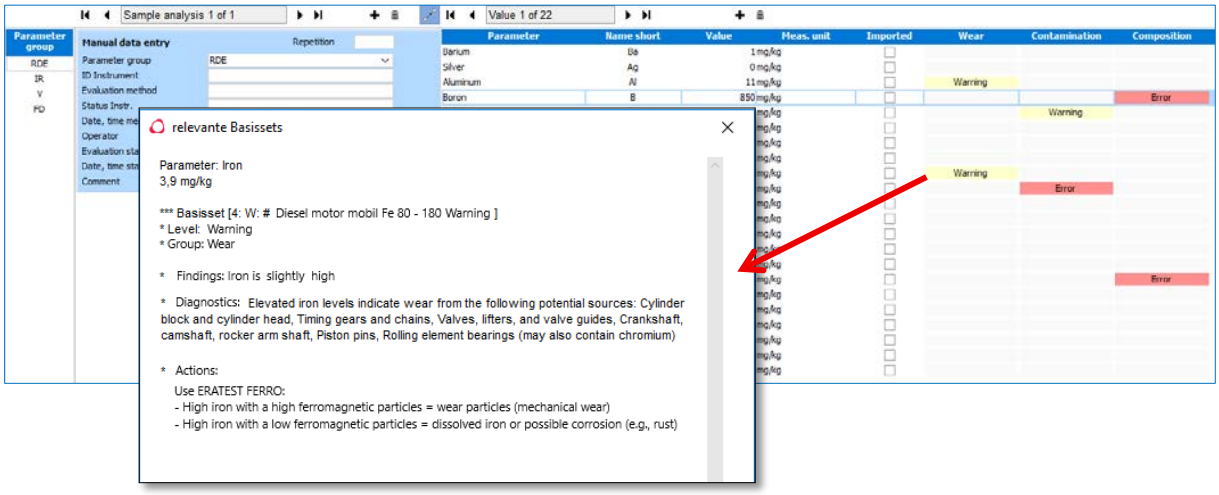
Rating rules represent the diagnostic core of the era**soft OCM**, acting as the bridge between raw analytical measurements and field-level execution. Rather than simply archiving numbers, these rules actively interrogate the data to provide operators with three critical outputs:

- Identified findings: Precise detection of existing fluid or machine conditions.
- Root cause analysis: Diagnostic paths that explain why a warning or error has been triggered.
- Prescriptive actions: Clear, standardized recommendations for corrective maintenance.

Once a complete set is applied, all incoming measurement data is evaluated against the defined limits. After the measurements are performed and imported into era**soft OCM**, the data is assessed accordingly and any warnings or errors are clearly displayed using color indicators, making them easy to identify.

A fundamental mistake in many oil condition monitoring programs is treating all machines the same. era**soft OCM** recognizes that the meaning of data changes with the application. Consider the presence of iron (Fe):

- In a hydraulic system: 80 ppm might indicate severe pump cavitation or cylinder wear, triggering a critical error.
- In a diesel motor: The same 80 ppm might be considered well within the "normal" run-in or steady-state wear phase.



Every rating rule can be customized. Teams can refine terminology by using familiar internal naming conventions and maintenance codes. By incorporating practical knowledge, the experience of senior engineers is integrated directly into the system rules. As your database grows, you can fine-tune limits, transforming the software from a simple evaluation tool into a dynamic knowledge base for your organization's mechanical expertise.

Indicator circle

era**soft OCM** is designed to transform multi-parameter complexity into a visual narrative: the Indicator Circle.

It is divided into three main sectors, offering a clear and comprehensive insight into both the lubricant's condition and the machine's mechanical integrity. Maintenance teams can quickly identify the nature of any developing issue.

1. The "Wear" sector is the primary window into component health. It monitors the presence of metallic particles from abrasion.
    a. The diagnostic goal is to verify whether the lubricant is still performing its core function, preventing metal-to-metal contact.
    b. A color shift in this sector warns of accelerated component fatigue or inadequate film strength before a physical failure occurs.

