

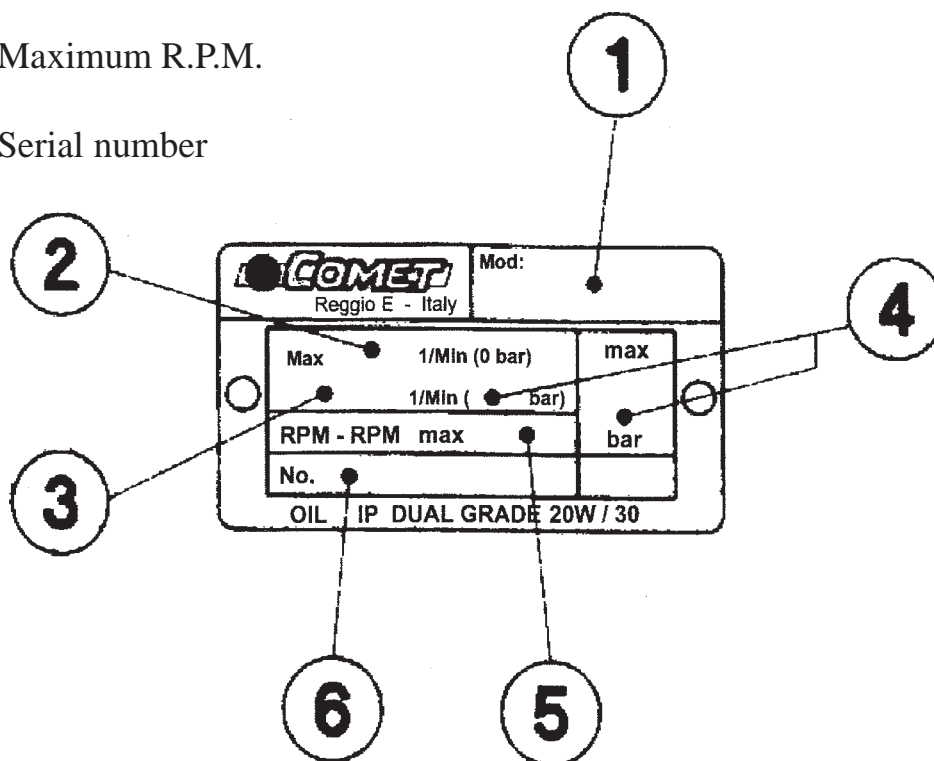


## Pump Operating and Maintenance Manual - Models 78-00111 - 78-0057

Thank you for purchasing the SDI Diaphragm Pump manufactured by Comet Pump. Comet produces quality products which are safe, efficient and durable. Please read this manual carefully, paying great attention to all the information provided, especially that on safety issues

The following data is on the pump name plate:

1. Pump Model
2. Maximum delivery (at 0 psi)
3. Flow rate at maximum pressure
4. Maximum in pump pressure
5. Maximum R.P.M.
6. Serial number





## PUMP OPERATING INSTRUCTIONS

### FOR MODELS 78-00111 - 78-0057

### **SAFETY INSTRUCTIONS**

Accidents occur every year because of careless use of industrial equipment. You can avoid hazards involved with high pressure pumping operations by following these safety instructions.

#### **Warning**

**Always use a pressure gauge when operating pump.** The pressure must not exceed specified rated pressure of pump or pump could be damaged causing leakage, resulting in injury to personnel in vicinity.

**Do not adapt relief valves to maintain more pressure than their specifications state.** This could result in relief valve or pump casing bursting because of too much pressure. Personnel in general area could be physically harmed.

**Do not put a valve between the pump and relief valve.** If the pump should be started with this valve closed this could put excessive pressure on the pump which could cause the pump case to burst and might injure personnel or other equipment in vicinity.

**Be sure to use shields or covers on all sheaves, belts, and drives.** Guards can prevent personnel from becoming seriously injured by being entangled in fast rotating parts.

