

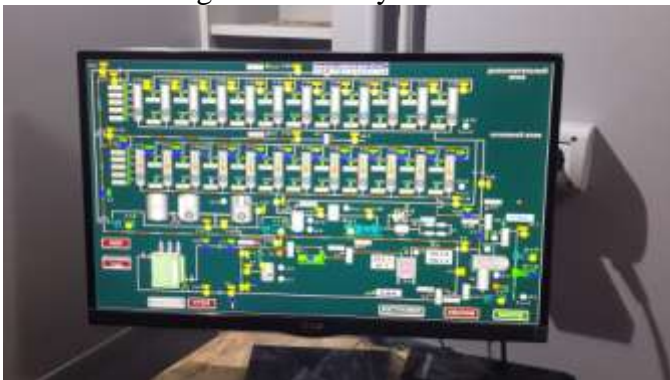
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## **CMM-R6 Fuller's Earth Transformer Oil Regeneration Unit**

Currently, over 40% of transformers used at energy facilities are older than 25 years. Annual transformer failure rate has a tendency to significant growth.

Regardless of the different approaches to failure analysis, the conclusions are that the most vulnerable parts of a transformer are the main insulation of windings, tap changers and bushings.

Replacement of all transformers after long service life is prohibitively costly. More importantly, the actual service life of most transformers is far from over. It can be **extended**, still maintaining the reliability of the transformer.



The **CMM-R** transformer oil regeneration unit has been developed to extend transformer service life by restoring the dielectric strength and chemical composition of electrical insulation oil.

В процессе восстановления масла из The process of restoration involves removal of oil decomposition products and acidic compounds of the oil, which increases its oxidation stability and reduces gas solubility.

The unique feature of the CMM-R unit is the capability to regenerate insulation oil directly in a transformer, which can still be operated online at the time of treatment. Processing oil in an on-line transformer allows removal of sediment from winding insulation and its extraction by sorbent.

Another feature of the regeneration unit is the Fuller's earth sorbent with multiple reactivation capability. This allows continuous oil processing without the need to stop and change or replenish the sorbent load.



The process of oil regeneration involves passing the oil through the micro porous sorbent for "molecular filtration", removing harmful substances and oil degradation products and trapping them in sorbent granules.



When the sorbent is saturated, the unit switches to **sorbent reactivation mode**. This process clears the pores of the sorbent, removing all contaminants into a special collection tank and a charcoal filter.

The sorbent can be reactivated approximately 300 times, in terms of lifecycle this means 1.5 – 2 years of operation.

When the sorbent is completely exhausted, it poses no environmental hazard and can be disposed of in a regular manner.

Oil regeneration has shown good results of oil processing.

The technology has proven to be very efficient and effective.



### **CMM-R6 unit (transformer oil regeneration with sorbent reactivation capability)**

When regenerating operational transformer oil with this process, the dissipation factor of the oil is significantly reduced and corresponds to that of fresh transformer oil.

This equipment allows to reduce acid number of transformer oil to the regulated values. A special feature of the process is the reduction of soluble and insoluble sediment. This sediment is harmful in that it deposits in the cellulose insulation, being much more acidic than the oil. The oil has a tendency to precipitate acidic products which then concentrate in the paper insulation. The acidity of the oil then changes very slowly. Further growth of oil acidity accelerates and is accompanied by formation of insoluble sediment and water-soluble acids.

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**CMM-6R with degassing and purification systems and operator compartment**



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**CMM-R design and operation  
CMM-R6 specifications**

*Application.* The CMM-R6 mobile oil unit is designed for regeneration of transformer oil.

**Table 1**

Parameter	Unit	Value
Maximum flow rate	l/hour	4000
Nominal flow rate, max	l/hour	1000
Max allowable oil temperature	°C	90
Operating pressure in the system	bar	2,5
Fuller's earth load	kg	900
Max power consumption	kW	27
Power supply		
Phases		3p+1N+PE
Voltage	V	380
AC frequency	Hz	50 - 60
Connections		
Oil inlet	DN	32/Camlock C125
Oil outlet	DN	32/Camlock C125
Reactivation exhaust	DN	50
Filter elements		
фильтр	ηm	0,3
Dimensions/no trailer		
Length*	mm	3500
Width*	mm	2090
Height*	mm	2110
Weight*	kg	6000

\* Processing rate and the amount of processed oil depends on initial oil quality

**Attention! Reduce supply rate depending on the initial oil acidity. Recommended nominal processing rate is at or below 1000 liters/hour**

*Scope of supply*

**Table 2**

No	Item	Quantity
1	<b>CMM-R6 unit assembled:</b>	<b>1</b>
2	<b>Operational documentation:</b>	
	- operator manual with certificates	<b>1</b>
	- component part manuals	<b>1 kit</b>

