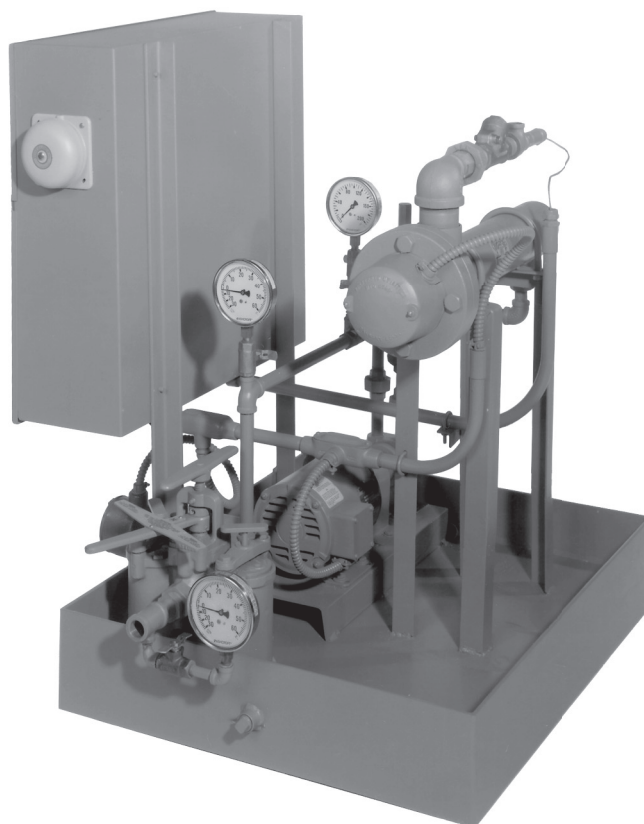


# THERMOPUMP FUEL OIL TRANSFER PUMP AND HEATER SET

*For No. 2 Fuel Oil Application*

- No. 2 Fuel Oil
- Flows from 20 to 2200 GPH
- Above ground storage tanks supply & return oil line heating system and Loop or Day Tank Fuel Oil Transfer System
- When heating is required an electric heater is turned on and an automatic solenoid valve energized to recirculate fuel oil.
- Redundant safety features include an oil temperature switch and integral heater thermostat to protect against overheating, and guarantee that the oil returning to the tank will not be heated above 80°F.
- Dual temperature sensors measure both the in line oil temperature, as well as the outdoor air temperature to activate the THERMOPUMP in response to climatic or internal tank conditions.
- Lead pump manual selection or automatic alternation with automatic lag pump back-up, alarms and safety shutdown interlocks.



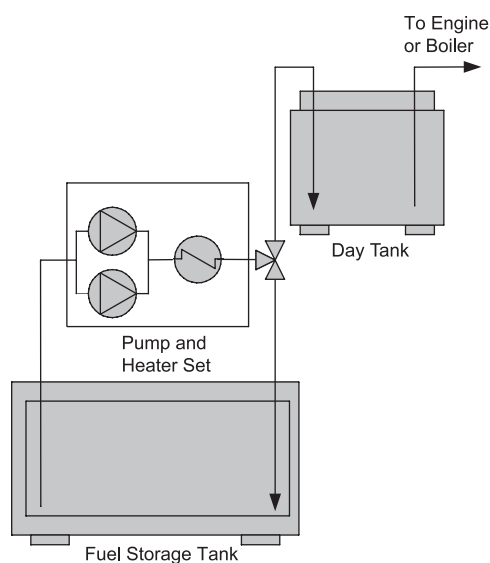
*Thermopump Fuel Oil Transfer Pump and Heater Set*

When Above Ground Storage Tanks and exposed suction and return lines are exposed to temperatures below 40°F, fuel oil “gelling” can result. This problem becomes especially dangerous, and costly, in the case of idle diesel tanks that serve emergency generators. The gelling of oil in these tanks and fuel lines can render emergency generator and heating systems inoperative at a time when they are most needed.

The THERMOPUMP system provides the above ground oil storage tank and exposed suction and return lines with a re-circulating flow of warm oil. Additionally, the THERMOPUMP can provide automatic duplex pump sequencing and monitoring for Boiler and day tank applications.

