Precision Filtration Products

YOUR ONE STOP FOR FILTERS

INSTALLATION OPERATION AND MAINTENANCE MANUAL

TORE-2-P

Portable Turbine Oil Conditioner

MODEL NUMBER: TORE -2-P

SERIAL NUMBER: 604324G

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CAUTION

- Insure fluid compatibility exists between fluid to be processed and the immediately previously processed fluid. If unit is to be used for the first time, we recommend that this system be flushed with the same type oil as that being purified ***before*** putting system into operation. This will help to avoid carry over contamination from the factory test oil, which may be a different type.
  NOTE: If applicable, hoses should also be flushed.
- Process fluid must be compatible with system seals (see specifications).If any doubts exist about process fluid compatibility with regard to a particular system, consult the factory or your local representative.
- A copy of the test oil MSDS sheets follow this caution.

The manufacturer only extends the warranty on purchased materials that the manufacturers extend, plus any defective workmanship on materials and labor by the manufacturer.

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WARRANTY

The company does not warrant conformity to any specifications. We guarantee freedom from defective material and workmanship, and title to products of its manufacture when such products are installed and operated in accordance with its instructions. These warranties shall terminate one year from date of invoice.

Our warranty does not extend to articles such as pumps, motors, electrical components, etc. manufactured by others. This responsibility rests entirely with the manufacturer of these articles.
These warranties are exclusive and in lieu of all other warranties, express, implied or statutory, including the warranties of merchantability and fitness for a particular purpose.

Except in the respect to patent matters, the exclusive liability of the company arising out of the supplying of its products, or their use, and any related services whether on warranties, negligence or otherwise, shall be at its option, to correct the defect, replace the products or repay the purchase price. In the event of correction or replacement, the purchaser will be responsible for all transportation and labor cost.
In no event shall the company be liable for indirect, consequential or special damages.

No change in this warranty shall be binding upon the company unless in writing and signed on its behalf by its proper authority.

All orders, sales and contracts are subject to our standard conditions of sale in effect at the time of our acceptance.

SERVICE POLICY

The company maintains a stock of repair parts and competent service technicians who are available for making repairs, maintenance or supervision of installations. A charge will be made for the service technicians time, material used, transportation costs, and all other expenses. All requests for service of repair parts should be directed to the company at Houston, Texas. Full information should be given concerning the difficulty experienced and the stock numbers of the equipment involved. Accessories, for which there is an extra charge, are frequently shown in installation bulletins for the purpose of indicating the proper way to install them or their function in connection with the equipment described by the bulletin.

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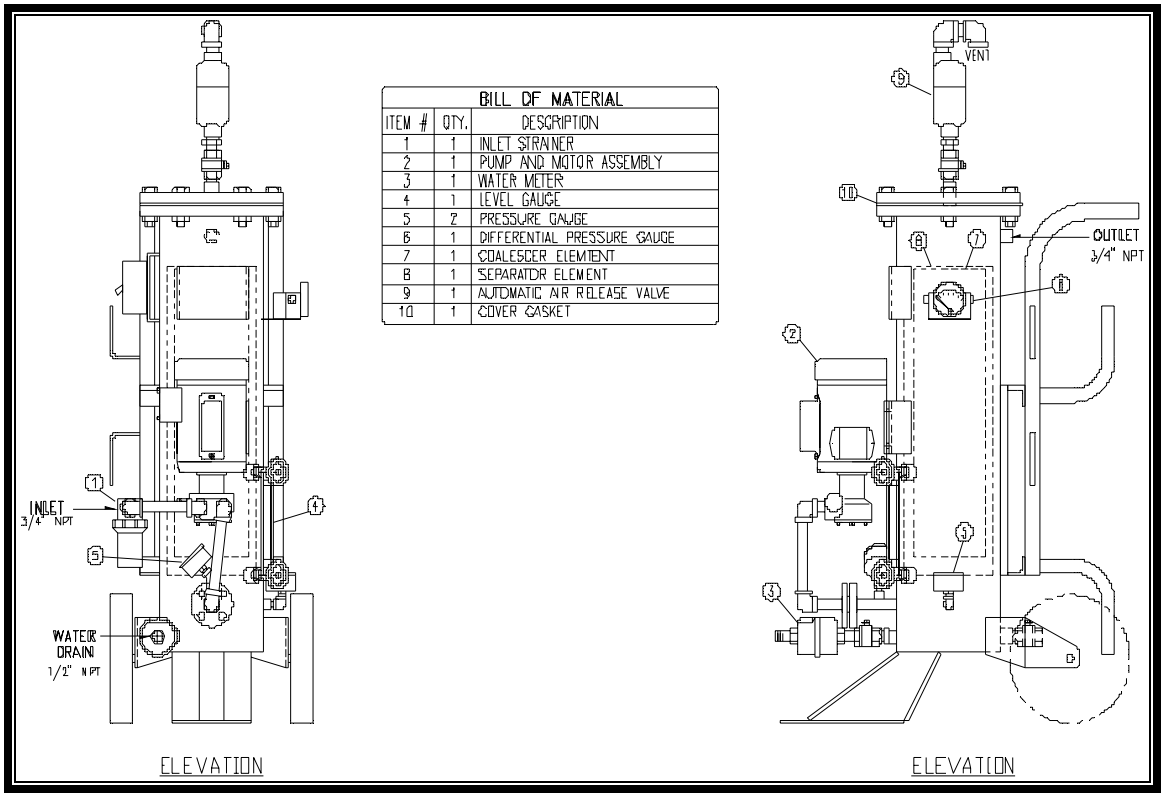
Introduction

