

# 2XZ-2VACUUM PUMPS OPERATION MANUAL



## **I. Construction**

2XZ-2 rotary vane vacuum pump is double stage high speed oil sealed rotary

vane vacuum pump (in the following called “the pump” for short). Its pumping principle is as same as that of 2X type pump .Rotors are eccentrically mounted within the cylindrical housing of the stators and vanes are fitted freely inside the respective slots of the rotor. When the rotor rotates at high speed, vanes in the rotor slot are urged outwards by centrifugal force as well as by spring force so as to keep close contact at their tips with the stator wall throughout rotation .Thus the inlet port and outlet port on the stator are separated by them. The volume of the space leading to the inlet port expands progressively and periodically with gas filling the space through inlet pipe, meanwhile the volume of the space leading to the outlet port diminishes progressively and periodically to compress the gas previously sucked .By means of gas pressure and oil pressure exhaust valve on the outlet port is opened to expel gas out of the pump through the valve, then vacuum is obtained at the intake side of the pump .Fig 1 shows the working principle of a single stage pump .Double stage pump is the arrangement of two single stage pumps in series .When the intake pressure is higher, both stages of the pump may exhaust simultaneously ,while at lower suction pressure gas is first expelled out from first stage to second stage ,then from second stage exhausts to the open air .

2XZ-2 type pump is equipped with gas-ballast valve. Its function is to fill the exhaust space with certain amount of air ,when the valve is open ,so to reduce the proportion of the partial pressure of vapor in the total discharge pressure .As the partial pressure of vapor is lower than that of the saturated vapor pressure corresponding to the working temperature of the pump, vapor can be discharged from the pump with the filled air in order to avoid condensation of vapor in the pump oil and to prevent oil from emulsifying by the condensed vapor so as to prolong the useful life of oil .However the ultimate vacuum of the pump shall drop ,and the temperature of the pump shall rise when the gas-ballast valve is open .

2XZ-2 type pump has the outstanding achievements of small size, less weight ,quiet operation and easy to start .Besides devices to prevent from sucking back of oil and leakage of oil from axle sealing to contaminate environment are also provided.

## **II. Field of Application**

1. The pump is one of the basic equipment to exhaust a sealed vessel. It can be used either independently as main and can also be served as for pump for booster pump diffusion pump and molecular pump or as holding pump for a vacuum system and as a pre-pumping for different kinds of the pumps. So that is can be applied in electro-vacuum industries, vacuum flask manufacturing, vacuum welding and as an

accessory to those fine gauges or meters where vacuum is required .It is more suitable for laboratory use because of its small size ,less weight and quiet operation .

2.The pump is allowed to work continuously for many hours at a stretch under atmospheric temperature of 5°C-40°C and intake pressure below 1230pa.While the pumped gas containing moisture of a relative humidity of more than 90% gas-ballast valve should be open.

3. When the inlet port widely opened to atmosphere the pump is not allowed to work more than one minute.

4. The pump is not suitable for pumping over-oxidized, poison, explosive and corrosive gas as well as gases which react chemically with the pump oil contain particles of dust.

### III. Specifications

Parameters/Models		2XZ-2
Pump speed(L/s)		2
Ultimate pressure(Pa)		$6 \times 10^{-2}$
Rotary speed(r/min)		1400
Motor power(Kw)		0.55
Working voltage(V/HZ)		220/60
Inlet Diam(mm)	I.D.	/
	O.D.	KF-25
Dimensions(mm)	Length	480
	Width	140
	Height	250
Weight(kg)		25

### IV. Erection

1. The pump should be erected on a dry airy and clean place.

2. The pump, with a handle at top and with four rubber pillarets at footings, is of portable type. Therefore, in most case the pump is merely placed at a flat and stable surface.

3. To wire the motor, note the direction of rotation viewing from the fan end of the motor, the rotation should be clockwise.

4. The diameter of the pipe, which joints the vessel to be exhausted and the pump, should not be smaller than that of the inlet port of the pump. The pipe should be short and should have as few bends as possible in order to reduce the loss of pumping speed. Meantime leakage of the pipe should be noticed. If rubber pipe is adopted, the pipe should preferably be desulfurized.

5. When the pump is started with the inlet port widely opened to atmosphere, little amount of oil mist will be brought out. It might affect the working environment, use plastic pipe to lead it away to open air.

6. The pump is equipped with such device which can prevent suck-duck of oil when it is stopped. Therefore, it is not necessary to mount a magnetic operated valve on the inlet port.

### V. Operation

1. It is suitable to stop pump then fill oil to the middle glass when check the oil

level. Too low, exhaust valve cannot be sealed and vacuum degree be effected .Too high, spraying of oil may be happened while the pump is started with its inlet port widely opened to atmosphere .It is quite normal to lift oil lever when the pump is rotating .Sho528-100, number 1 vacuum oil is adopted .When 2XZ-8/15 pump isn't water-cooling, we should use KS<sub>3</sub> oil. After filling oil, screw the plug. The oil should be filtered filling in order to prevent it from mixing with impurities to dog oil hole. The new standard mineral oil type vacuum oil is recommended.

