

KLEENTEK ELECTROSTATIC OIL CLEANERS FOR LUBRICATION AND HYDRAULIC OILS IN MODERN TURBINES.

INTRODUCTION.

Compared with some years ago, the maintenance of lubrication and hydraulic oils in gas turbine has become more important and strategic because the technical features of turbines and their use has changed.

In particular, the temperature of lubrication oil in tanks is far higher than before and this fact speeds up the oil oxidation process and the consequent production of “oil oxidation products” or “soft contaminants”

In addition, the different working conditions (no longer full loaded but rather peaking/cycling turbines instead) make both the lubrication and hydraulic systems more critical.

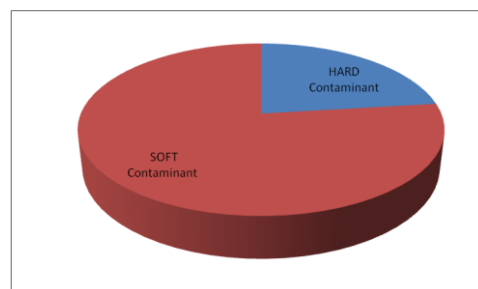
OIL CONTAMINANTS AND VARNISH.

It can be demonstrated that, in turbine oils, the majority of oil contaminants are polymerized oil oxidation products (“SOFT Contaminants”) and that particles (“HARD Contaminants” - due to internal wear and/other external sources) account for only the smallest proportion.

“Soft contaminants” not only account for the majority of contaminants but, being polar (sticky), they are also the most dangerous.

In fact they are absorbed on the metal surfaces throughout the system and form the so called “VARNISH”.

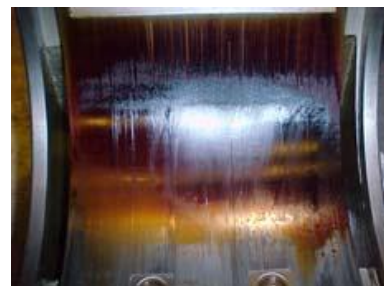
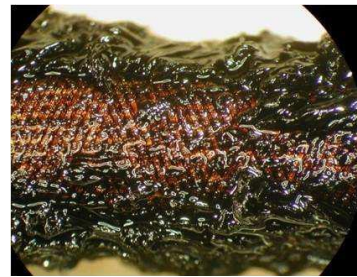
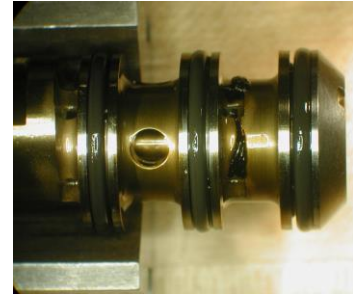
The size of “soft contaminants” is generally smaller than one micron, so it is difficult to detect them by particle counter (ISO 4406 – NAS 1638) and impossible to remove them with conventional filtration systems.



PROBLEMS DUE TO THE VARNISH.

The varnish, being sticky, collects on the metallic surfaces of the components and can cause:

- Valve malfunctioning and/or blockages.
Even a small quantity of varnish affects the proper movement of a valve. This can stop the turbine from starting properly, and in some cases causes a turbine trip.
This phenomenon dramatically affects the turbine's effectiveness and reliability. In most cases this results huge costs.
- The clogging of filters and small bores.
This causes premature, and in some cases repetitive, filter replacements.
- The reduction of heat exchanger effectiveness.
Varnish is an insulating material and therefore it decreases the efficiency of heat exchangers, leading to an increase in oil temperature and greater difficulty in controlling it.
- Wear.
Varnish alone and/or in combination with the finest particles that pass through filters causes the "sand paper effect". That means a dramatic increase in temperature (in case of bearings) and of wear in components (bearings, valves, pumps, gears, etc.)
- Leaks.
Varnish reduces seal life and increases oil leaks.
- Oil life.
Varnish reduces the oil's service life.



- Circuit contamination.
Varnish irreversibly soils the circuits and this leads to costly, time-consuming and non-environmentally friendly circuit flushings. It is like cholesterol in the human body.



