

FILTERALL LIMITED

Operation Overview OP211

Mobile Transformer Oil Regeneration Plant Type "MRP"

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NOTE :

The purpose of this document is to acquaint the client with the quality of control and operating system on our regeneration plants. This is not a substitute for the Operating Instruction Manual.

1. General

Mobile transformer oil regeneration plant (see also [Specification S211](#)) has been designed to regenerate transformer oil in service, or used transformer oil to the quality exceeding requirements of international standards for new transformer oil.

Transformer oil can be regenerated on-site (in energised or de-energised transformers) or in oil storage tanks.

Oil regeneration in transformer requires 8 to 12 recirculations of total volume of transformer through the plant at a temperature of 60 to 70°C. Oil regeneration from used oil tanks to clean oil tanks is done in a single pass through oil regeneration plant.

Transformer desludging is similar to transformer regeneration except number of oil recirculations is extended to 40 and up to 60 at a temperature of 80 to 85°C. Sludge, which was settled on internal surfaces of transformer, will be dissolved by transformer oil itself, and retained in oil regeneration plant.

2. Computer Control and Supervisory System

Operation	Operation of mobile transformer oil regeneration plant is controlled by Process Logic Controller (PLC) and monitored by Plant Supervisory system (PSS). Operation is displayed on the screen of 386 computer. Vital operating data are logged on a hard disk. Operator's commands are executed via the keyboard.
Automated operation	Operation of oil regeneration plant is fully automatic with provision for manual override of all necessary functions. Manual override is intended primarily for commissioning, maintenance and troubleshooting purposes.
Unattended operation	An unattended operation of regeneration is possible, since in addition to all vital alarm conditions, a fire protection alarm (and plant shutdown) is incorporated in to the control system. A total of 20 temperature points, 6 level points and 12 pressure and differential pressure points are monitored every 15 seconds on this plant.
Operating procedures	Operating procedures such as start up, normal operation, shut down, etc. are executed automatically according to operator's commands.
Alarm systems	A system of alarms and interlocks is in force during fully automatic operation as well in manual override mode.
Oil level	Level of oil in transformer is monitored by PSS . Level transducer is installed by an operator at any available opening at the bottom of the transformer and actual level is displayed on a computer screen. If during degassing or regeneration level of oil drops below the preset limit specified by operator, fatal alarm is activated followed by immediate degasser shut down.
Transformer filling	If regeneration plant is used for transformer filling, operator can preset desired level of oil in transformer, which will then be displayed on the computer screen. Progress of filling can also be watched on the computer screen. After preset oil level is reached operator will be alerted by audio visual signal and filling operation can be discontinued automatically.
Environmental protection	PLC in conjunction with PSS offer a highest degree of reliability in oil spillage protection during automatic or manual operation. Any oil leakage from various interface devices such as relief valves, dearators, vacuum pumps, etc. is monitored by level sensing devices and any initial small spillage is contained within the plant. If there is an indication of an oil spillage plant will shut down immediately. As a secondary oil spillage protection whole plant is installed on a leak proof skid and any oil leakage is monitored by oil spillage sensors. Third level of oil spillage protection is the trailer itself, with its 100 mm high, fully welded leak proof sides.

3. Oil Regeneration and Degassing

Regeneration & dehydration

Transformer oil is regenerated and dehydrated by a percolation through activated clay which is packed in regeneration columns. Duration of oil regeneration can be selected by operator. He can select number of hours or litres he intends to process. After pre-set limit is reached, the plant will automatically commence clay reactivation (clay purging) cycle.

Clay reactivation

Clay reactivation cycle continues for 16 hours. After this time oil regeneration commences automatically or plant waits for operators instruction, depending on whether operator selected continuous or one cycle operation.

Oil degassing

Oil degassing is always on when oil regeneration is on. It will continue (if selected by operator) during clay reactivation time. The purpose of continued degassing is to keep heated oil in motion in transformer, to facilitate washing of transformer surface and dissolving sludge sediments.

Automatic start up

After operator has connected inlet/outlet oil hoses to the transformer and established correct position of manual valves, he will initiate plant operation by pressing function key "**start**". Automatic start up sequence will commence and within five minutes plant will be in full operation, provided there is no fatal alarm condition (see operating and instruction manual for details).

During automatic operation **PLC** and **PSS** will control and monitor all operating functions. Any deviation from normal operating conditions will be indicated by small (audio visual) alarm.

Automatic Operation

Dangerous situation will evoke a fatal alarm and plant will shut down immediately. In any alarm condition operator will be advised by message on computer screen of alarm details and will find necessary recommendations for corrective action by looking at the help menu on the computer screen. After appropriate corrections have been carried out the plant will be restarted by pressing function key marked "**restart**". When restart button is pressed plant will commence normal operation within one minute.

Automatic Shut Down

By pressing function key marked "**stop**" operator will initiate automatic shut down procedure. Plant will shut down in six minutes, this period incorporates necessary cooling of heat exchanger and thermic heater. For full details see operating and maintenance instruction manual.

**Emergency
or Fatal
Alarm Shut
Down**

If the plant is shut down by operator pressing emergency button or by fatal alarm the shut down is immediate. After completion of necessary corrections operator can restart plant without any danger of over temperature or any other adverse effects. **PLC** and **PSS** will ensure that restart even after emergency shut down is safe.

Operator can select various operating modes or duration of processing or degassing operations such as:

**Operation
Mode
Selections**

- Operating temperature.
- Duration of regeneration.
- Duration of degassing.
- Etc.

**Data
Monitoring**

During regeneration and degassing operations all vital information such as operators name, operating temperature, operating vacuum, starts and stops, alarm details, etc. are logged on hard disk of the computer and can be extracted in the form of printed reports as and when required by supervisory personnel. Also oil quality data such as KV, moisture, acidity, etc. can be entered into computer by operator.

4. Diesel Generator Operation (Optional)

Diesel generator is started by a key switch and thereafter will operate automatically and independently. **PLC** will monitor duration of generated power or auxiliary power supply as well as any interruptions in power supply.

5. THERMIC HEATER OPERATION (OPTIONAL) (Optional)

Thermic heater is started by a two position key switch by operator. Thereafter it will operate automatically and independently. Temperature settings and any alarm conditions will be controlled and monitored by **PLC** and **PSS**.

6. Hose Reel Operation

Oil inlet and outlet hoses can be unwound or wound on motorised hose reels by wireless signal from transmitter carried by operator. In addition to motorised winding or unwinding there is also free wheeling override as and when required.

End of winding and unwinding is controlled by appropriate limit switches and cannot be overridden by an operator.

7. Oil Test Data - Processing

Oil test data from treated transformer such as KV, PPM and vacuum can be entered into computer by operator in regular intervals. **PSS** will log the time of entry and the value of the test. This information can be extracted by a supervisor in the form of a time related graph.