2. The pump can be started with inlet port widely open to atmosphere of under any degree of vacuum. If magnetic valve is provided on the inlet port, it should be started simultaneous with the pump.

3. When the pump is operated under higher room temperature, the oil temperature will be raised and the viscosity of oil will be lowered, the saturated vapor pressure of it will be increased so as to cause drop of ultimate vacuum of the pump, especially the total ultimate pressure measured by thermocouple gauge .Good ventilation for radiating heat or substitution of oil of better quality will improve ultimate vacuum.

4. To check ultimate vacuum of the pump, a column of mercury gauge should be used .Under the condition that the a column of mercury gauge is direct connected to the inlet port of the pump and temperature of the pump is stable and the gauge itself is checked after sufficient fore pumping, the pump will attain to its ultimate vacuum when it runs within s stretch of 30 minutes .

5.If the pumped gas contains more condensable vapor (its relative humidity is higher) let the pump run20-40 minutes with gas-ballast valve widely opened , then close the valve .Before stopping the pump open the gas-ballast valve, let the pump run 30 minutes without gas load.

## **VI. Maintenance and Service**

### **1. General Remarks:**

(1) The pump should always be kept clean to prevent any impurities from entering the pump. Suggest to do as fig2.

(2) The oil level should always be kept at middle of the sight glass.

(3) Due to the improper storage of the pump, water or any other impurities are introduced into the pump, the ultimate vacuum of the pump will be impaired. Open gas-ballast valve to provide the purification of oil. then observe the promotive effect on ultimate vacuum. In case of that no improvement of ultimate vacuum is observed after several hours, oil should be renewed and even renew the oil twice again if necessary.

Process of renewing of oil:

Let the pump operate about 1/2 hr to raise the temperature of oil as to decrease the viscosity of oil, stop the pump and drain out the oil...Restart the pump and let it operate about 1-2 minutes with inlet port widely opened. In this interval slowly fill little amount of clean oil into the pump through the inlet port to replace the oil originally in the pump housing.

(4) Diesel oil, gasoline and other oil of higher saturated vapor pressure are forbidden to mix with the vacuum oil in order to avoid the impairment of its ultimate

vacuum. Generally cotton cloth is used to wipe the parts to be cleaned .To wash the parts with metal chips, sand and other impurities, gasoline is employed. Reassembly should be carried out after they are dried.

(5) If the pump should be disassembled in order to clean or to inspect the interior parts, attention should be paid to the process of disassembly and reassembly to avoid impairment of the parts.

The processes are as follows:

## **2. Disassembly**

(1) Drain oil.

(2) Screw out the bolts on inlet flange, take out the inlet pipe. Screw out the bolts on gas-ballast flange, take out the gas-ballast valve.

(3) Take off the oil box.

(4) Take off the split-pin on the oil check valve and the impeller to the check valve.

(5) Screw-out the tighten bolts of the frame and pump body, take off the pump body.

(6) Screw out the cover plate bolts, take off the cover and then pull out the two, rotors and their respective vanes.

## **3 Assembly**

(1) Wipe all parts.

(2) Put vanes into the respective slots of the rotor then put the rotor of high stage into the stator, put the cover plate on the stator and mount the pins, key and sleeve on their originally place. The rotor should be rotated by hand freely and evenly.

(3) Repeat the same process once again for lower stage rotor.

(4) Put back the impeller of the check valve and check valve to their original place. The flat surface of valve head should be point to the oil hole. Stop the impeller by hand while rotate the rotor, the oil hole should be alternately closed and opened by the valve then adjust the max height of opening of the flat surface of the valve head to such a value of 0.8-1.2mm.

(5) Put the exhaust valve and oil baffle plate on the top of pump body.

(6) Mount the pump body, key, bushing and motor on the frame.

(7) Enclose the pump body with oil box.

(8) Insert the inlet pipe and gas-ballast valve and screw on their flanges to fix them.

## **Cautions:**

During assembly spread clean vacuum oil on the rubbing surfaces of all mating parts. All parts should be set back to their original positions in order to diminishing time of running .All the screwed parts should be tightened, no loosening is allowed.

All worn out parts should be inspected. Readjustment of replacement should be made for them if necessary.

After assembly their should be a “running in”. Inspection should be made on the running condition of the pump and check the ultimate vacuum at the inlet port of the pump. If the ultimate vacuum does not conform with specified value, adjustment should be made.

At same time with the overhauling of the pump the pipe system, Valves and motor

should also be cleaned and overhauled.

## **VII. Troubles and Their Removal**

### **1. Failures to obtain the specified ultimate vacuum and their remedies:**

(1)The oil level is too low, exhaust valve can not be sealed and sound of exhausting is loud, fill in more oil.

