CHONGQING TOP OIL PURIFIER CO., LTD



# TY Series

## Turbine Oil Purification Machine

## Turbine Oil Condition

Turbine oil is used as lubricant for the spindles of the host and auxiliary in various steam turbines, e.g.: steam turbine, water turbine, gas turbine etc. With the temperature and pressure of the steam from turbine are increasing, and escalation of capacity, the oil temperature is higher and higher, and thus lead to more demanding requirements of turbine. In addition to requirements of good oxidation stability and anti-corrosion, but should also have the requirements of anti-foam, anti-emulsification, extreme pressure and air release. In particular, more than 20 years, the power system 30MV and more large generating units increased year by year, the speed governing and the hydraulic system operating pressures could up to 4MPa.

## The quality of turbine oil would directly affect the operation of the turboset, so there are five requirements to turbine oil as follows:

1. Excellent stability of anti-oxidation:  Because the turbine oil is repeatedly recycling used (6-10 times per hour) for a long time (generally 5~15 years), meanwhile it always stays at a high temperature condition (about 60℃) and contacts with air and metal, so the turbine oil is asked for good stability of anti-oxidation, that is creating little sediments and acid during long term operation.
2. Excellent property of viscosity temperature and proper viscosity: proper viscosity of turbine oil is an important factor for ensure normal lubrication of the whole unit. Excellent viscosity temperature of turbine oil could ensure good lubrication no matter what temperature the turbine bearings would be at.
3. Excellent property of demulsification: the condensate water may be leaked into the oil system from the loose seals and make the oil emulsified, which prevent the units from operating safely. Therefore the turbine oil must be requested for excellent property of demusification, that is the water could be separated and discharged quickly.
4. Excellent property of anti-rusting and corrosion protection: the steam and condensate water will leak into the oil recycling system, make the oil emulsified and corroded, what more serious is it would cause some bad effects such as governing system down, units shaking, over abrading. So the good turbine oil must be requested for excellent property of anti-rusting and corrosion protection.
5. Excellent property of anti foaming：During operation, the air would be leaked into the oil and caused foam that will lead to abnormal problem of oil during recycling. Thus the turbine oil must have the good property of anti foaming.

## The Deterioration of Turbine

During operation, the turbine oil would be mixed with condensate water that leaks from worn-out seals or other parts, and the particles from all the worn-out parts or pipes. Therefore the turbine oil will lost its own lubricant function and increase the friction and damage of the components, meanwhile the water and metal impurities contains in the oil would speed up the oxidizing reaction of the turbine oil. So it’s important and necessary to purify the deteriorated turbine oil in time.

## Application

Our TY Series turbine oil purifier is applied for on-line turbine oil filtration in electric power, metallurgical, chemical engineering industries. It is good at emulsion breaking, dehydration and removing moisturem gasm impurities, soap, gelatin, acid, pigment and metal particulates in emulsified turbine oil and low-viscosity lubricating oil as well as turbine oil used in other machinery and electric power equipment, and improve the oil quality to ensure a normal work of the generator sets adjustment and lubrication system.

## Feature

1. it is strong ability of dehydration and breaking emulsion, that is easy to separate the great moisture and tiny moisture out of the used oil. Because of the special break emulsion device (water separator), the emulsified oil could be treat and become transparent.
2. It is strong ability of removing impurities, that is the big area and deep-seated accurate filtration material can eliminate the tiny particles from used oil that could replace oil system clean device, make great polluted oil system recovered and meet “the operating turbine oil pollution control standard”.
3. It is strong ability of automatic, safe and reliable operation. This model is used float ball level automatic control device that realizes auto working completely without manual labour, leads to a simple and stable operation.
4. Thus, TY series is specially fit for applying to filter turbine oil, hydraulic oil and the low viscosity oil that contains lots of water or tiny particles which need to be precisely processed.
1.It adopts the coalescence and separation technique and 3D-Evaporation technical and thin film evaporation technique, and it has strong ability to break emulsion and remove water from the oil.
2. Optimized electric heating system with automatic constant temperature controller ensures the oil temperature to be even and stable.
3. Precise multi-stage filtration system helps remove different kinds of impurities with high quality filter element of better ability of containing pollutants and long service life.
4. Advanced infrared oil level control system and pressure protection device make operation simple and safe.
5. It can purify any kinds of turbine oil used in steam turbine and water turbine online and onsite.
6. Air cooling system helps cool down air and gases from the flash distillation column so as to extend the service life of vacuum pump, avoiding the inconvenience of water cooling.
7. The machine can also be installed with digital flow meter and timer to calculate and record the volume of output oil and working hours (it’s optional).
8. Aluminum electric control cabinet has the merits of heat conducting and anti-explosion
9. Adopts interlocked protective system, which connected oil pump, heater, and oil level sensor, avoiding blank pumping, oil leak and electricity leak. If there is any fault, machine will be power off automatically.
10. High quality and low noise oil pump
11. Hi-automatization operation, convenience, reliable, and safety