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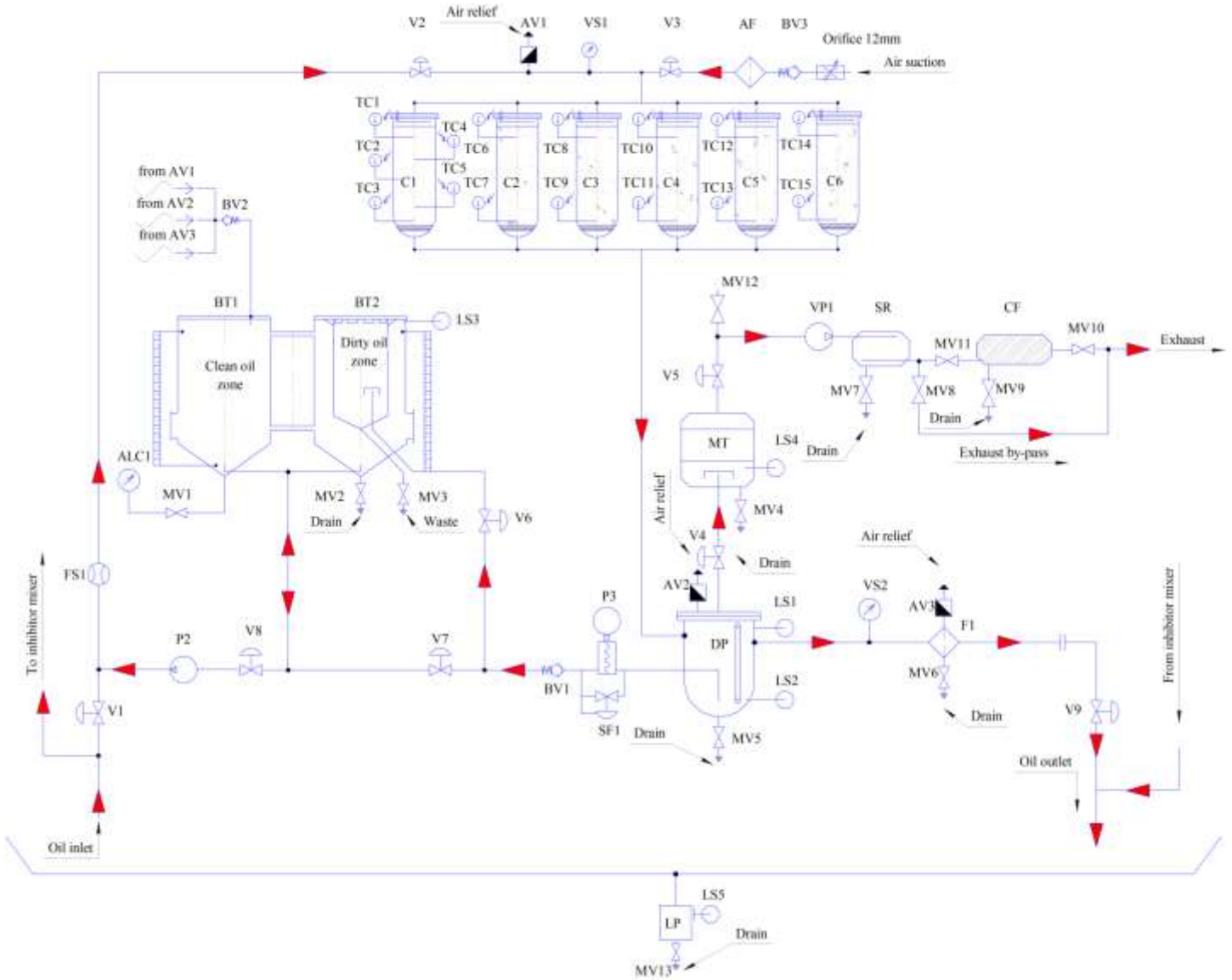
## Unit description

The unit is based on a frame supporting vessels, tanks and pumps.  
The regeneration unit consists of sorbent columns, buffer tanks and sorbent reactivation system.

The regeneration unit restores the chemical composition of the oil. Oil is restored by the sorbent. The sorbent can capture oil decomposition products, improving its color and dielectric performance.

### The process and component functions

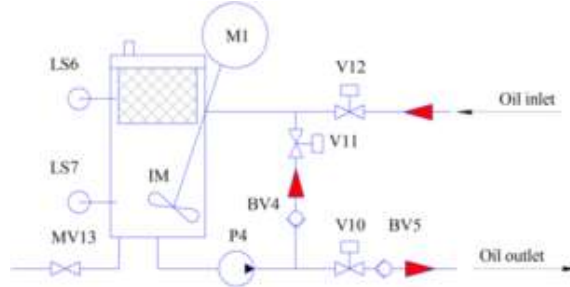
The controls are shown in the diagram, which indicates the primary hydraulic, pneumatic and vacuum devices, as well as fluid flow directions.



