VIKING PUMP CANADA

Duplex Fuel Oil Packages Field Start-Up Guide





Before arriving on job site, make sure you have:

- A copy of the approved drawing of the Duplex Fuel Oil Pump Package
- A copy of the approved drawing of the Control Panel
- □ Read all the instructions, notes, and suggestions in this bulletin to become familiar with the start-up production. If you have any questions or require clarification, please contact our system specialists at 1-888-845-7867 and press #2 for Applications and Technical Support.

When you arrive on job site confirm the following:

- Check the name plate rating on the Control Panel and compare to the incoming voltage and motor ratings.
- The compound gauge should be located on the suction header
- The pressure gauge should be on the discharge header
- Examine the suction header and confirm that the arrow cast into suction strainer points towards the pump suction.
- On the control panel confirm the voltage, phase, horsepower, certifications and part number stamped on the serial number plate located on the door of the panel match the specifications. <u>Do not</u> open the panel door.

Observations to be made on site:

General Installation

- The package should be anchored to the ground to prevent movement. If the unit is mounted on a shelf it should be properly bolted.
- All piping (suction, discharge and relief return lines) should be extremely supported to prevent pipe stresses being transferred to the unit. Ideally flexible connections should be used.
- Use mechanical lifting aids when possible (forklift, dolly, moving dolly, etc.) to lift or move the unit using the bottom of the baseplate <u>only</u>.

Don't lift the unit by piping as it could cause the pipe leaking or damage and void warranty.

Suction Piping

- □ If possible, follow the suction pipe to supply tank. The suction line should go around obstacles instead of over them. This is to prevent air lock (the system will not prime if the suction line is air locked).
- If there are any valves on the suction line they should be in the open position.
- With long suction pipes there should be a hand operated pump to evacuate the air from the suction line. This pump should be piped parallel to the duplex package.
- ☐ The relief valves piping cannot be piped back into the suction piping. Both valves can be piped to a common pipe, but that pipe must be piped back to the supply tank. There should not be any other valves in this line.

Discharge Piping

- The discharge will be piped into a day tank or directly into the diesel generator or boiler depending on the installation.
- □ If possible, follow the discharge pipe. If there are any valves on the discharge line they should be in the open position.
- Look at the day tank. There should be the line from the duplex pump unit, overflow and floats.









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Viking Duplex Fuel Oil Package Field Start-Up Guide





Fig. 3 – Typical Control Panel

Priming the Duplex Fuel Oil Package:

- 1. On the Control Panel make sure both the Main Disconnect "ON-OFF" switches are in the "OFF" position (power off)
- Look at the suction gauge to see if there is any pressure on the suction line. If there is pressure and the application is not flooded than the suction line is pressurized. Carefully remove the drain plug from the basket strainer to release the compressed air.
- 3. Turn the four ball valves connected to the pressure gauges (suction & discharge gauges) to closed position.
- 4. Remove the thumbscrew from the top of the lid of the basket strainers, rotate the lid counterclockwise until the pin hits and stops, then remove the lid.
- 5. Open the suction valves.
- 6. Fill the strainers with diesel (the suction valves should be in open position, as you fill one strainer the liquid level will flow in the other strainer).
- 7. Reinstall the lid with the tab of the lid just to the left of the boss with the body, rotate the lid clockwise until the holes line up, and reinsert the thumbscrew.
- 8. Both the suction and discharge ball valves should be in open position.
- 9. On the Control Panel, turn the "Hand-Off-Auto" selector switches to "OFF" position for both P1 and P2.
- 10. Turn both the main disconnect "ON-OFF" switches to "ON" position (power on).
- 11. Turn the "P1-Auto-P2" switch to "P1" position.
- 12. Have someone observe the motor fan for the next operation.
- 13. For P1 turn "Hand-Off-Auto" selector switch to "Hand" position and P1 will start.
- 14. After approximately 3 seconds turn the "Hand-Off-Auto" selector switch to P1 back to "OFF" position.
- 15. Confirm that the motor fan had spun in the proper rotation. If the motors are not rotating properly have an electrician switch the motor leads and check again the rotation of the motors.
- 16. Repeat steps 11 to 15 for P2.
- 17. Turn the four ball valves connected to the pressure gauges (suction & discharge gauges) to the open position.
- 18. For P1 turn "Hand-Off-Auto" selector switch to "Hand" position and P1 will start.
- 19. Observe the suction compound gauge; it should start pulling a vacuum. The discharge gauge will read 0 psi. Run P1 for no more than 2 minutes then turn it off. Place your hand on the pump (around the seal area) and if it starts heating up, turn off the pump to prevent mechanical seal failure.
- 20. When the pumps are primed and pumping the discharge gauge will show a positive pressure.