**Always relieve pressure on the system before performing fluid and maintenance.** Failure to do so may spray water or chemicals on service personnel causing water burns or chemical exposure.

**Use extreme care when using solvents to clean pump and pump parts.** Most solvents are highly flammable. Observe all safety instructions on packaging. Fires could result in serious burns to personnel and serious damage to equipment. **Do not modify the pump to function beyond its specifications.**

### **ORDERING PARTS**

Parts should be obtained through the dealer from whom equipment was purchased. SDI dealers carry a complete line of service parts; however, in the event they are not available, your dealer will order them for you. In order to reduce errors when purchasing parts from your dealer always supply your dealer with the following information.

- a. When possible give part number, serial number, and model number of pump.
- b. State part number followed by complete part name. Check parts list to be sure part number and name agree on the order.
- c. Indicate quantity of item wanted. When necessary, qualify amounts with words "each", "feet", etc.
- d. Specify shipping instructions: i.e., via freight truck, parcel post, express, etc.
- e. Indicate the date of order.

## **CLAIMS FOR DAMAGED MATERIAL**

Claims for parts lost or broken should be filed with the transportation company involved without delay.

If necessary for any cause to return materials, please secure approval and shipping directions from SDI prior to returning.

## **TO OUR CUSTOMER**

We at SDI would like to express our appreciation in your decision to use one of our pumps. This pump was designed by experienced engineers and built by skilled workmen to provide you with quality equipment.

SDI stands behind all of its products. The warranty card included with your pump should be filled out completely and returned to SDI as soon as possible.

# **Section B**

## **INTRODUCTION**

### ***Forward***

The SDI diaphragm pumps are pumps with a pressure balanced diaphragm system that assures a long life to diaphragms and to the other moving components. The components which come into contact with the working fluid are made of anti-corrosive brass and anodized aluminum and are therefore fit for numerous commercial and agricultural applications. If particularly corrosive liquids are pumped, SDI recommends replacement of all elastomeric components (O rings, gaskets, and diaphragms) with parts made of viton. These parts are listed as options on the parts list.

## **RECOMMENDATIONS TO THE USERS**

- a. Read the Safety Instructions before installing and operating the pump.
- b. For the use and maintenance of SDI diaphragm pumps consult this manual. Do not use maintenance procedures different from the ones outlined in this book.
- c. In case of difficulty or when repairs are necessary, please contact your authorized SDI dealer.

# **Section C**

## **OPERATION**

### ***Check Point before Starting***

**Always make the following checks before starting the pump.**

1. Check the oil level in the sight gauge. In case the pump requires additional oil, remove the cap, remove the diaphragm and add the necessary oil. Replace the diaphragm and cover.

**IMPORTANT: With pump not operating and sitting horizontal oil must never rise above the level shown by arrow in figure 2, Page 8. Use oil of the type indicated on the pump name plate.**

2. Check that the lever on the relief valve is completely turned. The purpose of the relief valve is as follows:
  - a. It enables the operator to choose the working pressure.
  - b. It maintains a steady operating pressure after setting the required pressure.
  - c. It acts as a safety valve, not allowing pressures above the pumps maximum operating pressure.

- d. The required pressure is obtained by pulling down the relief valve lever and by screwing the adjusting nut to achieve the desired pressure as indicated on the pressure gauge.
- e. If the pump is being operated by an engine, the relief valve lever can be utilized to unload the pump to make starting of the engine easier.
- f. The pump must never work over 550 rpm and the pressure indicate on the pump's nameplate.

## **Section D**

### ***Maintenance Procedures***

#### **PUMP STORAGE**

1. When the pump is not operating, it is often good practice to flush the internal components by pumping clean water for a few minutes. In order to drain the remaining clean water, turn the relief valve lever, break the suction line and operate the pump for an additional minute.
2. To avoid freezing during the winter season, it is advisable to store the pump in a place above freezing or to take the necessary precautions to verify that all water is drained from the pump.

