# REOIL System

### Oil Regeneration and Re-Adsorption Plant REOIL

**Application:** This plant type combines two approved technologies:

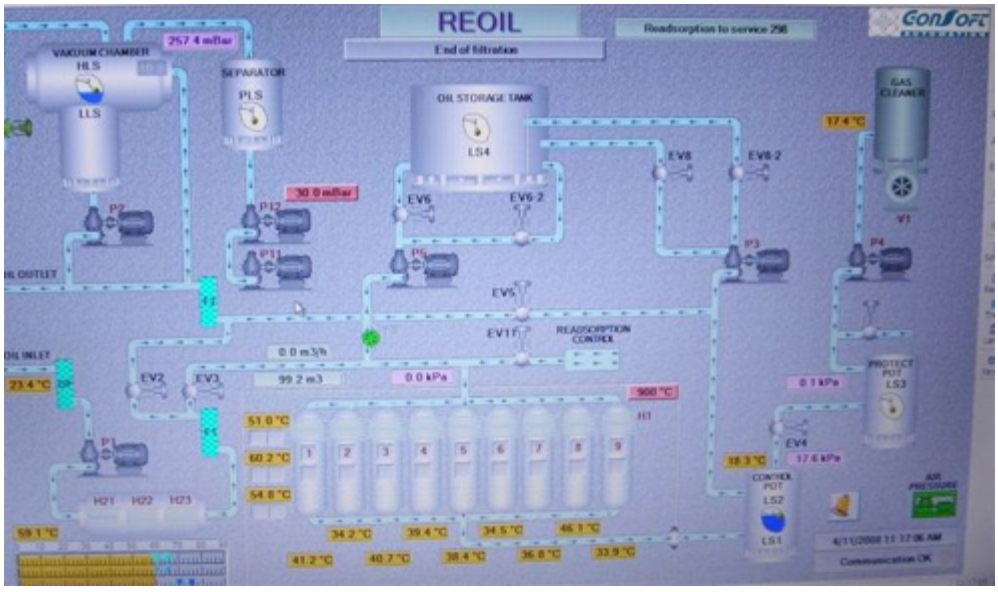
**Regeneration Unit (RU):**
Regeneration of aged oils by adsoprtion and reactivation of saturated adsorption clay by thermal treatment.

**Purification Unit (PU):**

Oil Purification System VOP

Both units are normally installed in a container.

If the adsorption clay reaches its maximum saturation, the RU is automatically separated from the PU. While the PU is further on treating the oil (degassing, dehumidification and filtering), the RU starts to reactivate the saturated adsorbens. As soon as this process is completed, the RU is again connected with the PU for normal operation (treatment an regeneration).




Depending on the quality of the adorbens clay it can be reactivated up to 250 times.

# Oil Regeneration unit

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Our General Conditions of Contract for the Supply of Plant and Machinery (GCCSPM) given hereafter form an integral part of this offer. They are binding in all respects unless otherwise expressly agreed upon in writing. Special conditions which are contrary to these GCCSPM are only valid only if made in writing. Thanking you for your kind attention, we are looking forward to your early reply and confirmation of offer.

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## *Application of the Plant*

The driving force behind the development of the REOIL Technology was the ability to economically fully regenerate used transformer oil.

Its main application is a removal of acidity, sludge and other soluble oil decay products while leaving the oil in the quality exceeding requirements of international standards for new oil. The concept of oil regeneration is highly cost effective. There is no need to bring new Activated clay and remove quantities of oily saturated clay away from a site. Plants control system offers the highest standard of safety and reliability. Ekofluid's REOIL technology is environmentally safe and sound.

## *Process description*

During regeneration process, deteriorated oil is being passed through an adsorbent media such as Activated clay. As the adsorbent media removes the contaminants (products of deterioration) from the oil, the clay gradually becomes saturated and its regeneration efficiency is reduced. At this point, in the conventional technology clay must be replaced. REOIL technology enables multiple use of the same clay - up to 250 times. This multiple use of clay is allowed by its "readsorption". REOIL technology consist from a cyclic two - phase procedure. A regeneration phase which is followed by a readsorption phase.

