Southeast Thailand Company Limited

GREEN PRODUCT

High Efficient Vacuum Oil Purifier

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II. Application and Features

Application:

The machine can remove moisture, water, gases and particulate, etc. from oil at a high efficiency and improve pressure-resistance and quality of oil so as to ensure safe operation of electric power equipment. It is mainly suitable for treatment of dissatisfactory transformer, mutual inductor and switch oils in the electric power field and industrial and mining enterprises.

Features:

1. The machine is characterized by small size, high efficiency and convenient mobility and is especially applicable to field live-wire work. It can dry out moisture of electric power equipment and carry out vacuum oil filling for electric power equipment conveniently.
2. Fitted with infrared oil-level automatic control and automatic system pressure-protection devices and high-efficiency degassing elements, the machine is easy and safe to operate.

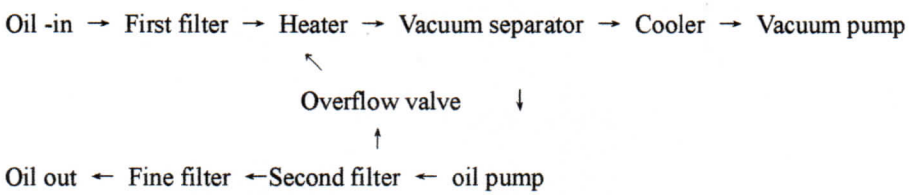
III. Working Principle and Structure

1. Working principle and structure (see diagram)

When the oil purifier machine is working, contaminated oil enters into the First filter via the inlet, where large particles of foreign matters are filtered off, then enter into the heater. There from the oil containing fine particles of foreign matters is heated and than enters into the vacuum separator, where moisture comes out of oil, quickly evaporates under the action of very low vacuum pressure and the degassing element and then is expelled by the vacuum system or transferred to the cooler for condensing. Finally the dewatered oil is pumped into the second and the fine filters by oil pump, where fine particles of foreign matters are removed, resulting

in purified oil and completing the whole purifying process.

2. Process flow (Fig.)



3. Structure sketch map (see diagram)

IV. Information

Water have two state in oil –soluble water (below saturation)exist in most of oil and free water (upwards saturation) exist in most of oil .As we say when the air have all vapor , the air have relative humidity of 100%; and when the oil have all soluble water, we told that the oil was saturated. Any of advances that beyond the moisture point will produce dissolved little dripping which suspend in the oil. In addition if there is have decline of oil temperature; it will make part of water become dissolved water.

In the isolated oil which used by electric component ,the temperature of transformer running usually is 60-80℃ and the using time can reach as long as 20-30 years. In the influence of heat and electric filed, the isolated oil attach with oxygen which was oxidated that will produce all kinds of oxide and mellow, aldehyde and acid etc., then finally separate out in the form of infusibility gelatins and oil mob deposition .Those acid substance will corrupt the inner of the transformer ,at the same time will destroy its performance of isolation which will produce the heat is difficult to scatter and make part of transformer over heat, indeed will make the loop short circuit and burn when it very severity.

The main purpose of transformer oil is to make the electricity isolate .Even through there is little water or other impurity will decline the breakdown intension of oil .General transformer is locate in the open air, when the temperature decline ,the fluid of the transformer oil will also decline and its capability of scatter heat as follows decline . In addition, in the transformer have a lot of copper and silver component etc., so if there is some activated sulfur and other corrupted substance in the transformer, it will corrupt the metal material. According to the working condition of transformer oil, it will have that performance as follows:

1) the good invariability of resist oxidation
2) good capability of enduring pressure
3) good fluid of low temperature
4) relatively high flash point
5) definitely capability of resist corrupt

For the quality of running oil of transformer ,according to the common divide standard of isolative oil IEC1039-1990 which constituted by the international electrician Aced and the standard IEC296-1982IIA e.g. some kind of index of oil exceed demand ,it should be deal with ,rebirth and renovate.