**Oil regeneration section flow diagram**

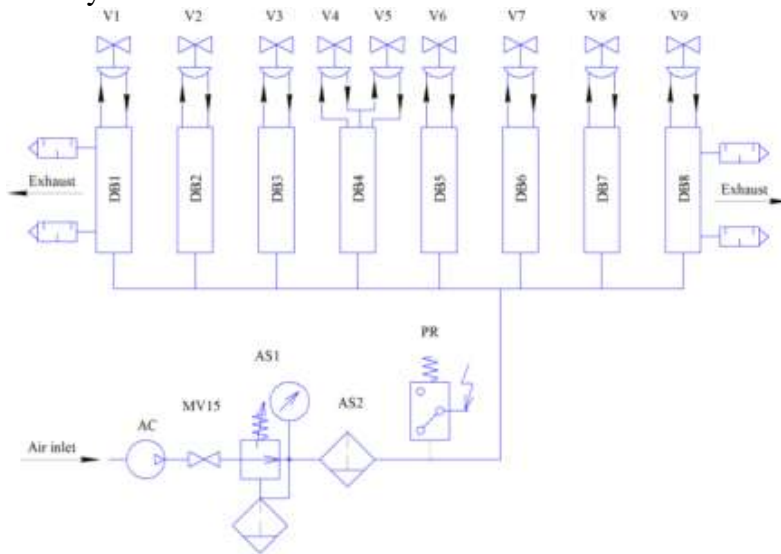
**Inhibitor injection system**

The inhibitor injection system is a device to mix the oil with an anti-oxidant additive.

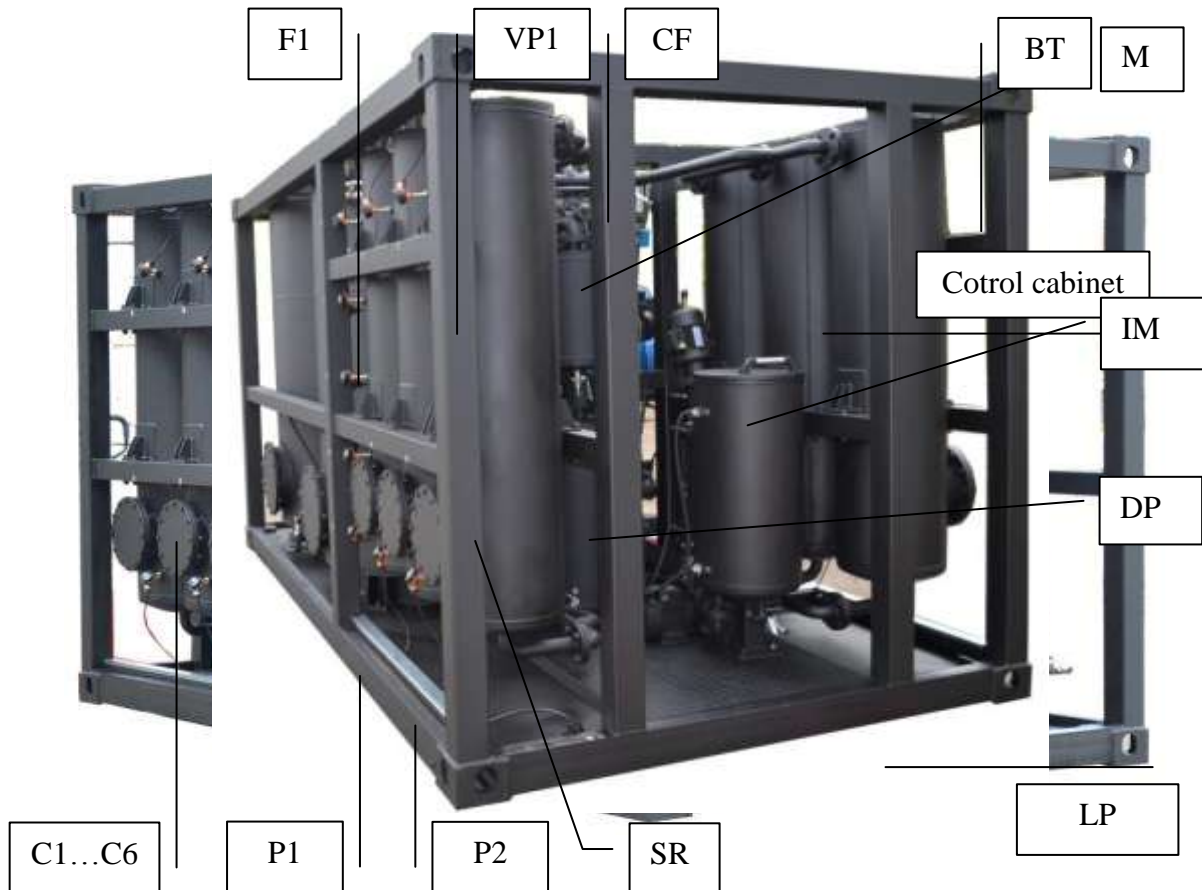


**Pneumatic distribution system**

The pneumatic distribution system is designed to supply air to pump pneumatic drives. Air supply is switched by the PLC.