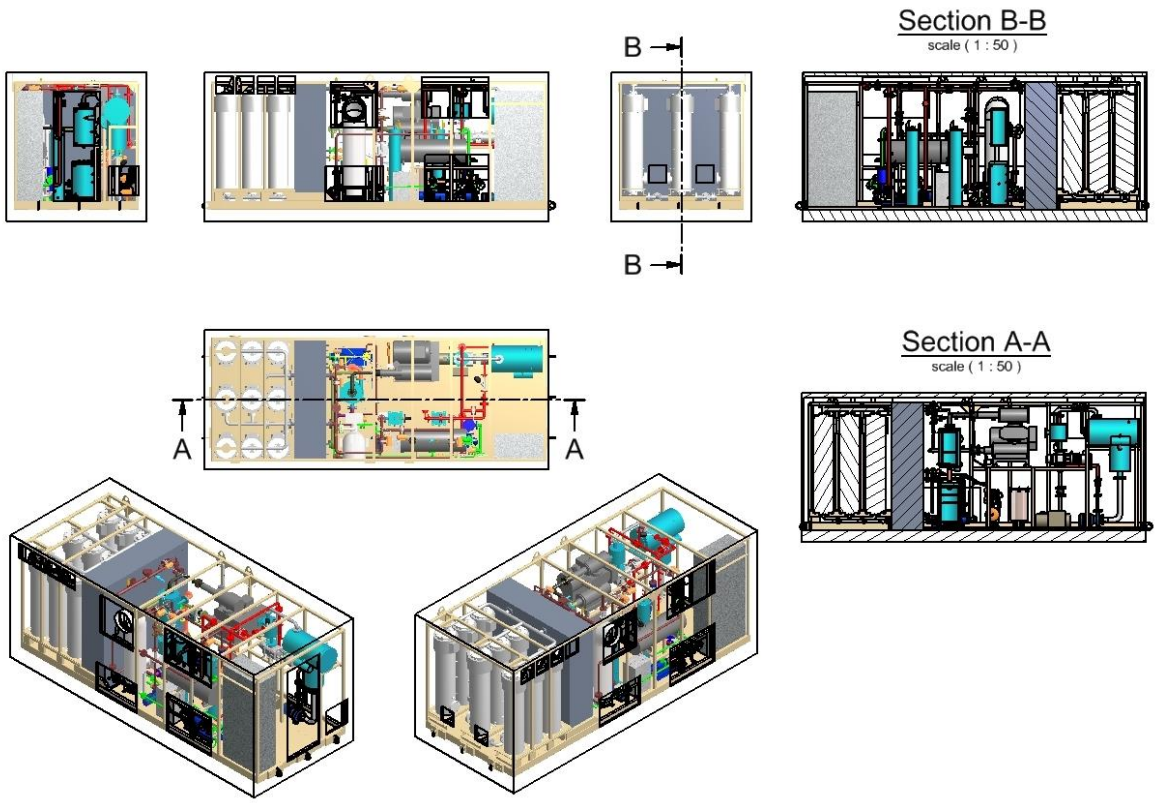
**Regeneration phase**

The mechanism of regeneration is along the principle of adsorption. Adsorption is the adherence of molecules or ions of any kind to the surface of solid. The higher attraction forces are and larger the surface of adsorbent, the greater capacity of adsorption. Activated clay structure is highly porous and its active surface reaches more than 100 m2/g In this phase, the oil coming from transformer or used oil tank is pumped to percolation columns. There, by forced percolation through clay, permanently installed in columns, is regenerated. After regeneration, the oil is in Oil treatment plant filtered by fine filter and then it is directed to a vacuum chamber where it is degassed. After degasification of oil within the vacuum chamber, oil is discharged back to the transformer or regenerated oil tank.

**Readsorption phase**

After certain time, and having circulated nominal quantity of oil when clay as adsorbent is saturated by contaminants and regeneration is no longer efficient "readsorption" will bring clay to its original state. Readsorption is a special procedure where the clay is with control of selected parameters (temperature, pressure, time...) desorpted and as like "new" can be used again. This allows that clay is permanently embodied in the percolation columns and by this mechanism is repeatedly readsorpted. At the beginning of readsorption phase, as following sequence of regeneration, amount of the oil is trapped inside of the clay. Recovery and collection of this oil is a part of readsorption. Oil is through control pot, gradually collected in a holding tank. At the same time intensive desorption process of adsorbent media (clay) is taking place. After readsorption, recovered oil is used in new regeneration phase.