V. Technical Data

指标名称 Items		单位 Unit	ZY-6 ZYA-6	ZY-10 ZYA-10	ZY-20 ZYA-20	ZY-30 ZYA-30	ZY-50 ZYA-50	ZY-100 ZYA-100	ZY-150 ZAY-150	ZY-200 ZYA-200	ZY-300 ZYA-300
流量Flow		L/min	6	10	20	30	50	100	150	200	300
工作真空 Vacuum Range		Mpa	-0.06 ~ -0.095								
工作压力 Working Pressure		Mpa	≤0.4	≤0.4	≤0.4	≤0.4	≤0.4	≤0.4	≤0.4	≤0.4	≤0.4
恒温控制范围 Temperature Range		℃	20 ~ 80								
电源 Power Supply			380V 50HZ(或根据用户需要) (or at user's option)								
噪音Noise dB		(A)	≤65 ~ 85								
无故障工作时间 Fault-Free Working Hours		h	≥4000								
连续工作时间 Continuous Running Hours		h	≥150								
电加热功率 Heating Power		Kw	9	15	15	15	30	48	60	72	90
总电功率Total Power		Kw	9.7	16.5	16.5	16.5	33.5	53	65	76	98
进（出）口管径 Inlet(Outlet) Diameter		mm	Φ20	Φ25	Φ25	Φ25	Φ32	Φ42	Φ50	Φ50	Φ60
设备重量 Weight		kg	150	230	250	270	300	500	700	900	1100
外型尺寸 Dimension	长L	mm	970	1000	1000	1050	1200	1450	1600	1800	1900
	宽W	mm	630	700	750	750	950	1000	1100	1200	1200
	高H	mm	900	1300	1400	1450	1500	1800	1800	1900	1900
滤后指标 After Filtration	击穿电压 Breakdown Voltage	KV	≥65								
	含水量 Water Content	ppm	≤5								
	含气量 Gas Content	%	≤0.1								
	杂质 Impurities	μm	≤5								

VI. Special Notice

1. About safety

Alarm Control system line can not presume to change.

Danger Don't take down any part of the machine when it working.

Alarm Don't touch the inside-parts of the machine when it working.

Danger The automatically heating temperature had adjusted as customer's required. can not be changed by amateurish person.

Notice Only the person who knows electrical system knowledge can overhaul the machine.

2. Operation condition

Notice: Don't operate the machine under these conditions:

- The condition that temperature and humidity exceed the range of the machine.
- The moisture condition due to temperature rapidly changed.
- The corrosion or liberate condition

Notice: Should be caring when the machine under this condition:

- The static and noisy condition.
- The heavy electrical magnet condition
- The emissive condition
- The water ,oil or chemical condition

Notice: the machine operating condition has strong impact on the life and performance of the machine .Please makes sure the condition as following:

- The working temperature in –20 to 45℃.
- The highness of altitude level will directly influence the machine's vacuum degree, the higher the height is, the lower the vacuum degree is.

  The oil which need deal with can not too dirty (that is the impurity in the oil can not too much), or it must be filtrated by other oil filter. To avoid effect the machine's performance or block up the component of filter.

3. Additional points for attention during operation

3.1 When the vacuum pump works, attention should be paid to the oil level shown on the oil gauge (the level should be above the mark line) and oil changed in time if there is too much water content in it in the vacuum pump. If there is much water in the cooler during operation, drain it in time

3.2 Frequently observe the pressure gauge readings. Clean the filter or replace its components when the pressure is >0.4Mpa.The screens of the primary and secondary

3.3 After the electricity machine running 5000h, it should add lubrication to avoid the machine destroyed.

3.4 Pay attention to the running noise of pumps and related motors at any time during operation and straighten it out as soon as there is any abnormal noise.

3.5 After some times running ,should pay attention to the safety of control system , delicacy of temperature controller and whether the pump axes is destroyed or leaked out ,or whether having block up in the pipe system or checking the noisy whether is normal of the pump and relative electricity machine. If there is a stop for over one month, the machine should place on the dry circumstance and close the tank door and cover well the machine body.

In non-use time, drain the residual oil off the machine for future operation.

VII. Installation and Start-up

I) Installation

1. The machine should be installed evenly on a leveled ground.
2. No foundation is needed and it is only necessary to move the machine to the even ground near the oil tank.
3. Power cables used for the machine must be suitable for the max. Current needed for it.

II) Test of running

1. Close all the valves and connect oil inlet and outlet pipes to ensure free passage of feed-in and outcome oil between the machine and the oil tank.
2. Correctly perform wiring of 3-phase 4-wire power system to guarantee the fastness of the pipe ,correctness of the power line and make sure the correspondence of the power pressure and device, at the same time keep the electric control system in the prepare condition.
3. Check the around whether having disadvantage factor which will effect the machine running, only can start

the machine when confirm every thing is in right order.

