

EMYOS



MARK-1 OIL PURIFICATION & REGENERATION SYSTEM

INNOVATIVE OIL REGENERATION SOLUTION FOR TURBINE AND TRANSFORMER OILS



Mobile modular oil-regeneration complex for turbine and transformer oils

Compact mobile system for on-site cleaning, drying and degassing of turbine and transformer oils at thermal and nuclear power plants.

Four-module architecture for flexible configurations

Main purification module with control system plus plug-in turbo-drying, vacuum-drying and ion-exchange modules for acid - number correction - combined as needed for each project.

Online 24/7 operation without turbine shutdown

Connected in bypass to the turbine oil tank, the system runs continuously in parallel with the standard lube-oil system, cleaning oil and flushing control/lubrication lines while the turbine remains in operation.

High-efficiency multi-stage purification

Inline monitoring of cleanliness and moisture, coarse filtration down to 20 μm , dehydration and degassing, followed by electrostatic fine filtration down to 0.05 μm and ion-exchange cartridges to reduce acid number – restoring oil close to delivery condition and extending service life.

Transformer oil treatment for power and distribution transformers

Drying, degassing and fine filtration of transformer oils in de-energized transformers with recirculation until target parameters are achieved, reducing operational risks and extending equipment lifetime.



OUR COMPANY

Our company provides high-performance regeneration services for turbine, transformer and other industrial oils. By extending oil service life instead of replacing it, we help our clients reduce operating costs, minimize waste and improve their environmental footprint.

Proven improvement of anti-wear properties

Electrostatic oil cleaning demonstrably improves the anti-wear properties of turbine oil Turbine oil ISO VG 32 and slows down oil ageing, allowing longer safe operation compared with untreated oil.

Successful operation at major hydro power plants

At Sayano-Shushenskaya HPP, deep electrostatic cleaning of turbine oil restored its properties to the level of new turbine oil ISO VG 32 (in line with ISO 8068 / DIN 51515) and significantly improved the ISO 4406 cleanliness class. This allowed the plant to continue safe turbine operation without oil replacement, reducing oil consumption, lowering operating costs and extending equipment service life.

Transformer oil regeneration and reuse

Expert reports from FSK UES (220 kV substation, Kemerovo) confirm that deep cleaning of transformer oils significantly reduced mechanical impurities and dissolved contaminants, making it possible to reuse in-service oils instead of replacing them.

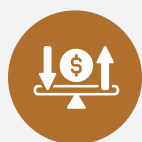
Fleet-wide results at thermal power plants

Biyskenergo reports show that after deep cleaning, turbine oils across several turbine units reached the target ISO 4406 cleanliness classes and maintained stable operating properties comparable to fresh oil. This allowed the units to continue reliable long-term operation without a full oil change, reducing oil consumption, minimising unplanned maintenance and lowering overall operating costs.

Long-term experience at nuclear power plants

Energoatom reports many years of successful operation of electrostatic cleaning units on turbine and transformer oils at nuclear power plants, with stable oil quality over long service intervals and no negative impact on equipment. Continuous in-service regeneration has reduced the need for full oil replacements, lowered oil consumption and waste volumes, and contributed to higher reliability of critical power units.

MAJOR REQUIREMENTS FOR OIL REGENERATION SERVICE



Economic scale

Sufficient volume of turbine / transformer / industrial oils in continuous operation to achieve a clear technical and economic effect from regeneration instead of replacement.



Technical conditions

Safe access to oil tanks and pipelines, standard power supply and connection points for bypass / recirculation so that the mobile unit can be integrated without affecting normal plant operation.



Data & cooperation

Baseline lab analyses and operating data, permission for sampling and monitoring before and after treatment, and joint evaluation of technical and economic results for long-term cooperation.

10+ YEARS OF FIELD OPERATION

Over more than 10 years of field operation, electrostatic oil-regeneration units have treated in total over 100,000 litres of turbine, transformer and industrial oils at power plants, reducing the need for fresh oil by up to 70% compared with full oil replacement and helping extend equipment service life.

PROJECT GOALS



Technical performance

Demonstrate stable oil quality and reliable operation of turbines/transformers with in-service regeneration.



Cost reduction

Quantify savings in fresh oil purchases and maintenance compared with full oil replacement.



Environmental impact

Reduce waste oil volumes and the associated CO₂ footprint by extending oil service life.



Long-term cooperation

Develop a standard service model and data package for scaling oil regeneration across the client's asset fleet.

PREDICTED RESULTS

- **30–50% Fresh oil savings**

Reduction in fresh oil purchases compared with full replacement over the project period.

- **50–70% Waste oil reduction**

Less waste oil generated thanks to in-service regeneration and extended oil life.

- **20–30% Lower lifecycle costs**

Decrease in total lubrication related costs (oil, disposal, downtime, maintenance).

- Baseline: full oil replacement - conventional approach
- With regeneration service - reduced fresh oil and waste
- Lifecycle cost per unit - total lubrication-related costs



OUR PROJECTS



Ukraine & Central Asia

Long-term electrostatic oil-regeneration projects at hydro and thermal power plants in Ukraine, Kazakhstan, Uzbekistan and Kyrgyzstan - turbine and transformer oils in continuous operation.

European Union & Middle East

Preparation of pilot oil-regeneration projects at power plants and industrial sites (turbine, transformer and industrial oils), focusing on a service-based model and scalability.

HOW IT WORKS?

01. Connect & start in bypass/recirculation

The unit is connected to the turbine or transformer oil tank in bypass mode, flow and temperature are set, and circulation is started without stopping the host equipment.

