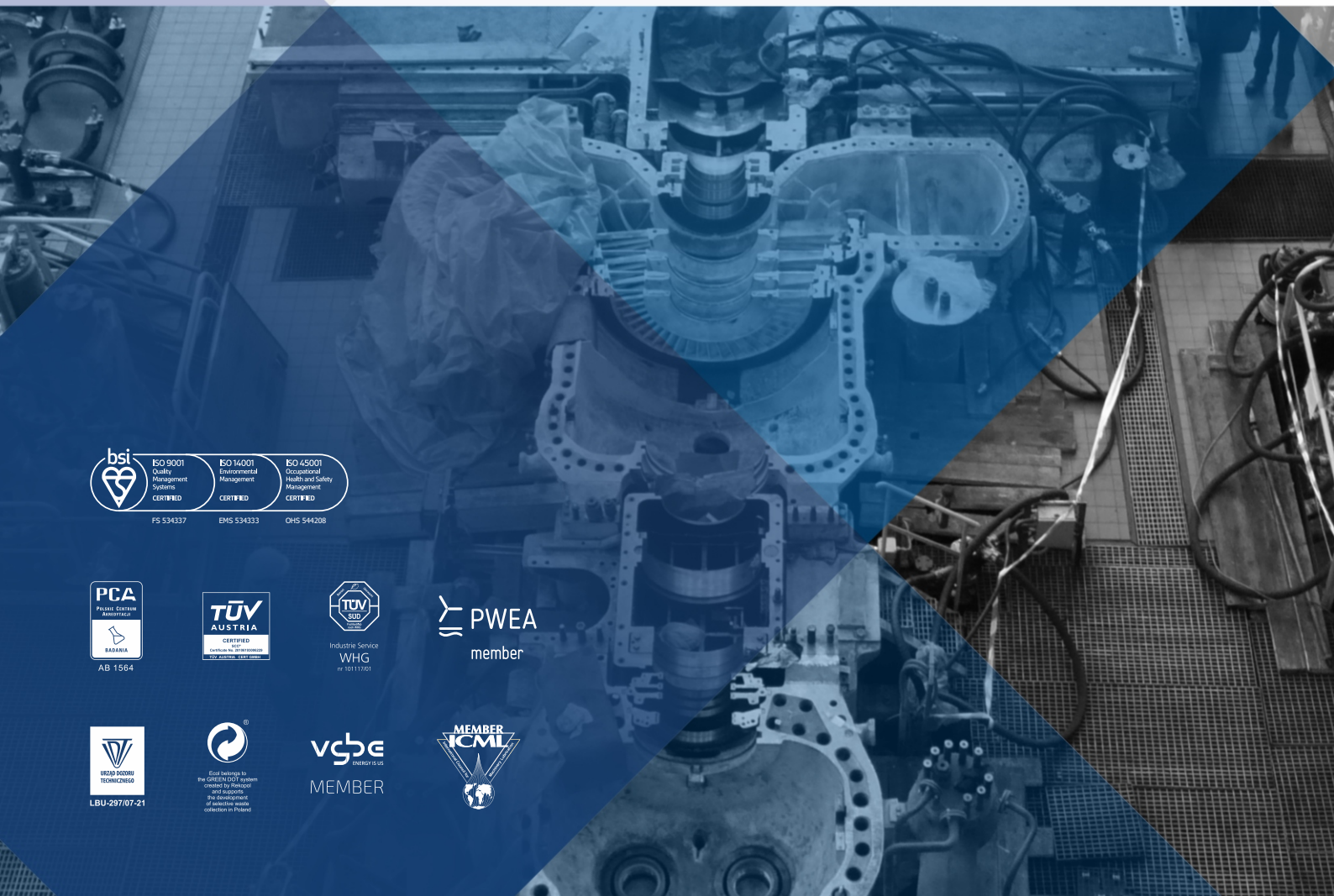




Hydrodynamic cleaning and high velocity oil flushing of steam turbines oil system - technology description



Hydrodynamic cleaning and flushing of oil systems

- technology description

Do You know the cost of exploitation of dirty lubrication system in Your plant?

This cleaning and flushing technology developed by Ecol is the most effective method of preparing new oil systems and restoring operated oil systems, regardless of their size and complexity for future reliable operation.