### Standard Equipment

- Microprocessor-based control with message display and keypad
- Two magnetic motor starters with overload protection
- Two motor circuit breakers
- Control circuit transformer (if required)
- Alarm bell with alarm silence / reset pushbutton
- Two “Hand-Off-Auto” switches
- “Power On” indicator
- Two pump & motor assemblies
- Three relief valves, two check valves and four ball valves
- Duplex inlet strainer with DP switch / gauge
- Inlet compound pressure gauge
- Two discharge pressure gauges
- Three gauge isolation valves
- Flow switch and one base assembly leak detector switch
- Outdoor air temperature sensor
- Oil temperature switch
- Electric oil heater
- Integral heater thermostat
- Two temperature gauges
- Three-way motorized valve (optional)



*Thermopump Fuel Oil Transfer Pump and Heater Set Application Example*

# THERMOPUMP FUEL OIL TRANSFER PUMP AND HEATER SET

## Specifications

- Power: Refer to table below
- Fluid: No. 2 Fuel Oil is standard. Consult factory for other fuel types
- Pump: Bi-rotational, positive displacement type with cast iron housings and self-adjusting mechanical seals
- Motors: Base mounted, Open Drip-Proof (ODP) construction
- Strainer: Duplex 1", or 1½" complete with 40 mesh perforated basket

Volume vs. Heating Capacity			Specifications		
Catalog Number	Capacity	BTU	Motor H.P.	Heater K. Watt	Set Voltage
LO-101TP	28.8 GPH	5,000	⅓	1.5	115v-60hz-1Ø
LO-102TP	48.0 GPH	8,500	⅓	2.5	115v-60hz-1Ø
LO-103TP	99.0 GPH	17,000	⅓	5	230v-60hz-1Ø
LO-104TP	180 GPH	34,000	½	10	230v-60hz-3Ø
LO-105TP	312 GPH	61,000	½	18	230v-60hz-3Ø
LO-201TP	384 GPH	68,000	½	20	230v-60hz-3Ø
LO-203TP	810 GPH	143,000	¾	42	230v-60hz-3Ø
LO-205TP	1140 GPH	205,000	1 ½	60	460v-60hz-3Ø
LO-207TP	2160 GPH	368,000	2	108	460v-60hz-3Ø

*Note: All heating capacities are based on Delta T of 40° F.  
All pump capacities are based on zero psig*

### Ordering Information

1. Select catalog number (see table)

For non-standard or heavy oil pumping systems, consult factory

**THERMOPUMP FUEL OIL TRANSFER PUMP AND HEATER SET***Suggested Specifications***1. Piping And Mounting**

Provide an electric heating and duplex pump and straining set that is factory assembled with components piped and mounted on a continuously welded steel plate containment basin with 3" steel side rails. Provide a ½" containment basin plugged drain connection. The basin shall be sized to contain (capture) potential leaks from all factory installed piping and components. Pipe shall be schedule 40 ASTM A-53 Grade "A" with ANSI B16.3 Class 150 malleable iron threaded fittings. Fuel Oil Heating and Transfer Pump and Straining Set shall be Preferred Utilities Mfg. Corp. Danbury, CT, THERMOPUMP Model LO-\_\_\_ rated at \_\_\_GPH of No. 2 fuel oil against a discharge pressure of \_\_\_psig.

**2. Containment Basin Leak Detection Switch**

Provide, mount and wire a float operated Containment Basin Leak detection Switch to shut off the pumps and energize an audible and visual alarm should a leak be detected. The level sensor shall be of a plasma welded stainless steel construction. Electrical connections shall be contained in a weatherproof junction box.

**3. Electric Fuel Oil Heater**

Provide, install and wire an Electric Fuel Oil Heater on the discharge of the duplex pump and motor assemblies. When the oil temperature in the system drops below 40° F the heater shall come on and be capable of heating [\_\_\_] GPH of fuel oil to a 40° F Delta T to a maximum of 80° F. The heater shall shut off at a set point that is field adjustable. The heater shall have a maximum watt density of 18 watts per square inch, and shall contain an integral adjustable thermostat supplying [\_\_\_\_\_] Btu/Hr to the system. The heater shall be controlled by a line voltage thermostat which shall be wired in the pilot circuit of a contactor of ample rating for the heater current. The heater shall be listed as standard by Underwriters' Laboratories, Inc. and shall be installed in a 150 p.s.i. flanged manifold with oil connections not less than 2" i.p.s. Heater shall be Preferred Utilities Model L.

