LubAnac
indus classic

Monitoring by analysis of industrial oils during service.

LubAnac Indus Classic is a diagnostics system for the monitoring of the evolution of the state of the lubricant during use and as an assessment of the operating conditions of the machines. It allows to reduce maintenance cost and downtime in production, to improve planning of maintenance operations and to optimise drain oil intervals.

LubAnac Indus Classic can check if the lubricant is the best adapted to the operating conditions, determines the origin of possible pollutants and can be used in combination with other condition-based maintenance methods like vibration analysis, thermography etc..

LubAnac Indus Classic is recommended for the analysis of lubricants in hydraulic systems (except for HFC-type non-flammable fluids), reducers, bearings, compressors (except refrigerating compressors) and general industrial lubrication. It can be used in combination with specific options depending on the application like particle counting, viscosity index, foaming and air release (AIR),), varnish detection (MPC) and microscopic analysis on the nature and relative size of particles (OPTIC).

Measured characteristics

Mechanical wear:
Wear elements : Iron, Lead, Copper, Tin, Chromium, Aluminium, Nickel, Silver (ppm).

Contamination of the lubricant:
Appearance (aspect and colour)
Silicon (ppm)
Water (%)
Insolubles (%)

Characteristics of the lubricant:
Viscosity (mm^2/s) at 40°C.
Acid Index – colorimetric method (mg KOH/g)
Lubricant additive elements Ca, Zn, P, Mo, B (ppm)

Options
Viscosity (mm^2/s) at 100°C and Viscosity Index
Foaming and Air Release (AIR)
Purity and oil cleanliness (Particle count)
- NAS 1638
- ISO 4406
- Visual support on the nature of particles

MPC (Membrane Patch Colorimetry) for varnish detection.
Microscopic analysis on the nature of particles (OPTIC).

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Interpretation of results

Visual appearance
The appearance of an oil (Transparency, deposits) can provide information about a possible deterioration, for example pollution by another fluid or by solids.

Insoluble content
This measurement indicates the quantity of solid impurities (in weight %) retained by filtration using a 5-micron Millipore filter. These impurities may come from external pollution by solids or from wear metals and increase the wear rate of the equipment. These 'insoluble' particles are in suspension in the oil and can be entirely different from the elements content determined by plasma emission spectrometry.

Kinematic viscosity
This is the kinematic viscosity carried out at a standardized temperature (40°C for industrial oils).
Viscosity is a fundamental value which can be affected by:
- Pollution (increase or decrease)
- Oxidation (increase)
- Thermal cracking (decrease)

Water content
Various methods exist for determining water content and these can be differentiated by the expression unit of the result: either in weight %, or in ppm.
The maximum admissible water content in an oil depends on its nature (hydraulic, thermal ...), the criticality of the lubricated circuit and the operating conditions. The presence of water can have varying consequences both as regards to the properties of the oil and the equipment lubricated:
- Chemical reaction (hydrolysis) involving the additives of the formula.
- Oxidation catalyst.
- Formation of an emulsion.
- Corrosion of the machine parts....

In all configurations pollution by water represents an anomaly which must be remedied as swiftly as possible (decantation, filtration, centrifugation, purging, partial or total draining ...)

Acid index
This measurement gives the number of mg of potassium (KOH) required to neutralize the acid compounds present in the oil.
Regular monitoring can provide an indication of the oxidation of an oil : the acid number increases with oxidation.
However, one needs to know some additives have a naturally high acid number even in the absence of degradation. For example, the Zinc Di-Thiophosphate anti-wear additives (hydraulic oils) or the Extreme-Pressure additives of the Phosphorus-Sulphur type (oils for reducers). A new oil which contains these additives will therefore have a higher acid number from the beginning of its service life.