## Special features

1. The plant is delivered ready for operation.
2. Continuously clean the oil
3. On-line water content measuring device (optional)
4. All oil treatment plants, type TY are equipped with an automatic Anti-Foam Control System.
5. The plant is equipped with built-in control and safety devices, which provides for a maximum operating security.
6. Minimised power consumption through optimised degassing (excellent efficiency factor).
7. Standardized filter housing for 1 micron , 5 micron, 20 micron and 80 micron filter cartridges.
8. Automatic supervision of the degree of contamination of the fine filter cartridges
9. All parts of the machine are stainless steel and food grade material
10. All plants are PLC controlled (optional)

## To meet customers' special needs, we develops

TY semi-automatic turbine oil purifier,
TY-A automatic turbine oil purifier with PLC
TY-Ex Ex anti-explosion turbine oil purifier for different requirements and working conditions.
TY-W Enclosed type turbine oil purifier which can prevent rain, sun, dust
TY-M Mobile outdoor type turbine oil purifier which can move and operate on-site

## Working Principal

While the oil purifier is working, the oil will flows into the heater by the pressure of inner and external. After heating, the oil goes into the 1st-stage filter to remove big particles and then reaches 2nd-stage filter (that is water separator) which adopts strengthen hydrophilic oleophobic technique to change the mutual acting force from oil and water surface, make the tiny water droplets in oil move fast and coalesce into big water droplets that would be separated out and subsided in the water storage tank. Meanwhile the oil enters into the vacuum tank and pass by sprinkler which make the oil sprayed and formed big aerating area and long aerating time, that could finally separate gas from oil. The mixed gas that contains steamed water and gas will go across the condenser and form liquid, which would be discharged by vacuum pump. The oil whose water was removed will be pumped into 3ird-stage filter to eliminate tiny impurities and precisely purified by fine filter, finally get clean oil out.

## Technical Parameter

**Table 1 Vacuum Oil Purifier Technology Standard**

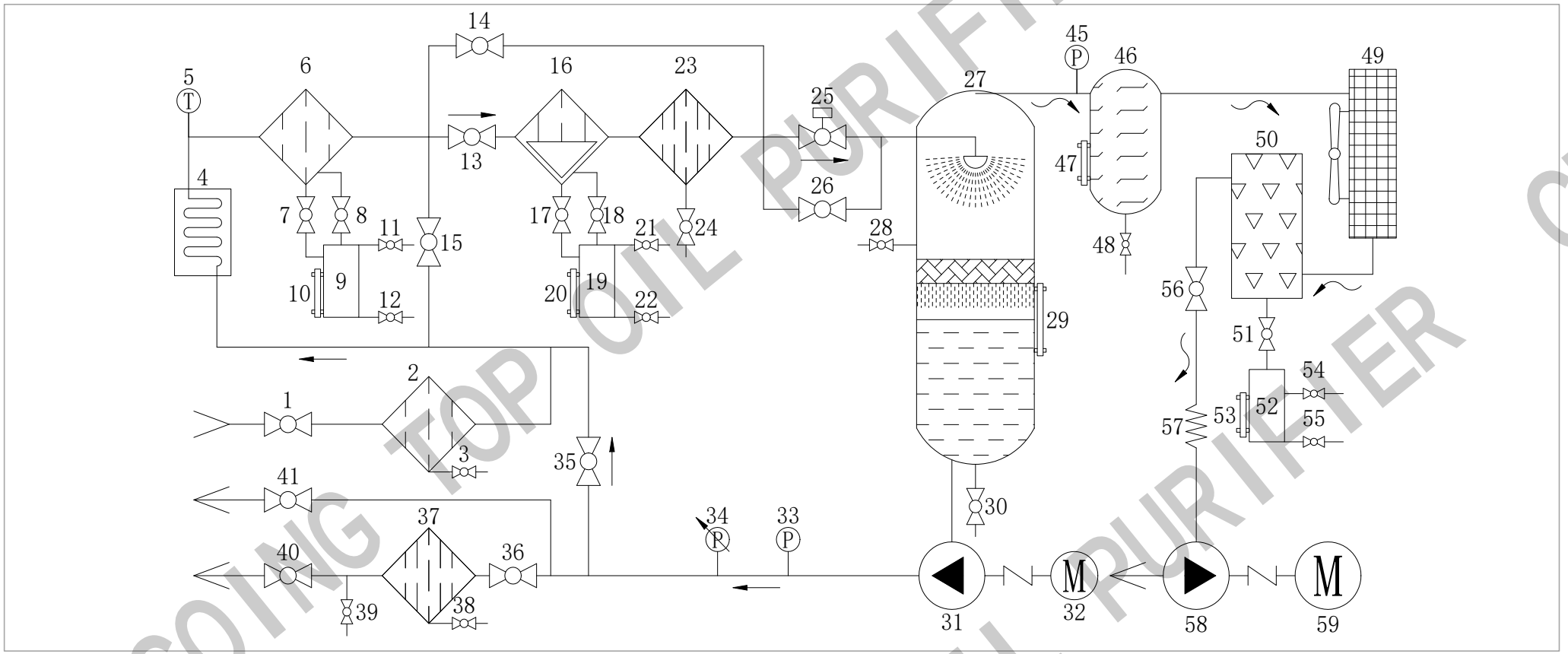
| Parameter | | Unit | TY-10 | TY-20 | TY-30 | TY-50 | TY-100 | TY-200 | TY-300 |
|---|---|---|---|---|---|---|---|---|---|
| Flow rate | | L/min | 10 | 20 | 30 | 50 | 100 | 200 | 300 |
| Vacuum degree | | Mpa | -0.06～-0.095 | | | | | | |
| Working pressure | | Mpa | ≤0.5 | | | | | | |
| Working temperature | | ℃ | ≤40~60 (no more than 55℃ for purifying turbine oil.) | | | | | | |
| Power Supply | | V/Hz | 380/50/3P (Customized) | | | | | | |
| Heating power | | kW | 15 | 18 | 24 | 30 | 60 | 81 | 90 |
| Total power | | kW | 17 | 20 | 26 | 32 | 64 | 86 | 100 |
| Inlet (outlet) dimension | | mm | Φ32 | Φ32 | Φ32 | Φ42 | Φ42 | Φ60 | Φ76 |
| Weight | | kg | 400 | 480 | 600 | 700 | 800 | 1100 | 1350 |
| Overall dimension | L | mm | 1300 | 1300 | 1400 | 1400 | 1500 | 1850 | 2100 |
| | W | mm | 1000 | 1050 | 1100 | 1150 | 1100 | 1300 | 1400 |
| | H | mm | 1600 | 1700 | 1800 | 1850 | 1850 | 1900 | 2000 |