NOTE: If the suction line is long you may have to refill the basket strainer again. Before this is done the suction valves will have to be in the closed position, otherwise the vacuum will be lost. Then alternate running P1 and P2 in manual mode.

NOTE: Some local codes specify an anti-siphon valve to be installed on the suction line. It is usually installed close to the main supply tank. In some cases, this valve will prevent the pumps from priming. If the pumps don't prime after a few attempts, ask the contractor to loosen the spring in the anti-siphon valve and once pump is primed, the spring can be set in order to meet local codes.

NOTE: If the installation has a flooded suction, turn the suction and discharge valves to the open position. The suction pressure gauge should show a positive pressure. If it doesn't, follow the suction line to the supply tank and see if all valves are open. If all valves are open and the pressure gauges don't read a positive pressure, there's a blockage in the line. The blockage will have to be cleaned before running the pumps.



CONTROL PANEL

- Check the name plate rating of the Control Panel and compare with the incoming line voltage and the motors ratings.
- Check that the controller is properly connected to the pump motors
- If motors are rotating in the proper direction (as checked in steps 10 to 15 under Priming section) and all the above checks out correctly, turn the "Hand-Off-Auto" switches for both P1 and P2 to the "Auto" position.
- Activate float switches manually to test if pumps start and stop at desired levels.
- Once the level falls below the start lead pump level float switch FL2 (as shown in diagram under Float Controls), the pump motor is energized and the lead pump starts pumping fuel into the tank.
- If the lead pump has failed and the level falls below FL2 start lead pump level float switch. The "Lead Pump Failure" red pilot light is turned on and the lag pump motor is energized so that the lag pump keeps pumping fuel into the fuel tank.
- In order to turn off the "Lead Pump Failure" red pilot light, the manual "Reset" red push button must be pressed.
- Once the level reached the stop all pumps level float switch FL3, the pump motors are de-energized and the pumps stop.
- If the alternation selector switch "P1-Auto-P2" is in the "Auto" position, the stop all pumps float switch FL3 triggers the alternator and reverses the order of the lead and lag pumps. For example, if P1 was the lead pump before the trigger, P2 will become the lead pump after the trigger.

RELIEF VALVES

Checking Relief Valves Current Setting

- 1. With the pump running, notice the reading on the discharge pressure gauge.
- 2. Slowly close the discharge ball valve.
- 3. Operate only one pump at a time in manual mode.
- 4. The reading on the discharge pressure gauge will increase.
- 5. Make a note of the pressure reading when the valve is fully closed; this value is the pressure relief valve setting. It should be approximately 15 to 20 psi greater than the specified pump discharge pressure.
- 6. Open the discharge valve and turn the pump off.
- 7. If the pressure relief setting is satisfactory, repeat for another pump.



Setting the Pressure Relief Valves

- 1. Turn the "Hand-Off-Auto" switches to "OFF" for both P1 and P2
- 2. Remove the cap (Item J) of the pressure relief valve for pump P1.
- 3. Loosen the lock nut (item F)
- Turn the adjusting screw (item C) clockwise to increase the pressure setting or counterclockwise to decrease pressure setting.
- 5. Tighten the lock nut (Item J)
- 6. Reinstall the cap (item B) onto the valve.
- Turn the "Hand-Off-Auto" switch for P1 to "HAND" position
- Slowly close the discharge ball valve for P1. If the pressure relief setting is not satisfactory, repeat the operation to adjust the adjusting screw.
- 9. Repeat steps 1 to 8 for pump P2

SYM.	NAME
A	BODY
В	CAP (O-RING SEAL)
С	ADJUSTING SCREW
D	RETAINER
Е	O-RING †
F	LOCK NUT
G	SPRING †
н	STOP RING
I	PISTON †
J	CAP (GASKET SEAL)
к	GASKET †



CAP (GASKET SEAL)



Float Controls

The standard duplex control panel contains NC relays to operate 4 float switches (switches supplied by others) for the day tank.