Elements
The method used to determine the elements content is known as plasma emission spectrometry.
This analysis enables rapid determining, in a single measurement, of the mass concentrations of the various chemical elements present in the oil.
The result is expressed in ppm or Parts Per Million, or in mg/kg.
1mg/kg = 1 ppm = 0.0001% or 10000mg/kg = 10000 ppm = 1% .
Plasma spectrometry doses only the chemical elements with a particle size below 5 microns.
These chemical elements may come either from the additives present in the oil, from pollutions or wear elements.
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Option AIR

Air release

The air release time characterizes the capacity of the oil to release the previously dispersed air. When air is introduced into an oil by mechanical agitation or by blowing, etc…, foam may form on the surface.
Air presence in oil can present certain disadvantages:

- Reduction in the lift of the oil film.
- Increase in the oxidation rate resulting from an increase in the oil-air contact surface.
- Increase in the compressibility of the oil, hence a rise in the temperature and an aggravation of oxidation,
- disturbance in the operation of a hydraulic command.
- Risk of cavitation.

The air release anomalies in the oil may originate from:

- pollution (silicon or other pollutants).
- ageing of the oil.
- mixing with another oil.

Foaming

Foaming is defined as the volume of foam and its persistence.
Some consequences of foaming are :

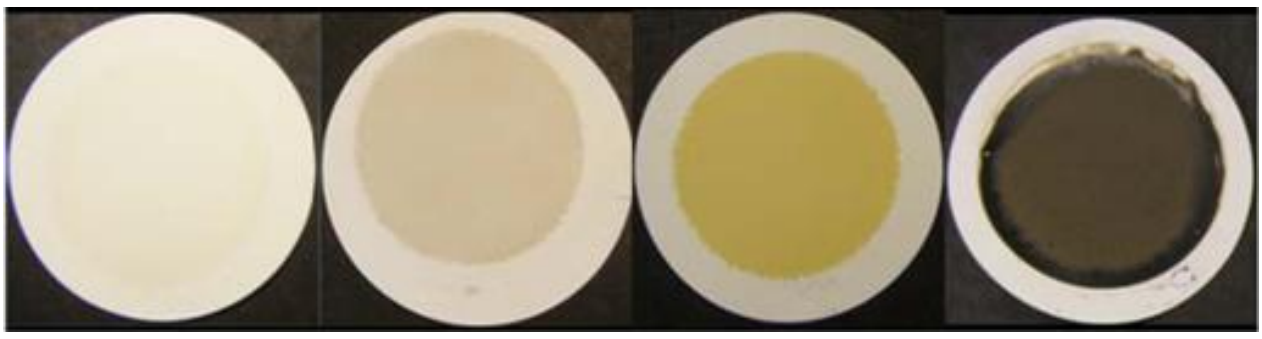
- Oil losses resulting from overflow of a casing or a tank.
- It is conducive to oxidation as a result of an increase in the air-oil contact surface.
- Very strong foaming may bring about a cut-off of the oil pump.

The reasons for excessive foaming may originate from:

- The return of the tank above the oil level.
- A very low volume of oil charge given the oil flow and pressure.
- The need to add antifoaming agents.
- Pollution.
- An intake of air into the oil circuit.

Option MPC : varnish detection

LubAnac MPC includes a membrane patch test to detect the presence of varnish. Turbine oils can run for a very long time at high temperatures. Oxidation products, thermal stress on base oils and additives, contamination by water, presence of air in the fluid, … and many other factors can initiate agglomerates that lead to sludge and varnish. Varnish formation can ultimately lead to breakdown of the turbine. The MPC index determines the presence of dissolved particles in the turbine oil.



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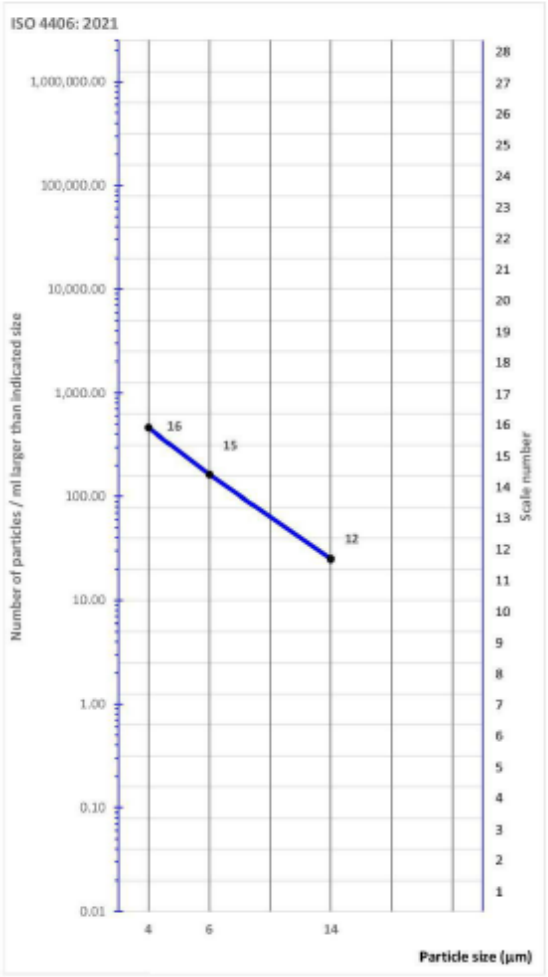
Option LNF

