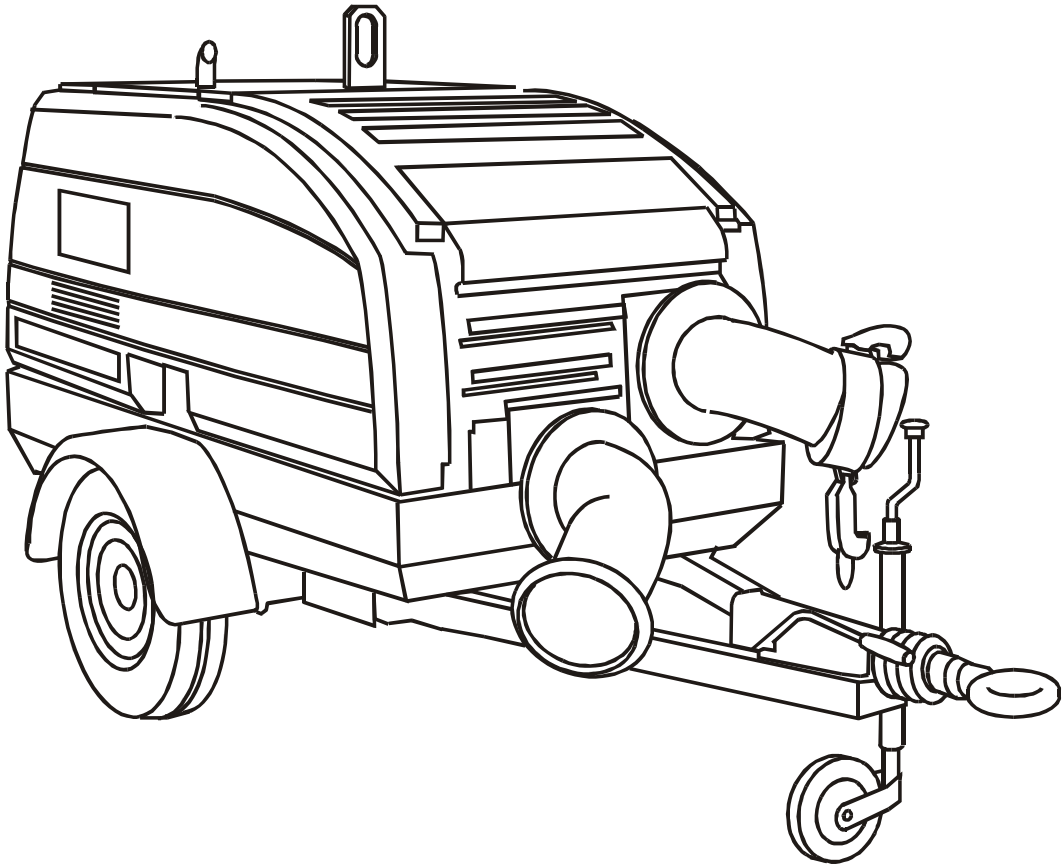
AUTOPRIME

Q RANGE
OF DIESEL DRIVEN
MOBILE PUMPS



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Coleford, England

DECLARATION OF CONFORMITY

FOR:

AUTOPRIME RANGE OF DIESEL DRIVEN MOBILE PUMP UNITS TYPE:

QI100, QI150, QC/QP 150M, QC/QP 200 and QHH80

Serial Number	AS SHOWN ON THE PUMP NAMEPLATE
Responsible Person	SPP PUMPS LTD.
Manufacturer	SPP PUMPS LTD.
Registered Address	Crucible Close Mushet Industrial Park Coleford, Glos ENGLAND GL16 8PS

It is hereby certified that this equipment complies with the essential health and safety requirements of the Machinery Directive, and conforms to the standards listed below:

Directives:

'Council Directive 89/392/EEC - 'Machinery Directive'

'Council Directive 91/368/EEC, 93/44/EEC & 93/68/EEC - 'Amendments''

Harmonised Standards:

EN 292	Part 1	Safety of Machinery - Basic Concepts and
	Part 2	General Principles for Design
pr EN 809:		Pumps & Pump Units for Liquids - Safety Requirements
EN50081	Part2	EMC Generic Emission Standard - Industrial Environment
pr EN50082		EMC Generic Immunity Standard - Industrial Environment

Signed:

Name: Richard Martyn

Position: Engineering Manager - Authorised to sign on behalf of SPP Pumps Limited

Date: 1st October 2004

CONTENTS

1. INTRODUCTION

The purpose of this handbook is to lay down operating guidelines and routine maintenance instructions for the **AUTOPRIME Q Range** of diesel engine driven pumps, featuring the electric priming system (*SMART*prime).

Instructions and statements contained within this handbook are given with our best intentions and are correct at the time of compilation. They are subject to alteration at any time.

These pumps are most commonly supplied mounted on 2 wheel road trailers but can also be supplied on site trailers, skid mounted, or as a pod unit for customer's to mount on suitable foundations.