**4. Positive Displacement Pumps**

Provide and mount two (2) positive displacement rotary type pumps with cast iron housing and self-adjusting mechanical, Carbon ring seals. Pumps that have aluminum, brass, or bronze housings or rotors are not acceptable. Packing gland equipped pumps, close-coupled pumps, Carbonator shaft mounted pumps or centrifugal pumps are not acceptable.

**5. Motors**

Provide and mount two (2) open drip proof, rigid base, standard NEMA frame motors. Pump and motor assemblies shall be factory assembled on a structural steel channel. Rotating parts shall have a steel OSHA guard.

**6. Outdoor Differential Temperature Sensor**

An Outdoor Differential Temperature Sensor shall be provided. It shall be wired to the differential temperature control in the Fuel Oil Temperature Control Cabinet. This sensor and control shall turn the transfer pump on and circulate oil through the supply and return loop when the outdoor temperature reaches 40° F.

**7. Oil Differential Temperature Sensor**

An Oil Differential Temperature Sensor shall be provided and be wired to the differential temperature control in the Fuel Oil Temperature Control Cabinet. This sensor shall control and turn on the heater based on oil temperature.

**8. Temperature Controller**

An immersion type controller shall be provided with a snap-action microswitch to operate on rise of temperature, and shall limit the temperature of the oil discharge on the Thermopump System. This device functions as a safety interlock in conjunction with the thermostat on the electric oil heater and the flow sensing device in the pump discharge.

**9. Heater "No-Flow Alarm" and Pump Automatic Sequencing Flow Switch**

Provide a time delayed flow sensing switch on the discharge of the pump set to alarm a "No-Flow" condition when the heater is energized and bring on the lag pump should the lead pump fail to maintain flow. Flow switch shall be vane operated to actuate a single double throw snap switch. Switch shall be factory wired to the control cabinet for alarm and backup pump operation. Switch shall be rated for 1450 psig. Provide a flow switch outlet isolation valve for maintaining the flow switch without draining the fuel system.

**10. Oil Temperature Gauges**

Provide two (2) 5" dial Oil Temperature Gauges calibration for 0-250° F, for the supply and discharge sides of the pump set. The Gauges shall be of welded construction, with a shatter-proof polycarbonate lens, and be hermetically sealed to prevent moisture from entering the case, or fogging the lens. Gauges shall be mounted in separable wells.

**11. Pump Isolation and Check Valves**

Provide and mount four (4) pump isolation valves. Locate one (1) valve on the suction and discharge side of each pump. Isolation valves will allow off-line pump maintenance without system loss of availability. Isolation valves shall be ball type valves to provide full flow while open and positive shutoff when closed. Additionally, two (2) check valves shall be provided and one (1) mounted on the discharge of each pump.

**12. Automatic Motorized Valve**

Provide and mount one (1) motorized, three way ball valve. The valve shall be ball type to provide full flow while in either position. The valve shall be equipped with position limit switches and a means to manually operate the valve in the case of a motor or pump set controller failure.

**13. Fuel Oil Strainer**

Provide and mount a duplex fuel oil strainer on the suction side of the duplex transfer pump set. Strainer baskets shall be fabricated of 40 mesh stainless steel. Provide a factory wired differential pressure switch/indicator mounted with isolation valves. Strainer to be Preferred Model 53.

**14. Relief Valves**

Provide and mount two (2) relief valves sized to relieve the full outlet flow of the pump without causing the pump motor to overload or any component's pressure rating to be exceeded if the discharge is inadvertently valved off. Relief valves must be externally mounted from the pumps and piped to the return line in the field according to NFPA 30. Pump internal relief valves shall not be accepted. A third valve shall be provided for the electric heater. This valve shall have a set point of 5 psi above the pump relief valves. This valve shall be used to relieve any build up in pressure due to an inadvertent isolation of an operating heater. Relief Valves shall be Preferred Model R.

# THERMOPUMP FUEL OIL TRANSFER PUMP AND HEATER SET

## *Suggested Specifications*

### 15. Compound And Pressure Gauges

Provide and mount a 4" dial compound gauge on the suction side of the strainer. The gauge shall read 30" vacuum - 15 psig. Provide and mount a 4" dial pressure gauge on the discharge side of each pump. Gauges selected must provide mid-scale readings under normal operating pressures. Gauges shall be liquid filled to dampen pulsation, with bright finished stainless steel case, brass movement, bronze bourdon tube, and shall be furnished with a pulsation dampening orifice. Each gauge shall be equipped with an isolation ball valve.