Particle count

The diagnosis report includes the detail on the particle count analysis like the SAE AS4059, NAS 1638 Class or the ISO 4406-2021 count. The automatic measurement is performed by LNF equipment.

Graphic representation of the level of pollution



Reference sample : P99999
Automatic particle counting

Resume of particle counting :

Particle size	Number of particles / 100ml
>4 µm(c)	46,006
>6 µm(c)	16,296
>14 µm(c)	2,500
>21 µm(c)	700
>38 µm(c)	200
>70 µm(c)	0

ISO Code : 16/15/12

ISO 4406: 2021 limits:

Number of particles / ml		Scale number
>	≤	
2500000	∞	> 28
1300000	2500000	28
640000	1300000	27
320000	640000	26
160000	320000	25
80000	160000	24
40000	80000	23
20000	40000	22
10000	20000	21
5000	10000	20
2500	5000	19
1300	2500	18
640	1300	17
320	640	16
160	320	15
80	160	14
40	80	13
20	40	12
10	20	11
5	10	10
2.5	5	9
1.3	2.5	8
0.64	1.3	7
0.32	0.64	6
0.16	0.32	5
0.08	0.16	4
0.04	0.08	3
0.02	0.04	2
0.01	0.02	1
0	0.01	0

Option VI

VI (E)

The option VI foresees the measurement of the kinematic viscosity at 100°C and allows to calculate the viscosity index (extended). It can be used to see if a mixture of synthetic and mineral oil has taken place, but also to compare the used oil with the fresh oil. Turbine oils are available in different viscosity grades, depending on the type of installation. The option VI gives an easy tool to check compliance with the recommendations.

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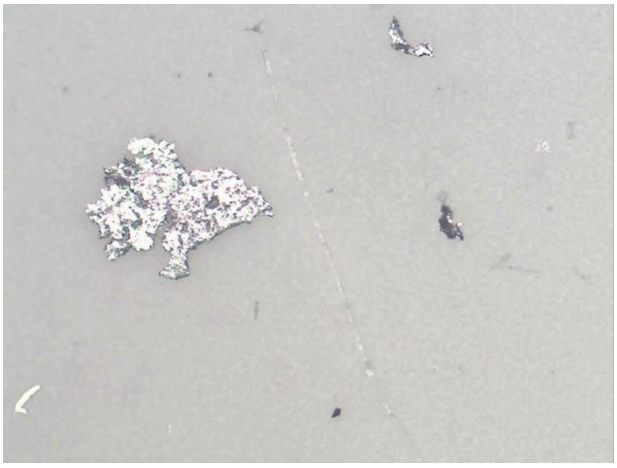
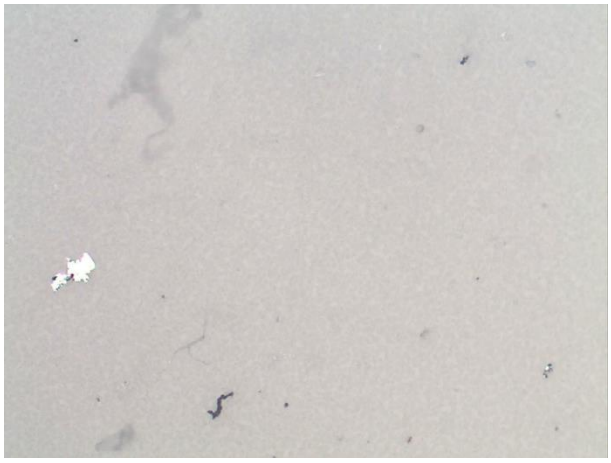
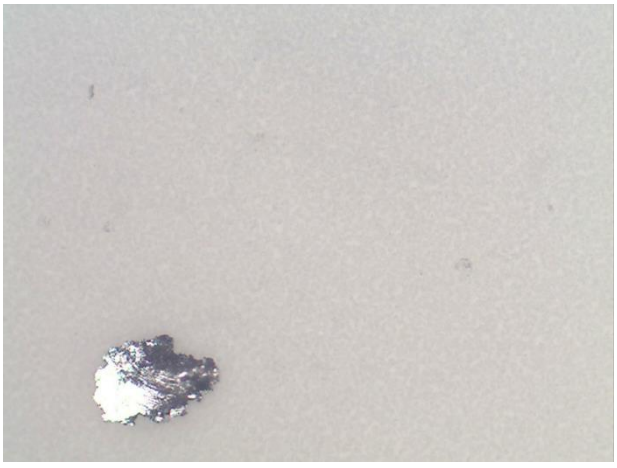
Option OPTIC : visual support on particles