*You may also choose to pump a solution of 50% anti freeze and 50% water through the pump system making sure solution comes out discharge outlet.*

### **CRANK CASE OIL**

1. It is important to maintain the oil at the correct level by addition oil if necessary. Oil has to be changed after 400 to 450 hours of continuous operation by following the oil changing procedure.

### **OIL CHANGE PROCEDURE**

1. Remove the valve chambers and the diaphragms.
2. Invert the pump and allow the old oil to drain while operating the pump shaft by hand.

***NOTE: emptying may also be made easily by removing the valve chambers and diaphragms.***

3. Reassemble pump by first installing the diaphragms and then reattaching the valve chambers. (See diaphragm replacement procedure).
4. Fill slowly with new oil until oil reaches the correct level in the sight gauge (See Figures 2-4). While refilling, move the pump shaft by hand while tilting the pump in both directions to facilitate getting the air out from under the diaphragms. If after the pump has operated for a five minutes the oil level has rescinded, add additional oil to the correct level. Recheck oil in an additional five minutes.

***NOTE: When changing the oil, check the diaphragms, and if these are worn, replace them.***

## **PUMP VALVE REPLACEMENT**

1. To remove valve cover clamp, first remove hex socket screw. Very carefully insert small screw driver on one side of the valve cover and remove.
2. Use a small screw driver to remove o-ring, again being very careful not to cut the inside of valve chamber. At this time, a penetrant such as WD40 may be sprayed inside the valve chamber to help loosen up the valves. Once the discharge valve is loose, remove the valve chamber.
3. Remove o-ring in same manner as previously described.
4. Then remove suction valve and finally the o-ring beneath the suction valve.

**NOTE: Suction and discharge valves are identical.**

**The valves may be disassembled by separating the two halves of the valve cage for replacing any worn components. Replace any worn components and reassemble valves.**

5. Inspect the inside of the valve chamber for any small cuts or scratches and remove with emory cloth if possible. If cut too deeply or washed out in o-ring area, valve chamber must be replaced.
6. Lubricate the inside of valve chamber before installing valve assemblies. First install the inside o-ring, then the suction valve. The valve disc goes toward the inside of the valve chamber on both the suction and discharge valve. After suction valve is installed, install another o-ring, the discharge valve, and finally the third o-ring.
7. Install the valve cover and clamp and tighten the set screw.
8. Repeat above procedure for remaining two valve chambers.

## **PUMP DIAPHRAGM REPLACEMENT PROCEDURE**

1. Drain crankcase (See Oil Drain Procedure).
2. Remove retaining screws from valve chambers.
3. Carefully lift valve chambers off pump.
4. Remove diaphragm retaining screw. Remove diaphragm.
5. Lubricate outer edge of new diaphragm and install onto top of piston. Install beveled washer and capscrew making sure the beveled side of washer points towards the diaphragm, then tighten capscrew.
6. Rotate pump slowly to bottom of stroke in order to pull outer lip of diaphragm down into pump case. Be careful not to pinch diaphragm.
7. Inspect o-rings on suction and discharge ports of valve chamber and replace if necessary.
8. Carefully place valve chamber back over diaphragm and install the capscrew and tighten alternately in order to pull each corner down gradually.
9. Repeat above procedure on remaining diaphragms.
10. Refill crankcase with proper oil. Rotate pump slowly by hand watching oil level sight glass to make sure that all air bubbles are out of the system.
11. Run pump for five minutes, shut down and recheck oil for air bubbles and proper level. Add oil if necessary.
12. Repeat item 11.