4. Start the vacuum pump and oil discharging pump and check for the right running direction and to see whether there is any jamming or binding with the vacuum pump-motor and oil pump-motor.
5. The machine begin to run: close all drainage valve, sampling valve and gas out valve which connected to the outside .Turning right the "model choice" as the manual condition, pressing the button of "vacuum pump running", then the vacuum pump startup to observe the display situation—the vacuum degree will slowly ascend, otherwise change the power line. After making sure, press the button of "vacuum pump stop" and exit the manual condition; then turn right of the circle valve, observe the device whether keeping identical to the crafts and adjust the pressure, vacuum, temperature and liquid levels technical. Only after assure the oil road and system start is right, it can press the button of "stop/ replacement, then observe whether every thing is right. If there are some questions, it can deal with according to the practical situation until confirm there is no wrong. (It has adjusted well before leaving factory).

*Notice: the machine inside have enacted all specification, it can rejigger when begin to adjust.

VIII. Operation and usage instruction

1. Preparation before operation.
   - Connect oil inlet and outlet pipe, test pipe.
   - Connect power supply wire (AC400V 50HZ)
   - Confirm the following process to see if

     The oil inlet and outlet it is fixed

     The power wire has a right direction,

     The power supply suit the machine, the electricity control system is in stand-by state.

   Notice: The operator must be trained, and then can start to operate.

2. Operation instruction

   Circumrotate the option switch to automatic reset, the system start to running:

   Notice: must ensure the pipe from oil tank to oil inlet pipe is expedite, forbid close oil inlet valve while the machine is running.

2.1.1 vacuum pump start up automatically, when the vacuum get to –0.06~-0.095mpa, slowly open (2) oil inlet ball valve, adjust the oil level to get to the balance, make the oil level of vacuum separator set in middle place, (after normal running the infrared will control the oil level automatically), at this time oil will by via-primary filter-heater-magnet valve, then enter into vacuum separator.

Notice: height above sea level will directly affect the vacuum level, the height above sea level is higher, and the vacuum will be lower.

2.1.2 When the oil level get to low oil level control point, oil pump will be running automatically, the magnet valve will be opened automatically, at this time the oil will via- primary filter-heater- magnet valve- vacuum separator- oil pump- secondary filter-recycling magnet valve and form loop.

2.1.3. when the oil running is normal, set the oil temperature 45-60℃,the heater will start automatically.

Notice: The oil temperature set by operator, the non-operator and maintainer should not change.

2.1.4. Oil outlet valve will be opened automatically after oil running for 3-5 minutes, at this time the magnet valve will be closed automatically, the oil will be out from fine filter and form recycling filter.

2.1.5..1when the oil level lower than control oil level of vacuum separator, the oil pump will be stopped; at this time the magnet valve will be in start situation to enter oil. When the oil level higher than the control oil level of vacuum separator, the oil pump will start run, protect oil pump to avoid running without oil.

2.1.5.2 When oil level higher than control oil level of vacuum separator, adjust magnet valve will closed, stop feed oil to avoid oil enter into vacuum separator.

2.1.6.If need stop machine, press (4)stop replacement button one time, the machine will be closed heat automatically, expand time to stop vacuum pump, finally the oil level get to low control oil level, oil pump will be stopped automatically. When the running indicator light to stop working, the whole machine will be stopped work.

(If have the emergent situation, please press emergent stop button to stop machine immediately. If want to start machine again, you should turn emergency stop button by clockwise direction, then it can start all control button.)

2.1.7. When the machine is in normal running, the oil recycling for many times, you can take oil sample from sampling place to test.

2.1.8. When oil pump has over pressure, (oil outlet valve be in closed, or secondary filter and filter blocked etc), the oil pump will be stopped automatically and give an alarm. Now should debug, start machine again.)