This manual contains operating instructions and pertinent literature for the GEI model number TORE-2-P.

Specifications

Model:	TORE-2-P
Electrical Power:	115 Volt, 1 Phase, 60 Hz, 15A
Design Flow Rate:	2 Gallons Per Minute
Design Pressure:	150 PSIG



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Principle of Operation

In the past 10 years oil filtration technology has changed from a gravity type water separation to pressure coalescence. This filtration system utilizes the latest technology to condition turbine oil. The TORE Oil Conditioner is designed to interface with the customers turbine generator oil system. The oil conditioner takes oil (the oil is drawn by means of a pump) from the bottom of the turbine reservoir into the conditioner where particulate and water are removed. By pulling the oil from the bottom of the reservoir, water and particulate are best removed from the turbine oil reservoir. After the oil is conditioned, it is returned to the turbine lube oil system to a point most opposite of the suction in order to assure a complete and efficient turnover of the lube oil reservoir. This return should be below the oil level in the reservoir to minimize aeration of the oil.

TORE PORTABILITY:
The system is mounted on industrial grade wheels to allow the operator to easily move the system from reservoir to reservoir. Filtration is accomplished by a simple, fast hook-up, eliminating any machinery down time. The sytem is painted industrial grey.

SUCTION STRAINER & SYSTEM PUMP:
Oil is drawn into the system inlet through an inlet hose and a 40-mesh (420 micron opening) suction strainer by the system pump . The inlet pump is driven by a 110 volt TEFC motor @ 1725 RPM which allows 2 GPM oil flow. The pump is a Tuthill positive displacement type pump. The pump is equipped with a relief valve to protect the piping and vessels from over pressurization by the pump. An inlet oil pressure gauge is supplied to verify inlet oil pressure and may be used to set/check the inlet pump pressure relief valve setting.

SYSTEM HEATER: *****OPTIONAL***

The oil then flows into the filter separator vessel where a 250 Watt electric heater may be installed. Normally, the oil temperature on the turbine system will be adequate for optimum water removal and the addition of an oil heater on this system would only aid in cold startups. This heater should only be operated with the filter separator vessel full of oil. If the heater is operated