**NOTE: If cylinder liners are removed, they must be replaced with oil holes aligned properly as shown in figure 2-9, Page 6**

**THIS IS CRITICAL ON THE SIDE CYLINDERS! Failure to align holes will result in premature diaphragm failure.**

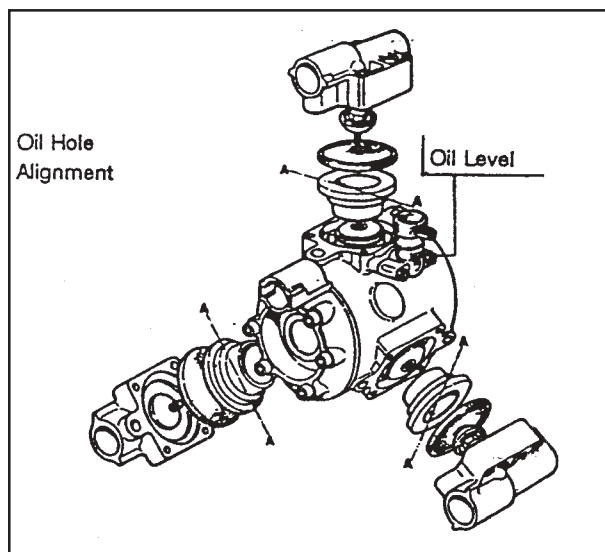


Figure 2-9

## **TROUBLESHOOTING**

### ***Symptom***

#### **1. Pump Does Not Prime**

- a. Check for air leaks in suction system
- b. Check for clogged strainer filter
- c. Check that the relief valve lever is completely up.

When the pump pumps air, either for lack of liquid in the tank or for other reasons, lift up the relief valve lever and allow the pump to purge itself of air.

- d. Defective suction or discharge valves.

*(See Valve Replacement Procedure)*

#### **2. Pump Lacks Pressure While Delivering Water**

Disassemble the relief valve assembly and check for a worn seat or valve. If necessary replace these components. Also check to see if foreign

material is lodged under the valve.

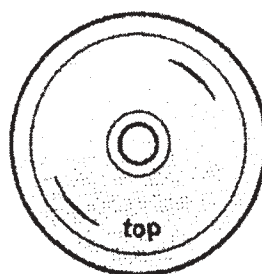
#### **3. Irregular Delivery of Water**

Check for wear on the suction and discharge valve seats and valve disks. If worn components are discovered, replace these components. Also check for foreign substances in the same suction and discharge valves. (See Valve Replacement Procedure)

#### **4. Water Mixed with Oil**

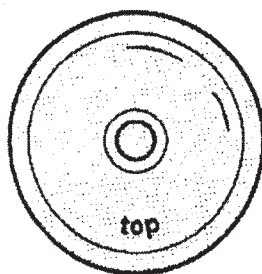
A leakage of a mixture of oil and water coming from the volume compensator or sight glass, means that one or more diaphragms have failed. Replace defective diaphragm. (See Diaphragm Replacement Procedure)

#### **Examples of Diaphragm Failure:**



**Two small fractures, corresponding to valve position**

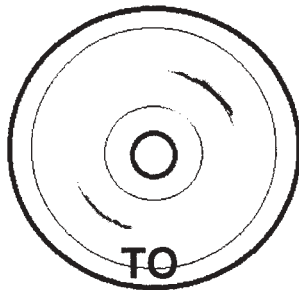
#### **Cause**



1. Restricted Suction. Blocked suction strainer. Suction hose blocked or kinked. Suction lift too high. Spray mixture too thick (dense)
2. Pump RPM above specifications
3. Suction valve not sealing
4. Cylinder sleeve holes not in correct position
5. Chemical incompatible with diaphragm material, in addition to one of the above