The process comprises three phases:

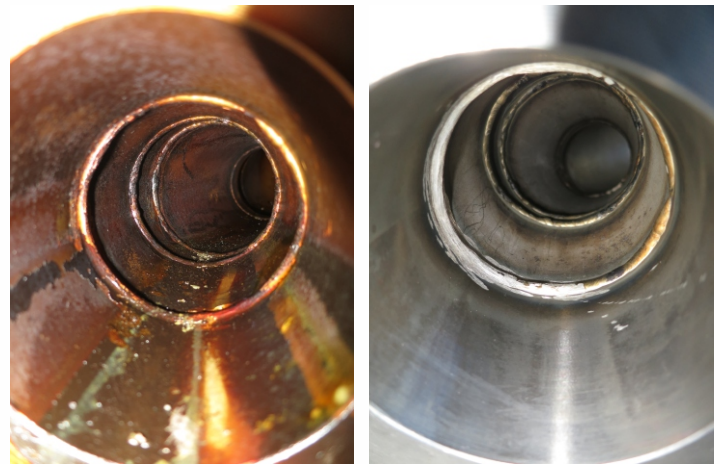
- hydrodynamic cleaning using water at very high pressure;
- flushing of oil system with oil at high (turbulent) flow rates and with full filtration;
- by-pass oil filtration prior to equipment start-up.

The core of this technology is cleaning of all the inner surfaces of oil system with high pressure water jets utilizing suitable nozzles (appropriate for water pressure and tube's diameters), immediate drying and application of protective oil spray to dried surfaces followed by flushing with continuously filtered oil at sufficient pressure and flow rate.

Step 1. Hydrodynamic cleaning of all inner walls of the system using water at high pressure (up to 150 MPa) - hydroblasting

The inner surfaces of the system are blasted with high-pressure water in order to detach soft deposits (products of oil ageing process, sludge, resins and asphalt) and well as hard deposits (such as corrosion, welding slag, varnish residues). The following activities are carried out in the course of the cleaning process:

- high-pressure hydroblasting (operating pressure of 150 MPa) of all inner walls of the pipelines and other elements of the oil system (pipelines - lube, seals, lever and hydraulic systems, coolers and tanks) using suitable equipment (lances and nozzles);
- immediate drying of cleaned surfaces using filtered compressed air;
- application of anticorrosion protection of dried surfaces until flushing (spraying with lubricating oil);
- protection of open connections against secondary soiling until the flushing process takes place.



Oil pipeline interior „before” and „after” hydrodynamic cleaning

This highly advanced technology allows disassembly of only small parts of the oil system (pumps, valves and fittings, cooling radiators, etc). At the end of this phase the system's interior is expected to achieve high level of purity by detaching impurities from inner surfaces of the oil system and carrying them outside the system by means of cleaning water.

Immediate drying of cleaned surfaces using filtered compressed air and application of protective oil layer prevents secondary corrosion of the oil system.

Step 2. Flushing of oil system with fully filtered oil flowing at high rates (turbulent flows)

During this step all impurities that persist after hydroblasting of inner walls are to be removed, while ensuring the appropriate purity of productive oil in the system.

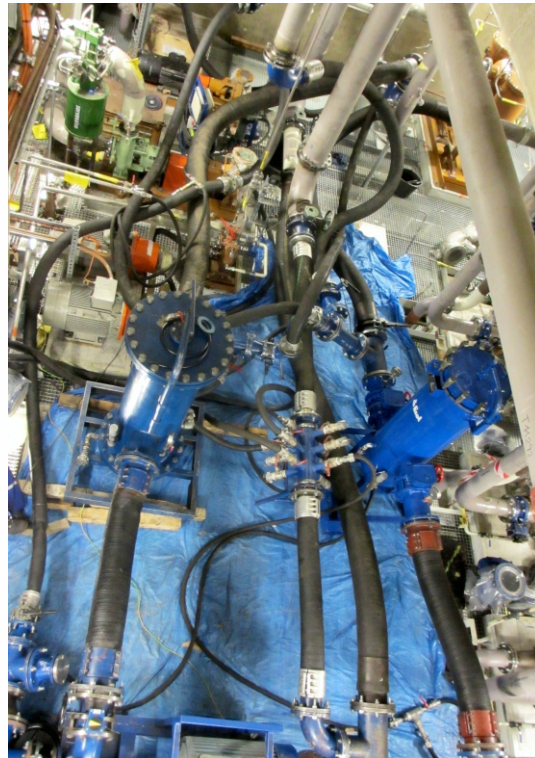
Machine oil system is flushed using special filtration and pumping units (flushing skids with absolute filters) ensuring turbulent flows at flow rates ranging from 13,000 do 20,000 litres per minute. The units have appropriate operating parameters and are connected to the oil system using hoses, manifolds, bearing and servomotors by-passes.