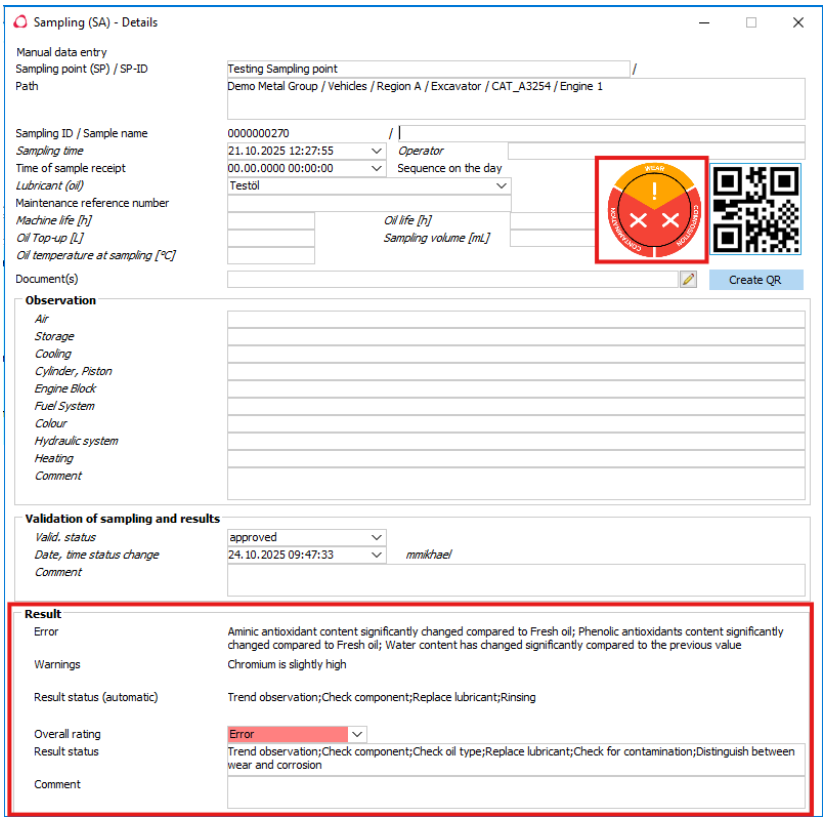
2. The “Contamination” sector reflects the "cleanliness" of the fluid environment. It tracks external ingress and internal byproducts that shouldn't be there.
    a. The diagnostic goal is to detect the presence of unwanted substances such as water, dust (e.g. silicon), fuel dilution, or soot.
    b. High contamination levels are the leading cause of premature bearing and seal failure. A warning here indicates that filtration systems or seals may be compromised.

3. The “Composition” sector monitors the molecular health of the lubricant itself.
    a. The diagnostic goal: To track additive depletion (such as Zn or P) and oil "altering" behaviors like oxidation, nitration, or viscosity shifts.
    b. This sector tells you when the oil has reached the end of its chemical life. A shift to yellow or red indicates that the oil’s protective properties are exhausted, even if the wear levels are still low.

Each sector of the Indicator Circle updates automatically following the data evaluation. The logic is simple yet powerful:

- Green: The parameter group is within the normal operating baseline.
- Yellow (Warning “!”): A parameter has breached the cautionary threshold; monitoring frequency should increase.
- Red (Error “X”): A critical limit has been exceeded; immediate corrective action is required.