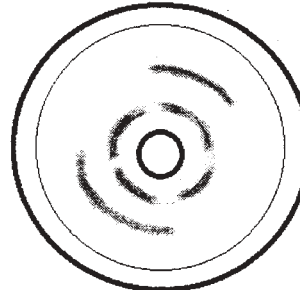
# Common causes of diaphragm failure



Two marks in correspondence to valve seat

## Causes

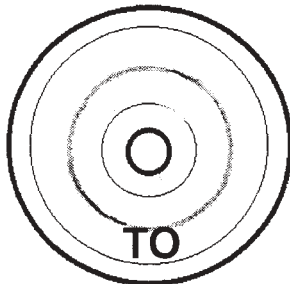
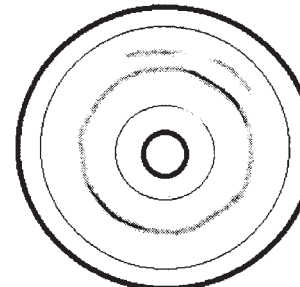
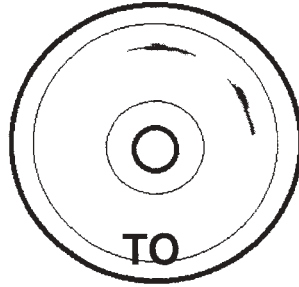
1. Restricted suction.  
Blocked suction filter.  
Suction hose blocked or kinked. Suction lift too high. Spray mixture too thick (dense)
2. Pump RPM above specification
3. Suction valve not sealing
4. Cylinder Sleeve holes not in correct position
5. Chemical incompatible with diaphragm material, in addition to one of the above causes.



Fatigued and worn underneath piston retaining disc and two marks in correspondence to valve seat.

## Causes

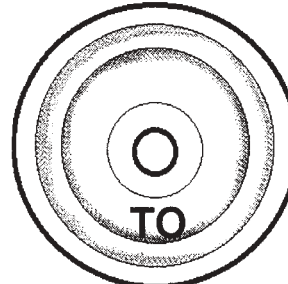
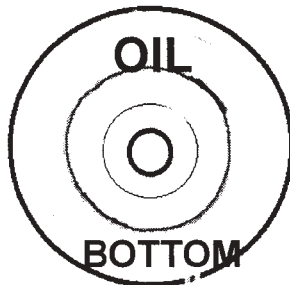
1. Chemical incompatible with diaphragm material
2. Diaphragm swollen and soft
3. Diaphragm soft and spongy (Below 60°)
4. Diaphragm profile distorted
5. Diaphragm shape distorted
6. Increase in external diameter
7. Diaphragm swollen



Circular fracture on piston side of diaphragm that is same size as piston.

## Causes

1. Excessive wear between piston and valve
2. Suction has too much pressure (excessive head)
3. Low pump RPM
4. Cylinder sleeve holes not in correct position
5. Delivery valve not sealing
6. Low oil level in pump



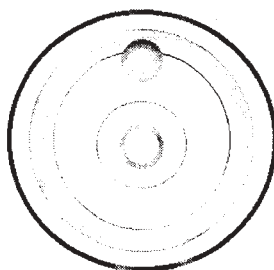
Fracture on external diameter and worn or fatigued under piston retaining disc.

## Causes

Fatigue breakage, diaphragm worn out

## Remedy

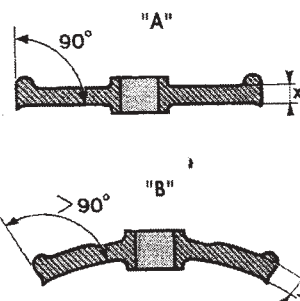
Diaphragm must be checked once a year.



Straight fracture

## Causes

Incorrect air bleeding, air trapped under diaphragm



A. Standard shape

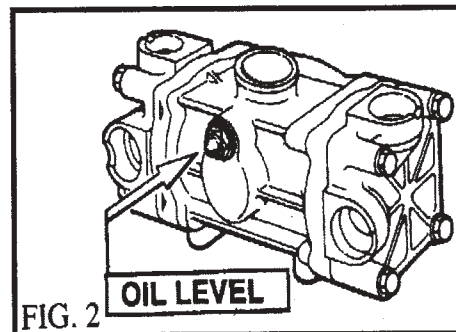
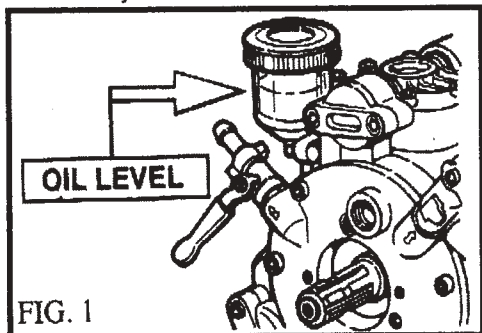
B. Diaphragm distorted