VARNISH has a direct, significant and often underestimated impact on a turbine's maintenance and management costs and on its reliability.

KLEENTEK ELECTROSTATIC OIL CLEANERS : THE SOLUTION.

1. The KLEENTEK ELC (Electrostatic Liquid Cleaner) is the only technology able to remove any kind of contaminant from the oil, regardless of its size and its nature. Therefore KLEENTEK is the sole technology also able to remove 100 % of insoluble oil oxidation products (varnish).
2. By removing insoluble oil oxidation products suspended in the oil, the oil itself can remove the deposits accumulated in the circuits or, if the circuits are new and clean, the oil itself can keep the circuits and their components very clean, for the entire service life of the turbine.



KLEENTEK ELC-R200SP-H on GE FR9FA gas turbine.

3. Oil cleanliness is not the main goal, but it is the way to clean circuits and their components (valves, pumps, bearings etc) and to keep them clean.
The use of KLEENTEK electrostatic technology is more effective than changing the oil (without detergent dispersant).
4. The KLEENTEK electrostatic oil cleaner (ELC) is the only technology that does not remove oil contaminants by using a filter medium.
KLEENTEK removal technology is only electrostatic. The oil passes, from the bottom to the top, through a "collector" of coaxial cylinders (made of aluminium and specially developed paper) that act as electrodes. The contaminants are attracted by electrostatic forces and captured in the "collector".

5. KLEENTEK is the sole technology that can guarantee that the oil is not damaged when cleaning, as occurs with any other standard filtration technology. It has been demonstrated that one of the most important root causes of the oil oxidation process is the passage of oil through standard fine filters. This phenomenon was first demonstrated by Dr. Sasaki of KLEENTEK. Now it is the subject of study and research by even the most important (standard) filter makers.

FUNCTIONAL FEATURES OF KLEENTEK ELC.

The KLEENTEK electrostatic oil cleaner:

1. Is connected as a by-pass unit to the oil tank and works 24 hours a day, the all year.

2. Is not a filter, so there is no pressure inside, even in the case of very dirty oils.

That means that there are no safety problems (vibrations, oil leaks, etc.) and that it is not necessary to carry out special checks and/or supervision.

3. It has very low power consumption : from 150 to 1.300 Watts.

That means very low energy costs.

4. The collectors (cartridges) can hold a large quantity of contaminants, without clogging.

That means very low maintenance costs.

5. The KLEENTEK ELC is a very precise and reliable instrument for continuously monitoring the water content in the oil. By controlling the current between the electrodes (in standard conditions with no humidity/water, the current is absent as the oil is a non-conductive material) using an ampere meter on the control panel, it is possible to see, in real time, the presence of even a minute level of humidity/water.

6. If the water content exceeds the level of 500 ppm (even just a few ppm are very dangerous for oil), the unit trips.

KLEENTEK ELC is able to remove up to 500 ppm of water.

7. It does not require any particular maintenance.

That means no unforeseen costs.

8. It is compact, making it very practical and simple to use in all circumstances.

9. It is very simple and very hard-wearing, which means it boasts a very long service without problems.



THE BENEFITS OF KLEENTEK ELECTROSTATIC TECHNOLOGY.

KLEENTEK Electrostatic Oil Cleaners offer significant and unexpected benefits to turbine users, both from a technical and an economic point of view.

- Reliable, trip-free valve performance. Maximum reliability and effectiveness of the whole system.
- Maintenance and running cost reduction.
- Extended oil service life.
- Avoidance of unplanned outages.
- Varnish-free lubrication and hydraulic oil circuits.
- Reduction in bearing and gear wear.
- Improved heat exchanger performance and therefore easier to control oil temperature.
- Extended seal and O-Ring life.
- The elimination of the need for costly system flushes.

The return on investment of KLEENTEK Electrostatic Oil Cleaners is really unmatched and impressive.

Systems often pay for themselves many times over in the first year of operation.

A highly innovative tool, essential for the efficiency and reliability of turbines, KLEENTEK electrostatic cleaner is a strategic piece of equipment which will enhance a company's overall profitability and competitiveness.