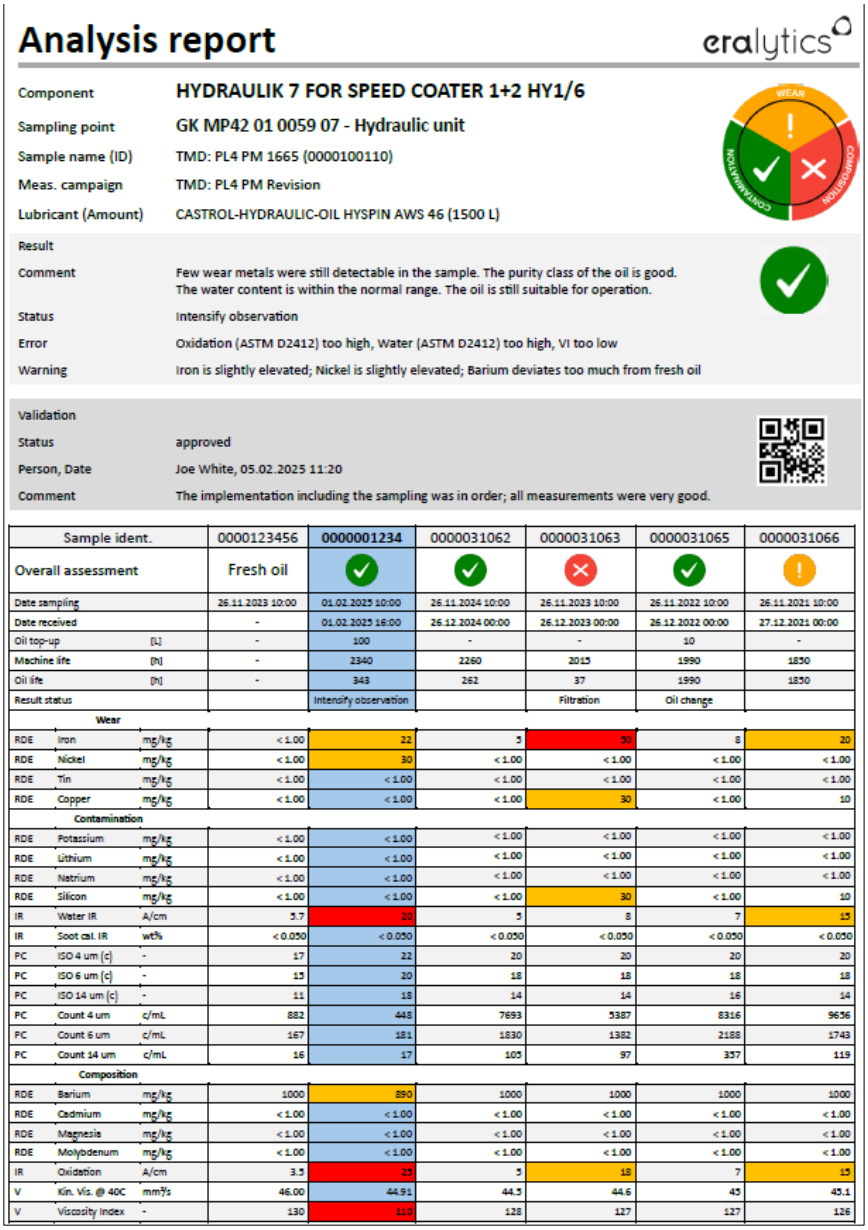
The “Sampling details” window serves as a central command hub where maintenance and service teams can refine, validate, and contextualize the results. In this window, the user can view all errors and warnings for the oil sample, add their own comments, and provide a final assessment in the “Overall Rating” section. This rating is later displayed in the report and compared with historical data from the same sampling point using the same fresh oil reference.



Results report

After the measurement is completed, the data is automatically saved to the corresponding sample and is ready to be printed as a report. era**soft OCM** is designed to provide customers with clear and easy-to-understand reports while supporting the maintenance team with actionable insights. It automatically flags warnings and delivers detailed explanations of the possible reasons why an oil sample triggered a specific warning. Based on this analysis, the system also provides recommendations for action, enabling maintenance teams to make informed decisions and take the right steps without delay.

The example analysis report below compares the most recent sample to fresh oil and can display up to five historic samples. This makes it easy to track how parameters change over time with the fresh oil serving as a reference.