### 16. Control Cabinet

Provide a completely pre-wired and factory tested control cabinet to ensure job site reliability. The pump and heater set and control cabinet shall be the product of one manufacturer for single source responsibility. Cabinet shall be completely pre-wired, tested, and shipped as an integrated system to ensure job site reliability. The control system enclosure shall be constructed to NEMA 12/13 standards. Doors shall be fully gasketed with a turned edge, piano hinges, and a three point lockable latching mechanism. Cabinet interior shall be primed and finished in a white gloss, chemical resistant enamel. Cabinet exterior shall be primed and finished in a durable, chemical resistant, textured gray enamel, suitable for industrial environments.

### 17. Control Hardware

The control strategy shall be microprocessor-based. RELAY LOGIC SHALL NOT BE ACCEPTABLE. The control strategy shall be factory configured and stored on a EEPROM, and shall be safeguarded against re-configuration by un-authorized / un-qualified personnel. The controller shall be designed so that it will "fail safe" in the event there is a microprocessor failure. Control hardware shall include combination magnetic motor starters with overload protection and circuit breakers. The control system shall provide common alarm dry contacts to be interfaced with the Building Maintenance System as required.

### 18. Automatic Standby Pump Operation

The standby pump shall be activated and operate in tandem with the lead pump upon low-low level in the day tank. The standby pump shall be activated and the lead pump shall be shutdown upon lead pump running and no flow produced and lead pump thermal overload.

### 19. Heating and Fuel Oil Transfer Pump Set Modes

When there is a "Call For Operation" from the Loop or Day Tank, the three way valve is automatically positioned to the fuel transfer position to deliver oil as required. When there is no "Call For Operation" and there is a heating requirement, the electric heater is turned on and the three way valve is automatically positioned to recirculate fuel oil to the main storage tank.

### 20. Safety Interlocks

Provide safety interlocks to shutdown both pumps during any of the following conditions: heater on and "No Flow" detected, over temperature, pump set "leak detected", day tank "leak detected" and "high-high" day tank level. These interlocks must continue to ensure safe pump operation even if the controller has failed or is out of service and the pump set is operated in manual "hand" mode.

### 21. Operator Interface

All operator interface shall be cabinet front door mounted. As a minimum, the following indications, alarms, control switches and pushbuttons shall be provided:

1. Alarm Silence, Manual Reset, Lamp/Alarm Test Pushbuttons
2. Lead Pump Selection and "Hand-off-Auto" control switches for heater and each pump
3. "Pump 1 On", "Pump 2 On", "Flow established" and Tank Level indications
4. Heater on and "No-Flow", three way valve "Failure", Over Temperature, Strainer High Differential Pressure, Pump Failure, Day Tank Leak, Pump Set Leak, Day Tank High level and Day Tank Low level Alarms
5. An Alarm Bell shall be provided for alarm conditions

### 22. Quality Assurance

The Control Cabinet shall be manufactured in accordance with UL508A. Simply supplying UL recognized individual components is not sufficient. The assembled control cabinet as a whole must be inspected for proper wiring methods, fusing, etc., and must be labeled as conforming to UL508A (CSA C22.2 #14 for use in Canada). Inspection and labeling shall be supervised by UL or other OSHA approved Nationally Recognized Test Lab (NRTL). The system must be manufactured by a nationally recognized Trade Union (I.B.E.W. or similar trade union). Lack of an NRTL certified UL508A wiring methods inspection and label or lack of a Trade Union label will be grounds for rejection.

### 23. Factory Testing

The complete pump and heater set must be fully tested prior to shipment. Testing shall include both a pressure and vacuum testing period. First, the complete pump set shall be pressure tested to rated pressure using an air pressure source. The test shall confirm that the pump set piping system can maintain rated pressure for 4 hours. Next, the complete pump set shall be brought to a vacuum greater than 25" Hg. The test shall confirm that the pump set piping system can maintain vacuum for 4 hours. Following a pressure and vacuum test the pump set shall be given a full operational test. The pump set shall be connected to a fuel oil supply and return. The pump set shall be operated normally. Motor and heater amps shall be noted at no load and full load conditions. The motor amps shall be within 10% of rated motor amps. During the test the relief valve shall be set and tested. Operation of pump set instrumentation shall be tested.

A copy of the test procedures shall be sent to the consulting engineer and owner. The owners and or the consulting engineer at their discretion shall observe this and all other tests. A certificate of factory testing, together with a copy of the wiring and arrangement diagrams shall be placed in the control cabinet prior to shipment.