Flushing is performed using fresh oil, which will remain in the system for further use (no need for separate flushing oil). The flushing process continues until predetermined purity criteria are reached in each location in the system. During this time oil temperature and direction of its flow are changed in order to agitate the remaining impurities.

Effective flushing of turboset oil system is based on the following three criteria:

- flow rates at all pipeline sections should be sufficient to invoke turbulence (Ecol technicians monitor flow conditions using ultrasound flow rate meters)
- oil cleanliness class in various locations of the system should be better than 15/12 according to ISO 4406 (measurement of oil purity are taken periodically during the flushing process using appropriate instruments, according to a predetermined schedule)
- no solid particles > 100 µm deposited on control filters installed in strategic locations in the system.

Purity criteria can become more stringent, depending on customer's expectations.

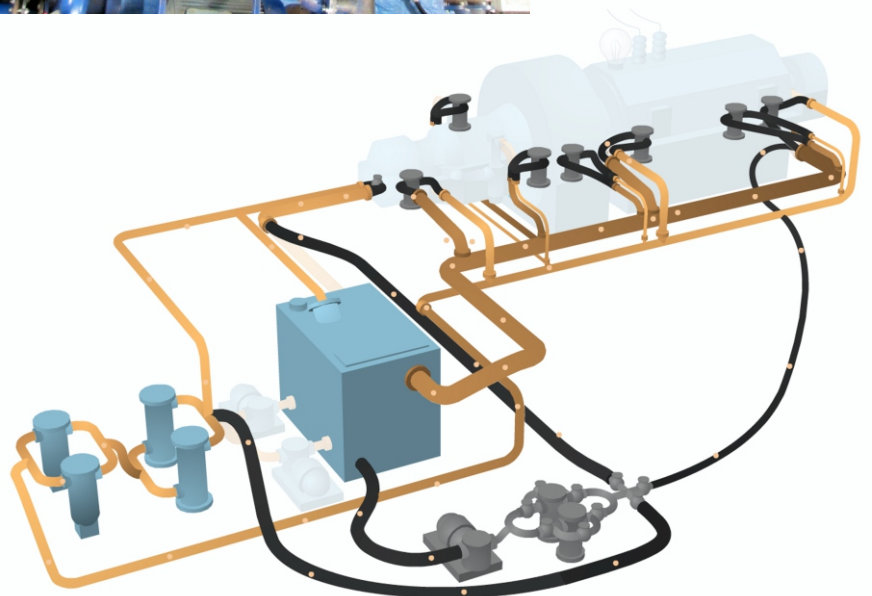


Testimonials:

Since 1993, we have been the largest supplier of specialized services for cleaning and flushing oil systems.

We have hydrodynamically cleaned and flushed with our technology a several hundred oil systems of turbine sets and other devices in Poland and abroad.

At your request, we can provide an up-to-date and detailed reference list.



Step 3. By-pass oil filtering before and during system start-up

In order to remove post-assembly impurities (introduced during works done after flushing) we perform by-pass oil filtration in main oil reservoir before and during system start-up.

The duration and filtration criteria are adapted to operational requirements.

Application of technology

- turbogenerators
- turbo pumps
- turbo blowers and compressors
- power hydraulics systems
- circulating lubrication systems

Our method guarantees the following:

- oil system will retain natural protective oxides layer on the inner walls of the pipeline system;
- long-term system and oil purity;
- reduced wear of lubricated parts and extended MTBR;
- reduced quantities of flushing oil in the process;
- significant reduction of filter insert consumption;
- significant increase in oil durability (reduced quantities of replacement oil);
- higher equipment availability reduced operation cost.

over 30 years of industrial services by Ecol Group



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