02. Multi-stage particulate cleaning

Coarse and depth filtration plus electrostatic fine purification remove sludge, varnish and solid particles, bringing cleanliness towards ISO 4406 $\leq 16/14/11$.

03. Vacuum drying & degassing (as required)

The VAC module removes dissolved and free water and gases in vacuum mode, stabilising dielectric strength and keeping moisture typically ≤ 8 ppm.

04. TAN correction & final polishing

The ION module lowers the acid number and removes dissolved oxidation products; the oil is then given a final fine-filtration pass and returned to the tank in a condition close to fresh supply (TAN down to ≈ 0.05 mg KOH/g).

ELAIA MARK-1 MAX Dielectric Liquid Purifying System

ELAIA MARK-1 MAX system is a unique technological development that performs high-quality purification of any oils and refractory liquids up to 6 purity class. ELAIA MARK-1 MAX provides a significant extension of the operation of oils, significantly reduces operating costs and, it is important to emphasize, makes a significant contribution to global environmental improvement. The system is an interesting and

effective solution for the energy sector, in particular for nuclear power plants, thermal power plants, hydroelectric power plants and power distribution networks. By means of recirculation in the main oil tank, ELAIA MARK-1 MAX system will provide oil purification without stopping the turbo unit or draining the oil to the “no” water state, and ensure the correction of the acid number of mineral and synthetic oils to the specified parameters.



ELAIA MARK-1 MAX system allows cost-effectively maintain the required cleanliness of industrial and hydraulic oils in the equipment and hydraulic systems of industrial equipment, as well as prevent industrial emergencies in advance.

The system combines unique technologies that allow multi-stage continuous processing of all types of oils, both mineral and synthetic, to the desired parameters of the purity and acidity class without stopping the main production.

Features

- Unique electrostatic purifying method with regenerative filter;
- Purifying of all types of oils on running equipment to the specified purity parameters;
- Draining the oil to the “no” water state;
- Removal of mechanical impurities up to 0.1 microns in size;
- Flushing of systems with removal of aging products of oils;
- Reducing the acid number of the oil to the specified parameters;
- Improving the lubricating properties of the oil;
- Extending the service life of oils at least twice, provided that oil-generating complexes are constantly used;
- Energy-efficient operation;
- Full automation of processes;
- Modular mobile layout;
- Use of materials that are resistant to corrosion;
- Uninterrupted operation period of at least 10 years;
- CE Certified. Compliance with European quality and safety standards.

ELAIA MARK-1 Turbo - Electrostatic purifying module with turbine dryer



Areas of application

- A backup for the regular oil purification station in the system of lubrication and regulation of the turbo unit at the nuclear power plants, thermal power plants, hydroelectric power plants;
- Monitoring and maintaining the cleanliness of working fluids in the lubrication and regulation system of turbine units at pumping stations of main gas and oil pipelines;
- Purifying and draining of hydraulic oils on operating equipment of industrial enterprises;
- Purifying and draining of hydraulic oils on offshore drilling platforms;
- Fine final purifying of base oils at the refinery.

Technical specifications

Performance	4800 L / h.
Degree of purifying in one cycle	more than 50%
Maximum achievable cleanliness class	6
Water concentration after purifying	no more than 8 g/t
Operating pressure	up to 3 Bar
Operating temperature of the inlet liquid	15-80 °C
Supply voltage	3 Ph, 380 V, 50 Hz
Power consumption	up to 4 kW
Noise level	up to 80 dB (A)
Purifying coefficient with no limit on fractions per pass	up to 50%

ELAIA MARK - 1 VAC Electrostatic purifying module with vacuum dryer



Areas of application

- A backup for the regular oil purification station in the system of lubrication and regulation of the turbo unit at the nuclear power plants, thermal power plants, hydroelectric power plants;
- Purification and regeneration (correction of the acid number) of energy oils and refractory liquids of the OMTI type during the PPR of turbine units at nuclear power plants, thermal power plants, hydroelectric power plants;
- Purifying and regeneration of transformer oils;
- Monitoring and maintaining the cleanliness of working fluids in the lubrication and regulation system of turbine units at pumping stations of main gas and oil pipelines;
- Purifying and regeneration of hydraulic oils on operating equipment of industrial enterprises and offshore drilling platforms;
- Purifying and regeneration of vacuum oils.

Technical specifications

Performance	4800 L / h.
Degree of purifying in one cycle	more than 50%
Maximum achievable cleanliness class	6
Water concentration after purifying	no more than 8 g/t
Operating pressure	up to 3 Bar
Operating temperature of the inlet liquid	15-80 °C
Supply voltage	3 Ph, 380 V, 50 Hz
Power consumption	up to 4 kW
Noise level	up to 80 dB (A)
Purifying coefficient with no limit on fractions per pass	up to 50%

ELAIA MARK-1 Turbo - Electrostatic purifying module with turbine dryer



Areas of application

- If it is necessary to reduce the acid number of oils, an ion exchange module is deployed.
- Cartridges with ion-exchange resin and a vacuum dryer are used to effectively correct the acid number in the oil being purified.

Technical specifications

Performance	4800 L / h.
Degree of purifying in one cycle	more than 50%
Maximum achievable cleanliness class	6
Water concentration after purifying	no more than 8 g/t
Operating pressure	up to 3 Bar
Operating temperature of the inlet liquid	15-80 °C
Supply voltage	3 Ph, 380 V, 50 Hz
Power consumption	up to 4 kW
Noise level	up to 80 dB (A)
Purifying coefficient with no limit on fractions per pass	up to 50%



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