The option **LubAnac OPTIC** includes a photograph under the microscope allowing to determine the nature of the particles and their forms and seizes







PARTICLE TYPE	SIZE MICRON	RELATIVE PRESENCE		
		HIGH	MEDIUM	LOW
Normal friction wear	<20	F		
Fatigue scales	20-50			
Severe wear		F		
Black metallic oxide				
Oxidation products				
Fibers			X	
Mineral pollution			X	
Organic pollution				
Miscellaneous				

F = FERROUS METALS J = YELLOW METALS (COPPER, BRASS...) A = OTHER NON-FERROUS METALS (LEAD, TIN...)
X = LEVEL OF PRESENCE. FOR A MAGNIFICATION OF 140, 1 CM ON PHOTO = 52 MICRONS

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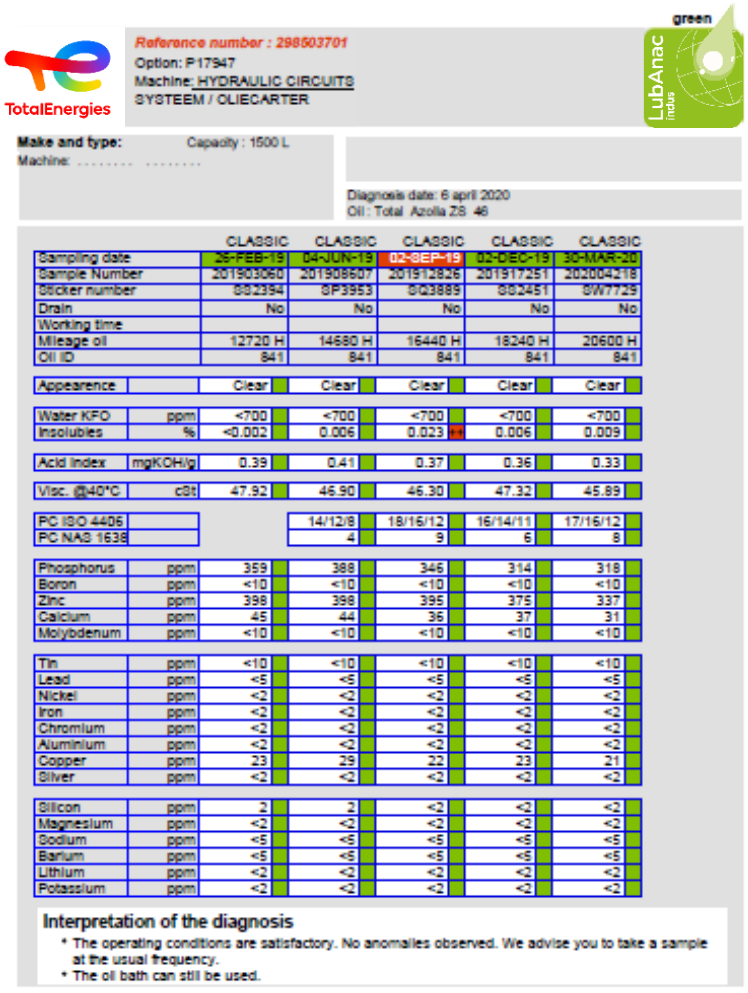
Presentation of results

The diagnosis report is available within 6 working days after reception of the oil sample in the lab and can be dispatched either by e-mail or can be consulted on a secured Internet portal.