**Table 2 After treated by machine**

| Item | Guarantee indexes |
|---|---|
| Moisture content | ≤50 PPM |
| Demulsification value | New oil≤15min,running oil≤30min |
| Impurity size | ≤1 micron |
| Gas content | ≤0.1% |
| Clean degree | ≤4 Grade (NAS1638) |

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## Flow Chart




1. oil inlet valve 2. primary filter 3. drain valve for primary filter 4. heater 5. temperature controller 6. secondary filter 7 . isolation (1) for secondary filter 8.isolation valve(2) for secondary filter 9.water receiver for secondary filter 10. water receiver's level gauge for secondary filter 11. water receiver's level gauge for secondary filter 12. water receiver's drain valve for secondary filter 13. isolation valve 14/15. by-pass valve 16. water separate 17. isolation valve(1) for water separator 18. isolation valve(2) for water receiver 19. water receiver for water separator 20. water receiver's level gauge for water separator 21. water receiver's vent valve for water separator 22.water receiver's drain valve for water separator 23. fine filter (1) 24.drain valve for fine filter (1) 25. vacuum vessels Electromagnetic valve 26. Vacuum vessel's bypass valve 27.vacuum vessel 28. vacuum vessel's town gas valve 29. Vacuum vessel's level gauge 30.drain valve for vacuum vessel 31. oil outlet pump 32.oil outlet pump's motor 33. pressure gauge 34. pressure controller 35. recycling valve 36. isolation valve 37. fine filter (2) 38. drain valve tor fine filter(2) 39.oil sample valve 40/41. oil outlet valve 45. vacuum gauge 46. anti-foam device 47.anti-can device's level gauge 48. anti-foam device's drain valve 49.cooler 50.condenser 51. isolation valve tor condenser 52. water receiver for condenser 53. water receiver's level gauge for condenser 54. gas release valve for condenser's water receiver 55. drain valve for condenser 56.vacuum valve 57 . Compensator 58. vacuum pump 59. vacuum pump's motor

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12. Automatic Potentiometric Titrator TP668
13. Petroleum Products Density Tester DST-3000
14. Karl Fischer Volumetric Water Content Titrator TPD
15. Simulated Distillation Device DIL-100Z
16. ASTM D1160 Vacuum Distillation Analyzer DIL-004D
17. Online Oil Quality Tester PTT
18. Copper Corrosion Tester TP-113
19. Dew Point Tester DPME-P
20. Fully Automatic TAN/TBN Titrator TP-669
21. ASTM D2887 Gas Chromatograph for Boiling Range Distribution DGA-2014B

1. Fully Automatic Karl Fischer Water Content Tester TP-2100
2. Digital Karl Fischer Water Content Tester TP-6A
3. Kinematic Viscosity Tester VST-2000
4. Kinematic Viscosity Tester TPV-8
5. Fully Automatic Oil Acidity Tester (6 cups) ACD-3000I
6. Fully Automatic Surface/Interface Tension Tester IT-800
7. Fully Automatic Open Cup Flash Point Tester TPO-3000
8. Fully Automatic Closed Cup Flash Point Tester TPC-3000
9. Digital Open Cup Flash Point Tester TPO-100
10. Digital Closed Cup Flash Point Tester TPC-100
11. Cloud Point & Pour Point Tester PT-2000

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