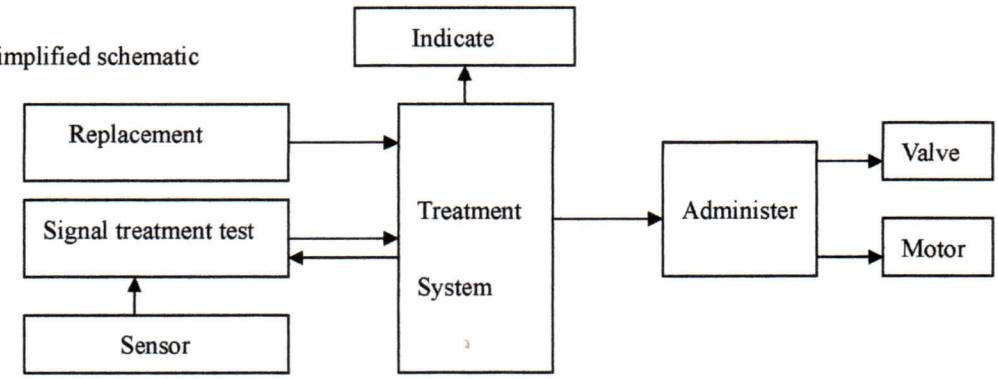
Notice: the waste oil should not very dirty, (its means there are so many impurities in oil) to avoid affect efficiency of degas and dewater or block filter element to reduce life of machine.

2.1.9. Adopt the machine to feeding or desiccation oil for transformer, mutual inductor-switch or bushing, generally not need assist vacuum source and heater, the vacuum source and heater's power of the machine have enough power to dry the equipment.

2.1.9.1 To dry oil spray or sprinkling, the whole core of the machine should be with sprayed or sprinkled oil. When carrying out multistage cycling purification of oil (i.e. multi-layer oil drying), it is necessary to control oil feed-in rate, feed-in oil temperature and stage cycling time in accordance with the relevant specification.

2.1.9.2 There should be a certain amount of acceptable oil in the vacuum tank before starting the machine to ensure an oil level balance for the transformer oil bolster.

Control simplified schematic



2.2 Manual operation: the firstly turn choice switch to manual place.

2.2.1 Press "vacuum pump running "button, when the vacuum get to –0.06~ - 0.095mpa, slowly open ball valve, adjust oil level to balance place, make the oil level of vacuum separator set in middle place, (after normal running the infrared will control the oil level automatically), at this time oil will by via- primary filter-heater-magnet valve, then enter into vacuum separator.

2.2.2 When the oil level get to low oil level control point, oil pump will be running automatically, the magnet valve will be opened automatically, at this time the oil will via- primary filter-heater- magnet valve- vacuum separator- oil pump- secondary filter-recycling magnet valve and form loop.

2.2.3. when the oil running is normal, set the oil temperature 45-60℃,the heater will start automatically.

Notice: The oil temperature set by operator, the non-operator and maintainer should not change.

2.2.4. oil outlet valve will be opened automatically after oil running for 3-5 minutes, at this time the magnet valve will be closed automatically, the oil will through heater-primary filter-oil inlet magnet valve-secondary filter-vacuum separator-oil pump-fine filter-oil outlet magnet valve, from inner recycling change to filter recycling.

2.2.5 when the oil level lower than control oil level of vacuum separator, the oil pump will be stopped, When the oil level higher than the control oil level of vacuum separator, should press "oil pump running" button, the oil pump will start run again.

2.2.6. .when oil pump has over pressure, (oil outlet valve be in closed, or secondary filter and filter blocked etc), the oil pump will be stopped automatically and give an alarm. Now should debug, start machine again.)

2.2.7.1 During the machine running, if there are some foam enter into cooler and get to oil level control point, the vacuum pump will closed automatically, at the same time you should close system, open the valve which is in cooler bottom, release resid or water ,then close valve to prepare use next again.

2.2.7.2When need stop machine, should press stop heat button, after 2-3 minutes press stop vacuum pump button, view inspection system, if oil level is low, press stop oil pump button, open release gas valve to release vacuum, the whole system finish oil purification system and stop running.

IX. Maintenance

I) after a certain period of running, the machine should be checked to see whether:

1. The electrical control system is safe and reliable;
2. The temperature controller is sensitive, reliable and accurate;
3. Oil seals of the pump shaft are broken with leakage;
4. There is any blockage with the running system and any abnormal noise with pumps or related motors;
5. There is any air or oil leakage with the running system and at sealing joints.
6. The oil level control is reliable.