(2)The failure may be due to the contamination of the oil by the condensable vapor, widely open the gas-ballast valve to purify the oil or renew the oil.

(3)Air leak at the joint of pipe, pipe itself and vessel, take measure to eliminate the leak.

(4)Improperly placing of the rubber seals of the inlet pipe or gas ballast valve or deterioration of them readjustment or replacement of them should be made.

(5)Clogging of the oil holes, drain oil, dismount the oil box, clear the oil holes.

(6)The vacuum system, including vessel and pipe, is seriously contaminated. Cleaning of them should be made.

(7)Breaking of vane springs, replace them by new spring.

(8)Vaness, stator of copper bushing may be worn out. Check them and make replacement or readjustment.

(9)Overheating of the pump, it causes not only the drop of viscosity of the oil and rising of the saturated vapor pressure of the oil but also causes the cracking of oil, improve ventilation and cooling to decrease ambient temperature. If the temperature of gas pumped is too high, it should be cooled before sucked by the pump.

### **2. Oil splash**

Check the oil level, whether it is too high. Are there any oil or impurities to clog the oil separator. The oil baffle is right positioned and firmly fixed.

### **3. Oil leakage**

Check the oil plug, sight glass and oil box shim. Replace them if necessary. The oil leakage many develop at the joint of pump and frame or shaft seal. Readjust or replace them if necessary.

### **4. Noise**

The noise may be caused by breaking of vanes, too much oil, worn out of bearing deterioration of parts. Check them an readjust or replace them if necessary.

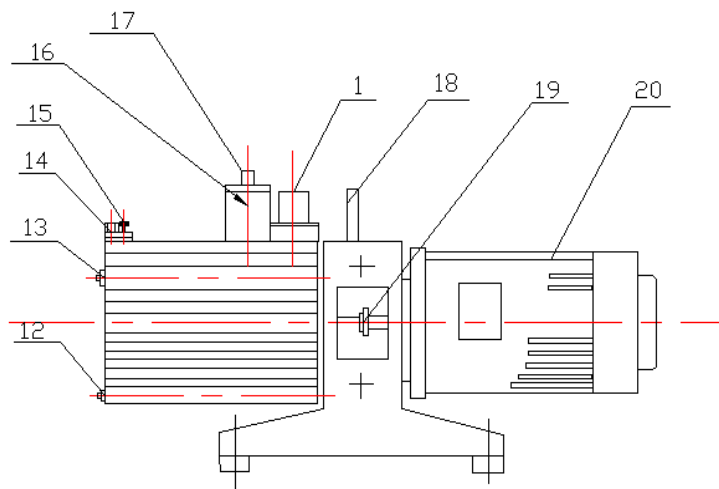
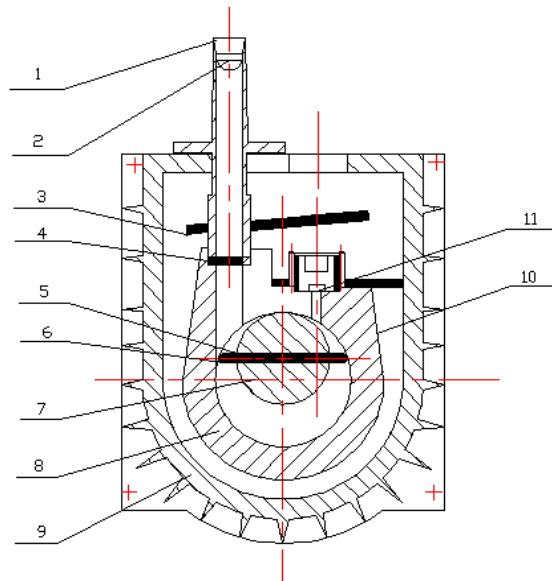
### **5. Such back of oil**

Oil check valve can not tightly close, oil level drops, fast after pump stops. Check the variation of oil level by starting and stopping the pump again and again.

Oil seals in two cover plates are improperly placed or worn out. Replace them.

The exhaust valve plate is worn out. A new plate is replaced.

Section view of the pump



- |                     |                                |                       |                   |                         |                              |
|---------------------|--------------------------------|-----------------------|-------------------|-------------------------|------------------------------|
| 1. Inlet port       | 2. Filter net                  | 3. Oil baffle         | 4. "O"ring        | 5. Spring               | 6. Vane                      |
| 7. Rotor            | 8. Stator                      | 9. Oil box            | 10. Vacuum oil    | 11. Exhaust valve plate | 12. Screw plug for oil drain |
| 13. Oil glass       | 14. Screw plug for oil filling | 15. Gas-ballast valve | 16. Mist arrester | 17. Outlet port         | 18. Handle                   |
| 19. Driving bushing | 20. Protective covers          |                       |                   |                         |                              |

## Pumping speed curve

**Pumping speed curve**