The top float (FL3) stops both pumps, the next float down (FL2) starts the lead pump and the bottom float (FL1) starts the lag pump. The top day tank float (FL4) is a primary redundancy in case FL3 fails - it stops all pumps and also trips the high-level alarm. The highest float (FLCDT) is a separate single-point redundant float, independent of the other 4, which stops all pumps in the event the primary 4-float switch fails.

Also, this contact is wired in a circuit independent of the PLC, so in the event the PLC malfunctions, there is a failsafe to shut down the pumps and trips the critical high-level alarm.

It may not be practical to fill the day tank to test the operation of the panel. A simpler way is to have the electrician simulate the open and closing contacts of the floats to check the operation sequence. This procedure can be used to check the high and low level alarms. The electrician can check the conductivity of the float (normally open or normally closed) to see if they are the same as specified. In some cases there is no day tank and the pump duplex unit pumps directly into the diesel generator or boiler. The panel will receive the signal from the generator and start the lead pump.



DESIG.	DESCRIPTION
FLCDT	Critical high level day tank
FL4	High level day tank.
FL3	Stop all pumps.
FL2	Start lead pump.
FL1	Low level day tank.



PRESSURE SWITCHES

If the duplex unit is supplied with pressure switches (either single or dual stage), they will be installed on the discharge line. These are not factory set and <u>must</u> be set during installation.

To simulate a low-pressure condition on the discharge line, have the control panel on automatic mode and then close the discharge valve of the pump running. The relief valve will open, and the pumping liquid will return to the supply tank. The pump will shut down and a red light will come on the panel - the time will be that is set on the timer.

It is difficult to simulate an actual high pressure shut down. Have the electrician simulate by opening or closing the contacts in the control panel.

FLOW SWITCHES (Boiler Installations – No Day Tank)

If the duplex unit is supplied with a flow switch it will be installed on the discharge line.

To simulate a low flow condition on the discharge line, have the control panel on automatic mode and then close the discharge valve of the pump running (either P1 or P2).

The relief valve will open, and the pumping liquid will return to the supply tank. Within 1 minute (Field time adjustable) the control panel will start the other pump and the "Low Flow" Signal red lights will light up on the panel.

TROUBLESHOOTING

1. No Discharge Pressure

- a. Verify Priming Procedure. (Strainers primed, proper motor rotation)
- b. Verify Relief Valve setting procedure.
- c. To test each pump individually close valves on pump not being tested. Run pump to be tested and slowly close discharge valve. If pressure increases, then there is flow from that pump. Turn pump off and close valves and repeat process for other pump. If gauge still has little to no reading, then the operating pressure (especially on short distances) might be 1-5 psi only and not measurable on gauge.
- d. To prove this; run one pump and close off a valve downstream (if available) and pressure should rise to the Relief Valve set point.

2. Panel Alarms

- a. Panel must run in AUTO mode to assure correct operation.
- b. PLC timers run through their time setting or false alarms may show.
- c. Manually jumping floats and pressure/flow switches in the panel is sometimes the only way to test setting due to the design of the entire generator system.

3. Fluid Leaking from a small hole located below the pump near seal

a. This is to indicate that the seal has failed and is usually caused by a dry run condition.



A properly installed and maintained Viking Pump will give long and satisfactory performance.

NOTE: Before making any pump adjustments or opening the pump liquid chamber in any manner make sure that:

- 1. Any pressure in the pumping chamber has been vented through the suction or discharge lines or other openings provided for this purpose.
- 2. The driver has been "locked out" so that it cannot inadvertently be started while work is being done on the pump.
- 3. The pump has been allowed to cool down to the point where there is no chance of anyone being burned.

If trouble does develop, one of the first steps toward finding the difficulty is to *install a vacuum gauge in the suction port and a pressure gauge in the discharge port.* Readings on these gauges often will give a clue as to where to start looking for the trouble.

VACUUM GAUGE – SUCTION PORT

1. High reading would indicate:

- Suction line blocked foot valve stuck, gate valve closed, strainer plugged.
- Liquid too viscous to flow through the piping.
- Lift too high.
- Line too small.

2. Low reading would indicate:

- Air leak in suction line.
- End of pipe not in liquid.
- Pump is worn.
- Pump is dry should be primed.

3. Fluttering, jumping, or erratic reading:

- Liquid vaporizing.
- Liquid coming to pump in slugs, possible an air leak or insufficient liquid above the end of the suction pipe.
- Vibrating from cavitation, misalignment, or damage parts.