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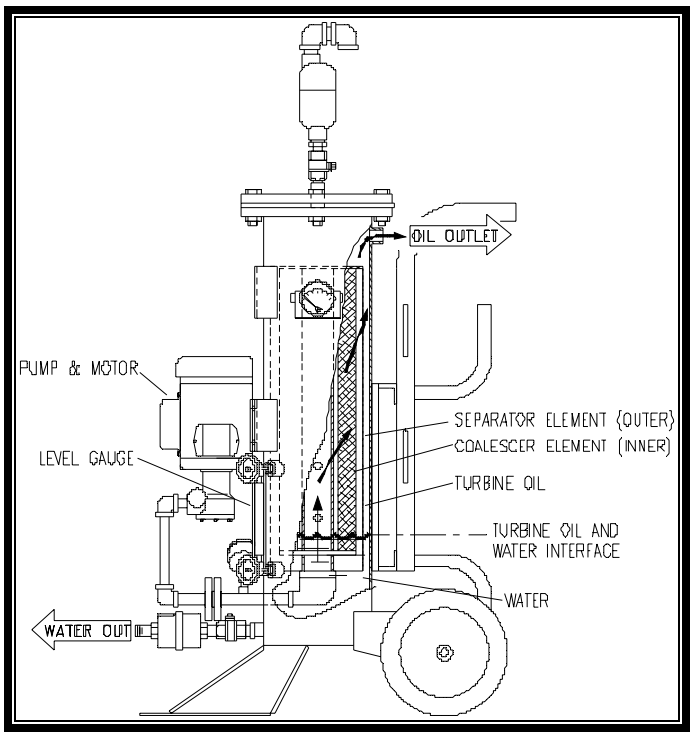
without being submerged in oil, damage to the heater may occur. The adjustable controller inside the heater housing controls the system temperature. It is recommended that the controller temperature be set at 110°F. The temperature controller was calibrated at the factory. If the oil temperature in the vessel is less than the set temperature of the controller, then the heaters will operate and at some point begin to cycle until the set temperature is achieved. At this tme, the temperature gauge supplied with the heater should match the thermostat set temperature. The filter separator vessel should be drained to service and/or clean the heater.

COALESCER-SEPARATOR VESSEL:



Water/Oil Coalescence Element

The oil then enters the single-stage coalescer-separator filter vessel into the filter coalescer element through the element adapter nipple. The oil flow into the coalescer element is from the inside to the outside. The oil then flows through the resin impregnated paper filter into a fiberglass media with a cotton cover that causes the water in the oil to coalesce into larger water droplets. The 2 gallon per minute flow rate requires one coalescer element. .

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Since the separator elements are located some distance from the coalescer elements in relative terms, the majority of the water settles by gravity to the bottom of the filter above the vessel separator bottom plate. The internals of the coalescer-separator filter vessel are epoxy coated to prevent corrosion.

Separator Filter Element

The oil flow path on the separator element is from the inside to the outside. The separator element works by repelling the water with a hydrophobic separator medium on the element's inside surface. The water then rolls (falls) down the inside of the element and on to the vessel separator bottom plate. Hydrocarbon fluids (oil) can pass through the separator media.

The separator element contains green screen Teflon separator medium. The separator element is mounted such that it is approximately 6" above the vessel separator bottom plate that provides an area for water collection.

Water Removal

A sight glass on the side of the filter vessel shows the water/oil interface level in the vessel. The water is drained manually through the water drain ball valve. The water drain ball valve should be opened when the oil/water interface reaches approximately the midpoint of the level gauge on the coalescer-separator vessel. When the interface drops to the bottom of the level gauge, the valve should be closed. Be sure to maintain an oil/water interface visibility on the level gauge. The water being drained from the oil conditioner passes through a totalizing meter so that the amount of water drained from the system can be trended.

IMPORTANT NOTATION

It is recommended that a water level be maintained in the vessel to allow the draining of only water. If all the water is drained until oil enters the drain piping, the next time the water is drained, a mixture of oil and water will initially drain from the piping. This mixture will be oily waste. Therefore,when manually draining the water from the coalescer-separator vessel, never allow the oil/water interface visual to disappear from the liquid level gauge.

Gauges

There are 2 gauges that indicate the coalescer and separator elements condition. The coalescer/separator vessel inlet pressure gauge and the

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coalescer/separator vessel outlet pressure gauge indicate the differential pressure across the coalescer element. The coalescer element is also supplied with a differential indicating pressure gauge which will give you a direct readout in PSID across the coalescer element. The coalescer should be replaced at 25 PSID maximum or once a year for optimum performance. The separator need not be replaced unless it has been damaged. It is recommended that the separator be cleaned and inspected each time the coalescer element is changed.

Automatic Air Release ****OPTIONAL****
As the coalescer-separator vessel is filled with oil, the air is extracted through the air release automatically. An isolation valve for the air release is supplied in case of failure or to allow the inlet strainer to be serviced without draining the system.

OIL OUTLET LINE & ACCESSORIES:
The oil leaves the coalescer-separator vessel into piping containing a pressure gauge. The outlet pressure gauge will give you a pressure reading of the oil leaving the TORE system and returning to the turbine oil reservoir. From this point, the oil is returned to the turbine oil reservoir via the oil hose supplied.