**Main components of the unit**



## Principle of operation

The plant may be operated automatically or manually.

The plant operates in the following stages:

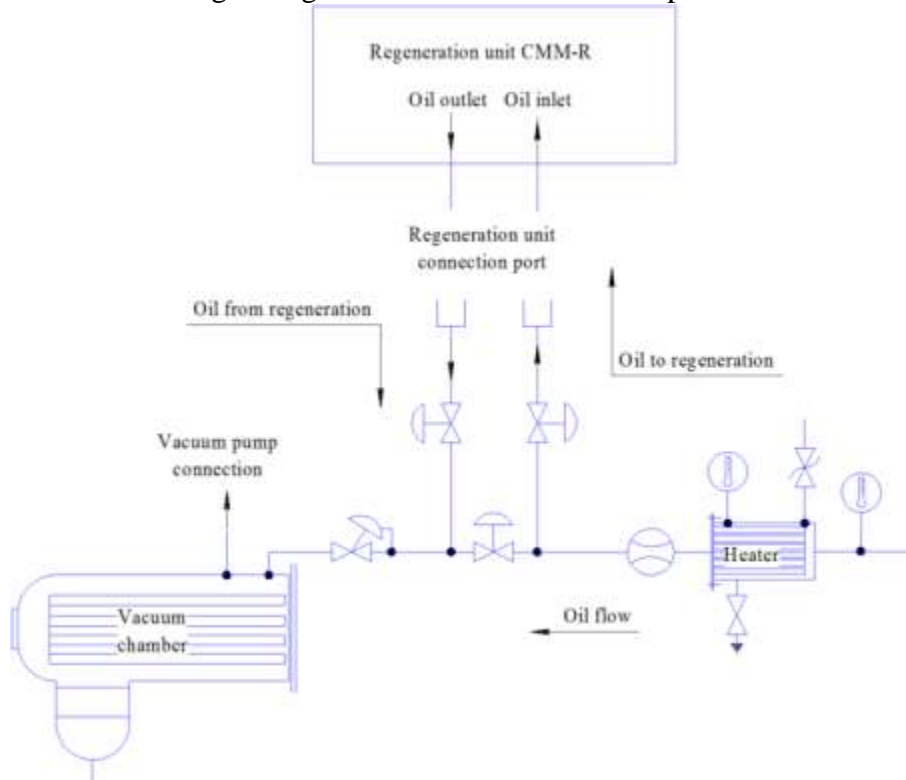
- 1) **Plant connection.**
- 2) **Plant charging.**
- 3) **Oil regeneration.**
- 4) **Sorbent reactivation.**
- 5) **Inhibitor injection.**
- 6) **Normal stop.**

### Plant connection

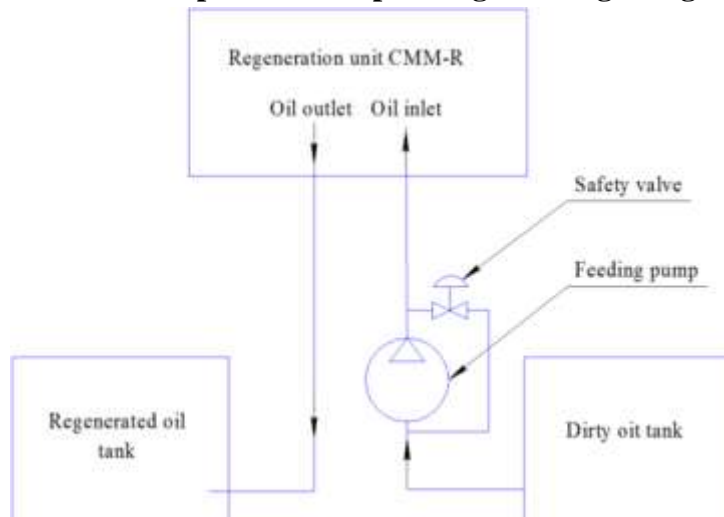
The plant should operate in combination with a degasser or be connected to a pump station.

Since the sorbent may contain air or other gases, the oil should be degassed before returning to the transformer.

The following arrangement is recommended for plant connection



### Connection of the plant when operating with degassing section



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