DISCHARGE GAUGE – DISCHARGE PORT

1. High reading would indicate:

- a) High viscosity and small diameter and/or lengthy discharge line.
- b) The strainer or filter is plugged.
- c) The pressure relief valve is set too high.
- d) Valve in the discharge line partially closed.
- e) Line partially plugged from build up on inside of pump, solidified product or foreign object.
- f) Liquid in the pipe not up to temperature.

2. Low reading would indicate:

- a) Pressure relief valve set too low.
- b) Pressure relief valve poppet not seating properly.
- c) The bypass around the pump is partially open.
- d) Pump is damaged or worn.
- e) The pump has too much internal clearance.

3. Fluttering, jumping, or erratic reading:

- a) Cavitation.
- b) Liquid coming to pump in slugs.
- c) Air leak in suction line.
- d) Vibrating from misalignment or mechanical problems.

Some of the following may also help pinpoint the problem:

1. Pump does not pump

- a) The pump has lost its prime from air leak or low level in tank.
- b) The suction lift is too high.
- c) Rotating in the wrong direction.
- d) The motor does not come up to speed.
- e) The strainer is clogged.
- f) The bypass valve is open, pressure relief valve is set too low or pressure relief valve poppet stuck open.
- g) The pump is worn out.
- h) Any changes in liquid, system or operation that would help explain the trouble, e.g. new liquid, additional lines or process changes.

2. Pump starts, then loses its prime:

- a) The supply tank is empty.
- b) The liquid is vaporizing in the suction line.
- c) There is an air leak or air pockets in the suction line.
- d) The pump is worn out.



3. Pump is noisy:

- a) The pump is cavitating (liquid vaporizing in suction line) or being starved (heavy liquid cannot get to pump fast enough). Increase the suction pipe size and/or reduce the length or decrease the pump speed. If the pump is above the liquid, raise the liquid level closer to the center line of the inlet port. If the liquid is above the pump, increase the head of the liquid.
- b) Check alignment.
- c) Anchor the base or piping to eliminate vibration.

4. Pump not up to capacity:

- a) The pump is starving or cavitating see "Pump is noisy" (Item 1).
- b) The strainer partially clogged.
- c) Air leak somewhere in the suction line.
- d) Running loo slow. Is the motor the correct speed and wired correctly?
- e) Pressure relief valve is set too low, stuck open or has damaged poppet seat.
- f) The bypass line around the pump partially opened.
- g) The pump is worn out.

5. Pump takes too much power:

- a) The system pressure relief valve is set too high.
- b) The pump is misaligned.

MAINTAINANCE

- 1. DO record pump model number and serial number and file for further use.
- 2. DO have spare parts, pump or stand by units available, particularly if pump is essential part of key operation process.
- 3. DO obtain, read and keep all maintenance instructions furnished with the pump.
- 4. DO make sure any pump that has residual system pressure in it or that has handled high vapor pressure liquids, has been vented through the suction or discharge lines or other openings provided for this purpose.
- 5. DO make sure that if the pump is still hooked to the driver while maintenance is being performed that the driver has been "locked out" so that it cannot be inadvertently started while work is being done on the pump.



Viking Pump of Canada Warranty

The company warrants all products manufactured by it to be free from defects in workmanship or material for a period of one (1) year from date of start-up, provided that in no event shall this warranty extend more than eighteen (18) months from the date of shipment from the company. If during said warranty period, any products sold by the company prove to be defective in workmanship or material under normal use and service, and if such products are returned to the company, transportation charges prepaid, and if the products are found by the company to be defective in workmanship or material, they will be replaced or repaired free of charge, INCOTERMS 2020 F.C.A. the company location. The warranty shall not apply to any part which has been subject to alteration, abuse, misuse, damage or flood, fire or act of God or where the unit has been improperly installed or applied.

The company assumes no liability for consequential damages of any kind and the purchaser by acceptance of delivery assumes all liability of the consequences of the use or misuse of the company products by the purchaser, his employees or others. The company will assume no field expense for service or parts unless authorized by it in advance.

Equipment and accessories purchased by the company from outside sources which are incorporated in to any company product are warranted only to the extent of and by the original manufacturer's warranty or guarantee, if any.

THIS IS THE COMPANY'S SOLE WARRANTY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, WHICH ARE HEREBY EXCLUDED, INCLUDING IN PARTICULAR ALL WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

No officer or employee of IDEX Corporation or the company is authorized to alter this warranty.