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Reference number : 298503701
Option: P17947
Machine: HYDRAULIC CIRCUITS
SYSTEEM / OLIECARTER

green

Make and type: Capacity : 1500 L
Machine: ....

Diagnosis date: 6 april 2020
Oil : Total Azolla ZS 46

		CLASSIC	CLASSIC	CLASSIC	CLASSIC	CLASSIC
Sampling date		28-FEB-19	04-JUN-19	02-SEP-19	02-DEC-19	30-MAR-20
Sample Number		201903050	201909507	201912936	201917251	202004219
Sticker number		682394	SP3953	SQ3889	682451	SW7725
Drain		No	No	No	No	No
Working time						
Mileage oil		12720 H	14680 H	16440 H	18240 H	20600 H
Oil ID		841	841	841	841	841
Appearence		Clear	Clear	Clear	Clear	Clear
Water KFO	ppm	<700	<700	<700	<700	<700
Insolubles	%	<0.002	0.006	0.023	0.006	0.009
Acid Index	mgKOH/g	0.39	0.41	0.37	0.36	0.33
Visc. @40°C	cSt	47.92	46.90	46.30	47.32	45.89
PC ISO 4406			14/12/8	18/16/12	16/14/11	17/16/12
PC NAS 1638			4	9	6	8
Phosphorus	ppm	359	388	346	314	318
Boron	ppm	<10	<10	<10	<10	<10
Zinc	ppm	398	398	395	375	337
Calcium	ppm	45	44	36	37	31
Molybdenum	ppm	<10	<10	<10	<10	<10
Tin	ppm	<10	<10	<10	<10	<10
Lead	ppm	<5	<5	<5	<5	<5
Nickel	ppm	<2	<2	<2	<2	<2
Iron	ppm	<2	<2	<2	<2	<2
Chromium	ppm	<2	<2	<2	<2	<2
Aluminium	ppm	<2	<2	<2	<2	<2
Copper	ppm	23	29	22	23	21
Silver	ppm	<2	<2	<2	<2	<2
Silicon	ppm	2	2	<2	<2	<2
Magnesium	ppm	<2	<2	<2	<2	<2
Sodium	ppm	<5	<5	<5	<5	<5
Barium	ppm	<5	<5	<5	<5	<5
Lithium	ppm	<2	<2	<2	<2	<2
Potassium	ppm	<2	<2	<2	<2	<2

Interpretation of the diagnosis

* The operating conditions are satisfactory. No anomalies observed. We advise you to take a sample at the usual frequency.
* The oil bath can still be used.

Machine and part references,

Sample information

General characteristics

Particle count (option)

Additive elements

Wear elements

Contamination

Diagnosis comments

Global Diagnosis

Client reference

Lubricant reference

Satisfying diagnostic

Slight deviations

Anomaly observed

Dangerous situation

The history of the 5 most recent diagnosis is displayed on the report. Reports are available in 19 languages. It is not possible to mix the history of LubAnac INDUS CLASSIC samples with other LubAnac routines.

A website that helps to manage the park monitoring : lubanac.totalenergies.com
A personal and secured access for:

- the consultation of new reports and history
- the possibility of making queries
- the management of diagnosis data
- the download of the data in Excel or pdf files
- mobile version for smartphones & tablets

Diagnosis and comments

The diagnosis and comments are automatically generated with the support of the LubAnac database. The LubAnac database takes into account the specific knowledge on the operating conditions of industrial installations and most recent lubricant technology. More than 25 years experience in the follow-up of industrial equipment running in the most severe conditions.

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