B. Swollen diaphragm

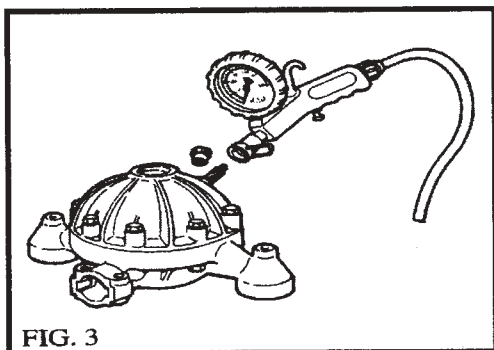
# OPERATING INSTRUCTIONS

## Preliminary Maintenance

A) Check oil level, when pump is idle and placed horizontally, it must be at the mark indicated on the oil site glass (fig. 1) or be visible on the oil level plug (fig. 2), depending on type of pump. Top off with SAE 30W oil if necessary.



B) Check the air pressure in the pressure accumulator if applicable, (fig. 3) depending on the range of pressure used in the pump. Pressurize according to table A. The pressure may be checked and changed accordingly using an air pump.



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TAB. A

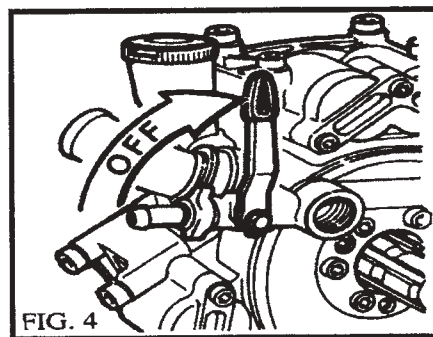
Pressure accumulator (psi)	Pressure of pumps (psi) When in use
30	30-75
30-75	75-150
75-105	150-300
105	150-750

**ATTENTION:** before starting the pump, make sure that taps not in use are in the "closed" position (fig. 4).

**ATTENTION:** Make sure that the moving parts of the pump are properly protected and are not accessible to other persons not authorized.

**NOTICE:** if the machine is used at a very low temperature, make sure there is no ice inside the pump and manifolds, turning the eccentric shaft of the pump by hand, after disconnecting it from the tractor.

**NOTICE:** Avoid exposing pump to freezing temperatures. If this is unavoidable run antifreeze through pump for several minutes then purge system of any antifreeze before use.



## STARTING

- Follow the pump Manual instructions.
- The pump must turn at a rotation speed between 400 - 550 rpm.
- To prime pump quickly, keep the suction circuit at "0" pressure or near to "0". Repeat this operation each time the pump is emptied.
- Bring the pump to the rated pressure according to the type of work to be carried out by regulating the pressure of the control. The pressure must not exceed the maximum pressure of the pump.
- Control the oil level during the first few hours of operation and add oil (when pump is idle) if necessary.

## MAINTENANCE

Wash the pump after use by running clean water through it for a few minutes.