## *Technical data*




| REOIL 5000-9 | Dimensions | Value |
|---|---|---|
| Length | mm | 5800 |
| Width | mm | 2150 |
| Height | mm | 2220 |
| Weight | kg | 9000 |
| | | |
| **Oil throughput** | | |
| oil flow min. | l/h | 1000 |
| oil flow max. | l/h | 5000 |
| air max pressure | bar | 8 |
| | | |

| | | |
|---|---|---|
| **Connecting pipe dimensions** | | |
| oil inlet | DN | 32 |
| oil outlet | DN | 32 |
| exhaust pipe of vacuum pump | DN | 50 |
| | | |
| Operating oil temperature | °C | 65-70 |
| | | |
| **Filter specifications** | | |
| Coarse filter | micron | 150 |
| Fine filter F1 | micron | 10 |
| Fine filter F2 | micron | 0.5 |
| | | |
| **Electrical power consumption** | | |
| Electric heater columns | kW | 44 |
| Electric heater steps | kW | 3 x 36 |
| Electrical motor for pump P1 | kW | 2,2 |
| Electrical motor for pump P2 | kW | 2,2 |
| Electrical motor for pump P3 | kW | 0,55 |
| Electrical motor for pump P4 | kW | 4 |
| Electrical motor for pump P5 | kW | 0,55 |
| Electrical motor for pump P11 | kW | 1,5 |
| Electrical motor for pump P12 | kW | 1,1 |
| | | |
| Audio pressure level (DIN 456335) | dB(A) | < 75 |

## *Guaranteed data for new oil*

Guaranteed data and capacity measuring are based on mineral oil like Shell Diala Oil D (new oil). Other oils may result in a deviation of the measured values / the capacity data.

| Property (Unit) | IEC 60422 value |
|---|---|
| Dielectric strength (kV/2,5 mm) | ≥ 50 |
| Dielectric dissipation factor at 90 °C | < 0,01 |
| Neutralization number (mg KOH/g) | < 0,03 |
| Water content (ppm) | < 30 |
| Interfacial tension (mN/m) | > 35 |

## *Operator requirements*

One or two operators are required to set-up the operation. Once the system is engaged, only to monitor the system is needed. The system is so user friendly, that the operator typically requires 1 - 2 hours per day of labor. Operators' main role is to control the system by global commands - via the keyboard. Although the system is sophisticated, the commands are kept simple - start, stop ... and do not require an advanced level of computer background. Actual starting, stooping and other program executing are control by PLC. The system can only be accessed when the operator has logged himself on via his own password.

## *Plant control*

REOIL® unit is controlled by Programmable Logic Controller (PLC) and interfaced with Supervisory Control and Data Acquisition (SCADA) computer system. Due to used computer systems only two operators are required for set-up. Once the system is engaged only one operator is required to monitor the system.

## *Optional Equipment*

### OE 1 1 CONTAINER 20ft


The whole oil treatment and regeneration plant is housed in a 20Ft. high strength steel container customized. The customized enclosure comes complete with access doors and vents.

This option is necessary for the enterprise of an on-line oil plant construction according to special standards against surcharge.

- Air conditioning (Optional upon request).
- SCS Certificate for sea transport (Optional upon request)

### OE 2 1 TRAILER with metal housing

Built according to European Union standards without local road permission. For the road transport of the dressing plant. The housing consists of lightweight construction material (e.g. aluminum, wood or plastic) with all necessary doors and service flaps. Maximum driving speed 80kmh

Type: GETO-Therm 25 (LPS28L7450)
(Lightweight construction material in sandwich construction )

Dimension: (mm)

| | |
|---|---|
| -Length (total) | 13540 |
| -Height | 2600 |
| -Wide | 2480 |
| -Height on trailer base | 1200 |

Weight of trailer: (kg)

| | |
|---|---|
| - max. Total weight | 28’000 |
| - max. trailer weight without plant | 10’000 |
| - max. axle weight incl. plant | 18’000 |

The trailer is equipped with all necessary door and openings for service of plant. Internal light according EG 2x7 pol connections. Side protection according EG norms

The chassis are completely sand-plastid and two component painted. REOIL unite will be installed into trailer at manufacturers place in Germany.Trailer will be supplied including TüV Approval and Certificate

Note:
Company Logo and special colors against separate offer and will not be included in our basic price. Construction according to special standards against surcharge.