Analysis report

eralytics

Component	HYDRAULIK 7 FOR SPEED COATER 1+2 HY1/6
Sampling point	GK MP42 01 0059 07 - Hydraulic unit
Sample name (ID)	TMD: PL4 PM 1665 (0000100110)
Meas. campaign	TMD: PL4 PM Revision
Lubricant (Amount)	CASTROL-HYDRAULIC-OIL HYSPIN AWS 46 (1500 L)

Result

Comment	Few wear metals were still detectable in the sample. The purity class of the oil is good. The water content is within the normal range. The oil is still suitable for operation.
Status	Intensify observation
Error	Oxidation (ASTM D2412) too high, Water (ASTM D2412) too high, VI too low
Warning	Iron is slightly elevated; Nickel is slightly elevated; Barium deviates too much from fresh oil

Validation

Status	approved
Person, Date	Joe White, 05.02.2025 11:20
Comment	The implementation including the sampling was in order; all measurements were very good.

Sample ident.			0000123456	0000001234	0000031062	0000031063	0000031065	0000031066
Overall assessment			Fresh oil					
Date sampling			26.11.2023 10:00	01.02.2025 10:00	26.11.2024 10:00	26.11.2023 10:00	26.11.2022 10:00	26.11.2021 10:00
Date received			-	01.02.2025 16:00	26.12.2024 00:00	26.12.2023 00:00	26.12.2022 00:00	27.12.2021 00:00
Oil top-up		[L]	-	100	-	-	10	-
Machine life		[h]	-	2340	2260	2015	1990	1850
Oil life		[h]	-	343	262	37	1990	1850
Result status				Intensify observation		Filtration	Oil change	
Wear								
RDE	Iron	mg/kg	< 1.00	22	5	30	8	20
RDE	Nickel	mg/kg	< 1.00	30	< 1.00	< 1.00	< 1.00	< 1.00
RDE	Tin	mg/kg	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00
RDE	Copper	mg/kg	< 1.00	< 1.00	< 1.00	30	< 1.00	10
Contamination								
RDE	Potassium	mg/kg	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00
RDE	Lithium	mg/kg	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00
RDE	Natrium	mg/kg	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00
RDE	Silicon	mg/kg	< 1.00	< 1.00	< 1.00	30	< 1.00	10
IR	Water IR	A/cm	5.7	20	5	8	7	15
IR	Soot cal. IR	wt%	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
PC	ISO 4 um (c)	-	17	22	20	20	20	20
PC	ISO 6 um (c)	-	15	20	18	18	18	18
PC	ISO 14 um (c)	-	11	18	14	14	16	14
PC	Count 4 um	c/mL	882	448	7693	5387	8316	9656
PC	Count 6 um	c/mL	167	181	1830	1382	2188	1743
PC	Count 14 um	c/mL	16	17	105	97	357	119
Composition								
RDE	Barium	mg/kg	1000	890	1000	1000	1000	1000
RDE	Cadmium	mg/kg	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00
RDE	Magnesia	mg/kg	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00
RDE	Molybdenum	mg/kg	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00
IR	Oxidation	A/cm	3.5	25	5	18	7	15
V	Kin. Vis. @ 40C	mm²/s	46.00	44.91	44.5	44.6	45	45.1
V	Viscosity Index	-	130	110	128	127	127	126

Business impact beyond measurement

The true value of OCM lies in optimizing operations, not just analyzing samples. By integrating era**lab OCM**, with its predefined threshold limits, contextual diagnostics, and customizable knowledge layers, raw data is transformed into actionable insights.

era**lab OCM** offers immediate impact on the plant floor:

- Behavioral mapping: Gain a granular understanding of how lubricants behave within specific, high-stress equipment environments.
- Early-stage detection: Identify microscopic wear patterns and developing issues long before they manifest as mechanical failure.
- Predictive maintenance: Pivot from rigid, calendar-based schedules to dynamic maintenance plans fueled by real-time health assessments.
- Downtime mitigation: Drastically reduce "firefighting" scenarios and unplanned outages.

- Resource efficiency: Safely extend oil drain intervals and maximize the service life of critical assets.

era**lab OCM** delivers structured operational intelligence, bridging the gap between isolated laboratory reports and the daily reality of equipment reliability.