# MAINTENANCE

Periodical maintenance to be carried out by user as follows:

**ATTENTION:** check pump only when it is not running.

## OIL

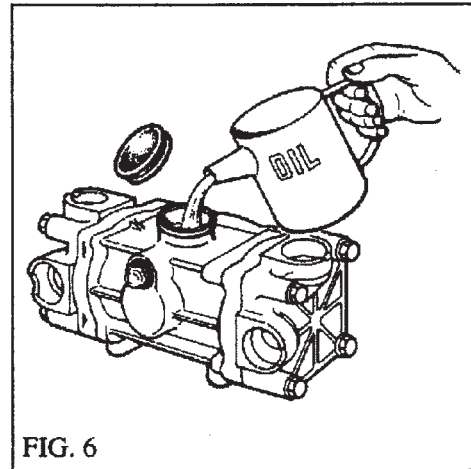
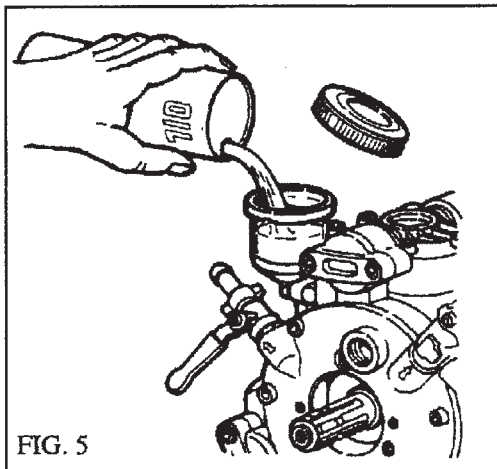
The level and cleanliness of the oil should be frequently checked (eg: each time the tank is filled). This will indicate if the pump and diaphragm are working properly.

### OIL LEVEL

When pump is not on the oil level must correspond to the reference slot found on the oil sight glass or oil level cap depending on type of pump. The oil level is not always constant when the diaphragm pump is working: the pump level is lowered when the pump starts working and is without liquid, when the water arrives, it rises to normal level.

During operation attention must be made to a decrease in the oil level:

a) if this happens during the first hours of working it is normal. Add SAE 20W/40 type oil to proper level as in fig.5. For pump BP 60 where the oil sight glass is not present, remove the diaphragm and the rubber cap (fig.6). When remounting the manifold tighten the connecting plate screws to a torque of 17 Nm.



b) if this happens after many hours of work and continues after 1 or 2 top ups, it is a symptom of diaphragm swelling caused by choking during inlet (dirty filter, deformed inlet tube or chemical attack to diaphragm). In this case check the filter and inlet system and/or refer to a specialized technician to check the diaphragm.

### STATE OF OIL IN THE CASE OF BROKEN DIAPHRAGM

If the oil becomes white (water present in oil), it may be a symptom of breakage of one or more diaphragms, therefore it is necessary to stop work and let a specialized technician check the conditions of the diaphragm and substitute if necessary.

#### **Notice:**

- If work is continued during these conditions it may cause serious damage to internal parts of the pump.
- If it is not possible to substitute the diaphragm within one day of its breakage, empty the carter of water and pour in oil (even used) or diesel oil to stop rust from forming on the internal components .

## INLET SYSTEM

The inlet system must be kept efficient, that is:

There must not be:

- Entrance of air caused by tube wear;
- Loosening of fittings;
- Wear of joints;

Regarding this, check that there are no small drips when the pump is still, this means air is entering the pump when in motion.

The filter must be maintained and kept clean with frequent inspections especially if powder based products are used.

## **PUMP FIXING**

**ATTENTION:** periodically check, especially when there is vibration during use (chain tractors, gasoline/diesel engines) that the pump fixing screws on the machine frame are tightened and if necessary re-tighten according to the machine manufacturer instructions.

## **PRESSURE ACCUMULATOR**

Check pressure in pulsation dampner, if present, and for pulsation on the pressure gauge.

## **EXTRA MAINTENANCE**

The following maintenance operations must be carried out periodically by a specialized technician.

## **OIL REPLACEMENT**

It is advised to replace the oil after the first 300 hours of work and then every time the diaphragm is changed.

**ATTENTION:** The oil must be collected in the proper containers and not thrown into the environment.

## **DIAPHRAGM REPLACEMENT**

At the end of every season it is advised to check the diaphragms and see to their replacement if worn or distorted . If particularly strong chemical products are used and if a guarantee is wanted for a perfect efficiency of the pump, when work begins again it is advised to replace the diaphragms regardless of their state.