II)After each 5000 hours' running, grease shall be replenished to prevent motors from being burnt.

III) Special vacuum pump oil or lubricating oil N46 should be used for the vacuum pump and oil replaced or replenished if necessary at any time.

IV) If the machine is not to be used for over a month, it should be placed in a dry environment with the panel door and all valves closed and the machine proper protected by a covering.

X. Procedures of Live-wire Operation

The following preparations should be made:

1. Get some satisfactory oil in an amount of 5-6% of the oil volume of the transformer on stand-by at the machine.
2. The outlet of the oil-discharging valve at the transformer bottom should be compatible with the inlet pipe of the oil filter machine. Otherwise a new suitable oil outlet pipe should be welded thereon.
3. Fill the vacuum tank with satisfactory oil to 1/2 of the oil gauge (the disruptive strength of filled oil should be 50KV).
4. Open the oil block cover of the transformer, insert the oil outlet pipe of the filter machine into the oil bolster below the oil level and seal the oil bolster cover with clean filter paper or film thereafter.
5. Insert the oil inlet pipe of the filter machine into the stand-by oil.
6. Open the oil discharging valve at the transformer bottom to discharge 3-5% of the oil there from (the 3-5% of oil, which is mainly composed of foreign matters and water, should be discharged and collected

separately).

7. While carrying out the above step 6, make the filter machine at high vacuum (not below -0.09Mpa) and immediately replenish oil to the oil level of the transformer oil bolster.
8. When the 3-5% "bad oil" is drained in step 6, connect the oil inlet pipe of the filter machine to the oil discharging valve.
9. Now the filter machine is ready for operation.

Caution:

1. Live-wire operation must be carried out during fine days;
2. The oil inlet and outlet pipes shall be connected under the personal direction of an electrical engineer;
3. The filter machine must be in good condition (with good heating, vacuum and filtering performance) for live-wire operation.

XI. Troubleshooting

Trouble	Possible Cause	Remedy
Feed-in oil is less than oil outcome in stable running	Strainer is blocked; resistance increases on pre-filter.	Wash strainer element; reverse filtering flow of pre-filter.
Abnormal noise with oil pump on start or in running	There is air in pump, producing noise, or not sufficient oil in pump or too much air in the oil of pump.	Check for oil feed-in, adjust oil inlet valve and remove air from oil inlet pipe.
Heater is on but oil temp. does not rise	1. Temp. sensor probe is out; 2. Poor contact of heater; 3. Circuit break; 4. Heating tube burnt out	1. Fix temp. sensor probe; 2. Check & replace; 3. Repair; 4. Replace heater
Vacuum drops below the rated value	1. There is air leakage stemmed from poor joint or otherwise uptightness; 2. Insufficient oil in vacuum pump; 3. Oil is dirty in vacuum pump; 4. Air release valve or other part of vacuum pump is broken; 5. Vacuum gauge does not work.	1. Repair; 2. Replenish oil to mark line; 3. Replace oil; 4. Repair; 5. Replace.
It is difficult to start vacuum pump	1. There is impurities in pump; 2. Belt is too loose or tight or coupling goes wrong; 3. Poor power wiring or motor goes wrong.	1. Check, esp. if there is any broken piece of copper gauze falling into pump from the inlet; 2. Adjust. 3. Repair.
	1. There is too much oil in pump; 2. Purified oil contains too much	1. Reduce oil to a little below the centerline of oil gage;

There is oil spray from air outlet of vacuum pump	moisture, vaporized content and foam; 3. There is too much oil in vacuum tank.	2. Open ballast valve to reduce vacuum; Raise oil temp; 3. Stop machine, start oil-discharging pump to lower oil level and then restart vacuum pump.
Filtered oil is not satisfactory	1. Oil contains too much water content; 2. Oil is not sufficiently heated; 3. Screen is broken; 4. Equipment has not been cleaned before operation; 5. Vacuum is too low.	1. Increase filtering cycles; 2. Raise heating temp; 3. Repair or replace; 4. Clean it; 5. See Item 4 above.
Oil outcome decreases	1. Oil level is too low in vacuum tank; 2. There is a high vacuum; 3. Oil tank is high positioned; 4. Air leak at oil seal of gear pump.	1. Increase oil feed-in; 2. Reduce vacuum; 3. Lower position of oil tank; 4. Change oil seal.