OIL DRAIN:
The oil drain valve may be used to drain the filter system completely for service and/or cleaning**.**

FILTRATION LIMITATIONS:
The oil conditioner can not prevent the degradation of the turbine oil if there is continuous chronic water ingression in amounts of 500 PPM or more to the turbine lube oil system. While the conditioner may match the water ingression rate, the effect of water washing the turbine oil may eventually destroy the demulsablity (the ability for the oil to shed water) and oxidation resistance of the turbine oil. This is not the fault of the oil or the oil conditioner, rather the turbine lube oil system is being operated outside the original design parameters.

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Electrical Controls

Inlet Pump:"Off-On" – Two position toggle switch. With the switch in the "ON" position, the pump will run with no visual indication. With the switch in the "OFF" position, the pump will be off.

Installation & Connection

Locate the unit on a solid, level foundation (preferably concrete). Locate the unit so that access to all the unit components is open and unobstructed. The TORE-2-P system should be located as close as possible to the turbine oil reservoir and not more than six feet above the oil level in the reservoir.

SUCTION LINE: The line size connection at the turbine oil reservoir to the TORE-2-P should be 1/2" minimum This line should be installed the shortest and cleanest route possible utilizing a minimal amount of fittings as necessary. A full port valve should be installed on the reservoir to facilitate system hook up. Optimum installation would be a flooded suction, but if this is not possible, provide a connection which would allow you to fill the suction line with turbine oil. At a minimum, fill the inlet strainer with oil to allow lubrication for the pump for initial start up. When the system is in operation, the pump suction gauge should read 5"Hg or less. Care should be taken to ensure the turbine oil level in the reservoir does not drop below the minimum operating level

DISCHARGE LINE: The discharge line should follow the same guidelines as the suction line, minimum 1/2" line size, shortest and cleanest route possible back to the turbine oil reservoir with a minimum amount of fittings. The discharge line should return to the turbine oil reservoir as far as possible from where the suction is located to assure good reservoir turnover. It should also return just below the the oil level in the reservoir to minimize the aeration of the oil.

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ELECTRICAL CONNECTION: The power requirements for the model TORE-2-P are 115V/1PH/60HZ/15AMP service. This system may be plugged into any 15 amp industrial grade electrical outlet. This service should be properly grounded and installed per your local code or the National Electrical Code, whichever is greater.

WATER DRAIN LINE: The water drain line should be connected to a suitable drain or reservoir (5 gallon minimum to facilitate three drain cycles). The water will be discharged by the system operating pressure. Precautions should be taken to assure no oil will be discharged through this system, care should be taken to assure the environment is protected.

System Check & Start Up

ELECTRICAL CHECK: Check the main power leads into the system. Ensure 115V/1PH/60HZ/15Amps service is available.

PIPING CHECK: Ensure all piping lines are properly installed and all connections are tight.

WATER LEG/COALESCER-SEPARATOR VESSEL: Before starting the system, a water leg must be developed in the coalescer-separator vessel. This may be easily done by connecting a clean water source to the drain valve of the coalescer-separator vessel. Ensure the manual drain valve is closed and the liquid level gauge on the coalescer-separator vessel is open. Slowly open the drain valve and allow the lower section of the coalescer-separator vessel to fill with water. When water is visible in the liquid level gauge on the coalescer-separator vessel, close the drain valve, disconnect the water source and continue with the start up.

VALVE ORIENTATION CHECK: Ensure all vent & drain valves are closed. **Ensure the manual water drain valve is closed.** Open the automatic air release isolation valve. Open the liquid level gauge valve set the coalescer-separator vessel. Open any oil inlet and outlet valves installed on the turbine oil reservoir.

SUCTION CONDITION CHECK: Ensure the suction line is primed with oil, or, at least, the inlet strainer is full of oil.

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SYSTEM START UP: Verify that all valves in the inlet and outlet lines are open. Turn the "Off-On" toggle switch to the "On" position. Allow the vessel to fill with oil. You may want to choke back on the discharge valve approximately 1/3 until the air releases close, then re-open the discharge valve. Once you have established flow, check the system thoroughly for any leaks or problems. Verify no oil has migrated into the water drain line. Record the pressure gauge readings on the maintenance sheet provided and discussed in the maintenance section of this manual. At this time you may turn on the heater if supplied . Your turbine oil conditioner is now in full operation.