## **INLET AND DELIVERY VALVES**

Periodically check (every 300 hours under normal working conditions) the state of the inlet and delivery valves. The maintenance must be more frequent if sandy liquid or abrasive liquids are used. It must also be carried out if drops or changes of pressure, irregular functioning and strange noises are noticed.

# MAINTENANCE CHART

OPERATION	Maintenance Intervals			
	Every 8h	Every 50h	Every 300h	End of season
CHECK STATE AND LEVEL OF OIL	X			
CHECK PRESSURE ACCUMULATOR		X		
CHECK INTAKE (TUBES & FITTINGS)		X		
CHECK AND CLEAN THE INLET FILTER	X			
CHECK FIXING OF PUMP MOUNTING		X		
CHECK DIAPHRAGM AND POSSIBLE SUBSTITUTE				0
CHANGE OIL			0 (1)	0 (2)
CHECK INLET/DISCHARGE VALVES			0	
CHECK TIGHTENING OF PUMP SCREWS				0

Note: X operation to be carried out by the operator

0 operation to be carried out by specialized technician

(1) first oil change

(2) change to be carried out same as diaphragm change

## **TROUBLE SHOOTING**

<b>SYMPTOM</b>	<b>CAUSE</b>	<b>REMEDY</b>
The pump does not charge	Air inlet Regulation valve closed control group not at zero Valve and/or site of inlet valve and delivery worn or dirty	Check inlet for blockage Position the lever  Replace or clean
The pump does not reach the desired pressure	Worn valve and/or site of regulation valve Valve and/or site of inlet valve and delivery worn or dirty Insufficient rpm's. Worn nozzles used or holes too big	Replace or clean Replace or clean  Bring the rpm to 350 - 550 rpm Replace
Pressure irregular or with pulse	Valve and/or site of inlet valve and delivery worn or dirty  Air inlet	Replace or clean  Check inlet for blockage
Excessive diaphragm vibrations	Pressure accumulator discharged or with incorrect air pressure	Bring air to correct pressure
Noise when oil level is lowered	Blocked inlet	Check inlet for blockage
Water present in oil	Broken diaphragm	Replace. If replacement is not immediate, empty water from pump introduce oil without water (even used) or naphtha to stop internal parts from rusting.

## **WARRANTY INFORMATION**

- The Manufacturer warrants its products for 12 months from the date of purchase, provided that the below is sent to the Manufacturer fully filled out and within 10 days from the delivery date.
- In accordance with the above –mentioned terms, the Manufacturer agrees to furnish free of charge any replacement parts for such parts as, in the Manufacturer's opinion or that of their authorized representative, are defective either in material or manufacture. In any case transport and labor costs shall be charged to the customer.
- The product returned to Comet S.p.A. for warranty inspection or repair must be sent back together with each single part the unit is complete with and must not have been improperly damaged. Comet will otherwise decline all responsibility for any warranty claims.
- The warranty does not include any payment for faults due to incorrect usage by the operator and for parts falling within the usual maintenance, such as: Gaskets, diaphragms sealing rings, oil and so on.
- The Manufacturer shall not be held responsible for accidents to the operator or third parties while the equipment is in use.
- This warranty shall not be valid if:
  - A) Previous service or repairs were performed by unauthorized individuals or companies.
  - B) The equipment was previously repaired with non original parts
- Breakdowns and failures in our machines during or after the warranty period, do not grant any right to suspend payments for the goods delivered which have already been agreed to. Nor can such breakdowns and failures be used to excuse further delay in such payments
- The Manufacturer reserves the right at any time to carry out any and all changes to improve his products. Nor shall he be obliged by this to add such improvements to units previously manufactured already consigned or in the process of installation.
- These general conditions of warranty hereby substitute and nullify every previous condition expressed or implicit.