## OE 3 2 flexible hoses each 15m (standard)

Each 15 m long, DN32 for max. oil temperature 90°C, in oil and vacuum-tight design. Flange connection on transformer side and quick coupling at the side of the plant.
The quick coupling can be closed by hand only. Vacuum proof with a leakage rate = 0.025 mbar/lt per second.

Note:
Other hose lengths or types may be ordered against additional cost.

## OE 4 Online Tan Delta Measuring

With the Tan delta Online measuring instrument it will be possible to measure actual value ether on the inlet or outlet of the plant. The Online measuring data's will be shown on the PLC Screen.

All information will be stored and can be printed out.

## OE 5 Online Oil Measuring Device , Type TransCom X

The Online measuring device serves continuous measurement of the following parameters for napthen based mineral oil at 60°C:
(according International Standard IEC 60422 / 60296)
Standard measuring oil outlet data:
Loss angle (tan δ) : IEC 60247
Moisture content (ppm) : IEC 60814
Breakdown voltage (kV/2.5cm) : IEC 60156
Now it is possible to measure the actual values of the most important parameters of mineral transformer oils online and real-time.

Scope of delivery:
Online Measuring Cell MF-100M, Transducer MF-3-AL, Computer HP-TransQM, IPC Screen incl.Software and automatic measuring process control by PLC.

Optional:
See OE 5 Vaisala parallel (at same time) measuring of moisture content (ppm) on the inlet of the plant (Outlet of transformer)

## OE 6 1 Moisture contend measuring instrument with one (1) probe

New intelligence for continuous on-line measurement of moisture in oil. Versatile configuration options including graphical trend display with 1-year history.
The moisture probe can be installed on the inlet or outlet of the oil treatment plant. If both inlet and outlet measuring is requested 2 moisture probe are required
Measuring :
Channel 1: –20 to 100°C
Channel 2: Relative humidity

## OE 7 ONLINE SUPERVISON FOR REGERATION ON ENEGISED TRANSFORMER

Online supervision device.
Comprising:
- 2 Automatic controlled valves
- 1 Automatic bypass valve
- 1 Oil level supervision device
- 1 Air trap (optional 2pc)

Automatic online process control separates in case of a malfunction transformer from REOIL plant.

## OE 8 1 SET OF SPARE PARTS

Sufficient for 2 years of maintenance of the plant (without commodity wares)

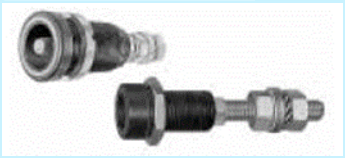
## OE9 MOTORIZED CABLE REEL

Electrical driven cable reel with 4 separate segments for 40m power cable of D 22mm.
The speed of motor for the reel will be controlled by a food switch. Each cable can be loaded and reloaded separately.
Dimension of the reel: LxBxH ca.950x700x800

Technical data of motor

| | |
|---|---|
| Tension: | 230/ 400V |
| Current: | 2.3 / 1.4 A |
| Capacity: | 0.55kW |

## OE10 POWER CABLE WITH POWER LOCK SYSTEM



Power cable 4X 70mm2 each cable with a length of 40m
Type Purwil 3 wire plus PE

Power lock system for each cable.
Femal will be mounted into separate connection box.
Male is connected to each power cable

Note: The cable plug system can be used with at the motorized cable reel (OE 9)

Separate connection box is not included in this offer

## OE11 COMMISSIONING AND TRAINING

Upon request we can offer commissioning and training on the REOIL plant.
The cost will be depending on the final destination where the training takes place.