System Shutdown

SYSTEM SHUTDOWN: Turn the heater switch to the "OFF" position and allow the system to run approximately 5 minutes to allow the surface of the heater to cool down. Turn the inlet pump switch to the "OFF" position. Close the oil inlet & outlet valves. If the system needs to be drained, it may be done easily with the oil drain valve. Open the drain valve and the manual vent valve and allow system to drain to the desired point. For element changeout, the vessel only need be partially drained to allow for the opening of the lid without any oil spillage. Care should be taken not to drain the system below the water leg in the coalescer-separator vessel. If this should occur, repeat this step in the start up section of this manual. Once the vessel is drained to the desired point, close all manual vent and drain valves. Your turbine oil conditioner is now shutdown.

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Maintenance

ANNUAL MAINTENANCE: Once a year, this system should be completely drained of fluid and all elements should be removed. At this time, all periodic maintenance should be done as well as the vessel should be thoroughly cleaned and inspected. The heater should be removed from the vessel and cleaned & inspected for damage to assure safe operation.
After all maintenance has been done, a new element should be installed. The system should then be started up as if it was a brand new piece of equipment. The complete check out and start up procedure should be followed.

PERIODIC MAINTENANCE: This unit was designed for trouble free operation, however (as with any machinery) problems could occur. The manufacturer recommends routine checks (at least daily) be conducted. Level, pressure, differential pressure and flow monitoring devices have been incorporated into this system to monitor possible problem points.

A "Daily Maintenance Record" sheet was included in this manual to help log pertinent information during your daily routine maintenance checks. Copies should be made of the original in order to keep a history of your TORE-2-P system. Comparisons of the readings should be done periodically to determine if the system is operating properly. This schedule may be adjusted to better fit your operation if necessary. The important thing would be to not let it go undone.

The pump should be maintained as outlined in the enclosed pump literature. The motor should be maintained as per the motor maintenance specifications. The coalescer filter element should be replaced when 25 psid is indicated or one year has elapsed (whichever occurs first). The heating element should be checked periodically to assure safe operation.

The oil inlet strainer should be checked & cleaned at any time the system is shutdown or when pump cavitation may occur. As the strainer becomes clogged, an increase of suction pressure will occur creating a cavitation noise within the pump.

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Changing The Coalescer/Separator Elements

The system must be shut down and close the inlet and outlet valves on the turbine oil reservoir if hooked up for operation.

1. Drain the filter through the oil drain valve . One half gallon should be sufficient. This should be water at this point. If oil should be drained, repeat the steps in the "Water Leg" section of this manual on page 11. Insure no oil will back up into your water system.
2. Loosen the vessel head bolts and swing the cover open.
3. Remove the retaining bolt and metal washer.
4. Remove the separator cannister and inspect for damage. Replace if necessary. If the separator appears to be in good shape, carefully wipe it off with a clean cloth.
5. Remove the expended coalescer element and dispose of it properly.
6. Clean out the inside of the vessel with a clean cloth.
7. Install the new coalescer.
8. Install the clean or new separator cannister.
9. Clean & re-install the metal washer and the retaining bolt.
10. Tighten retaining bolt snugly.
11. Clean cover o'ring and cover o'ring seating surface areas.
12. Inspect o'ring and replace if necessary.
13. Replace the cover and cover bolts.
14. Tighten cover bolts alternately and in a criss-cross pattern snugly.
15. Bolts should be tightened to 20 ft lbs.
16. On restart, ensure the vessel is vented and inspect cover gasket for leaks.

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Trouble Shooting

No power to the unit – check:

1. External power supply

Inlet oil pump will not run - check:

1. Motor overloads – reset
2. Main power circuit breaker
3. Main power
4. Pump frozen

Loss of pump pressure - check:

1. Oil supply restriction
2. Air in the system
3. Plugged inlet strainer
4. Drive coupling – loose/broken

Excessive pump pressure - check:

1. Outlet valve should be open
2. Elements are plugged

Heater circuit will not operate – check:

1. Heater temp control setting
2. Thermocouple
3. Controller
4. Toggle switch

Safety Features

ELECTRICAL PERMISSIVES & FUSING: The pump motor is protected by the overload.

INLET PUMP RELIEF VALVE: The positive displacement inlet pump has an integral pressure relief valve to protect the entire system from over pressurization. This pressure should be set at 50PSI.

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