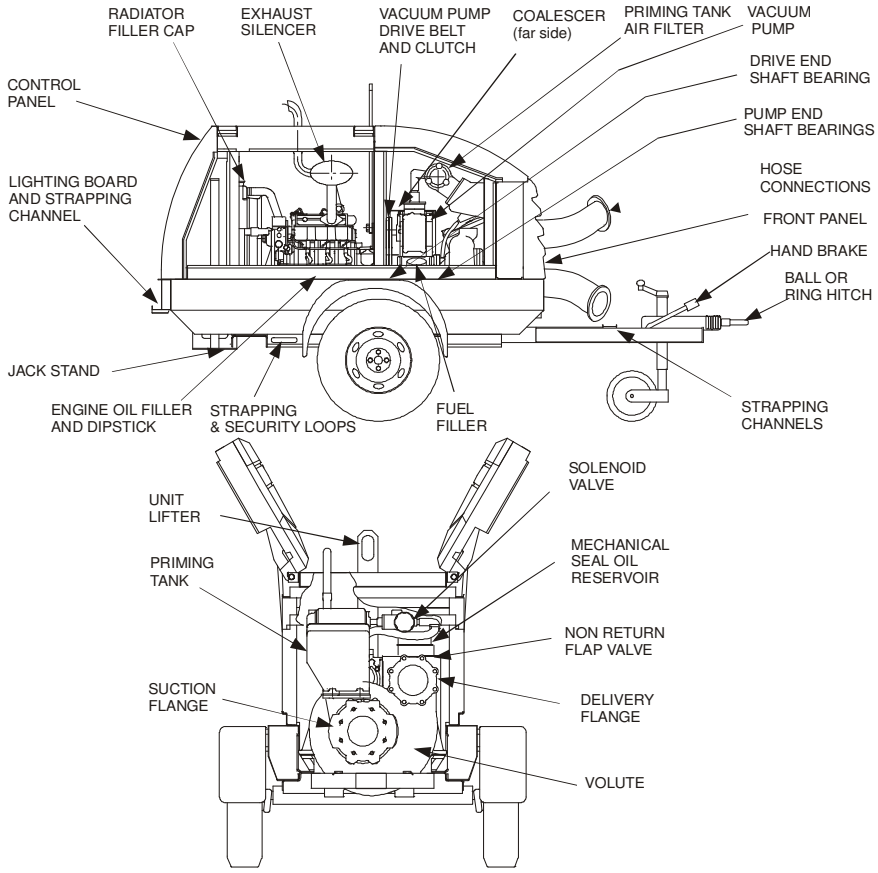
This Handbook covers the following pumps:

QI 100 – 4" automatic priming mobile pump driven by an Isuzu 3LB1 diesel engine mounted in a bunded and sound reducing canopy.
QI 150 – 6" automatic priming mobile pump driven by an Isuzu 3LD1 diesel engine mounted in a bunded and sound reducing canopy.

QC 150M (CAT) / QP 150M (Perkins– 6" automatic priming mobile pump driven by a CAT C2.2NA (QC) or a Perkins 404D-22 (QP) diesel engine mounted in a bunded and sound reducing canopy.

QC 200 (CAT) / QP 200 (Perkins) – 8" automatic priming mobile pump driven by a CAT C2.2NA (QC) or a Perkins 404D-22 (QP) diesel engine mounted in a bunded and sound reducing canopy.

QHH80 – 3" automatic priming, high head mobile pump driven by an Isuzu 4LE2 diesel engine mounted in a bunded and sound reducing canopy.



Q Range Pump Components

2. SAFETY PRECAUTIONS

2.1 Safety Symbols

Safety instructions within this manual are marked with the following symbols:

This symbol refers to general mechanical aspects of safety.

This symbol refers to electrical safety.

ATTENTION This symbol gives warning of a hazard to the pump itself, which in turn could cause a risk to personal safety.

2.2 Pump Safety Precautions

ATTENTION apply to all the following:-

2.2.1 This pump contains exposed moving parts and hot surfaces **DO NOT OPERATE THE PUMP WITH THE DOORS OPEN.** Guards removed for maintenance must be replaced before starting the pump.

2.2.2 Never insert anything into the pump casing whilst the pump is running and the suction and delivery hoses are disconnected.

2.2.3 Never use collapsible hoses on the suction side of the pump and use all pump flange holes to fit suction and delivery hose connections.

2.2.4 Always lift pump sets vertically by the lifting eye. Any side force will damage the lifter. Never lift with suction or delivery hoses attached. The increased weight of these items may cause lifting gear failure.

2.2.5 Check the type of liquid being pumped before working on pump ends. Residues could be hazardous to your health. If in doubt flush out with clean water before work commences.

2.2.6 Personnel working on the pump unit must always wear clean correctly fitting clothing and safety footwear. Clothing impregnated with oil or fuel can constitute a health hazard through prolonged contact with the skin and may also constitute a fire hazard.

2.2.7 Always allow adequate ventilation for diesel engines. Be aware of fire risks from items such as exhaust pipes and silencers. Never place flammable items around the unit.

3. HANDLING & TRANSPORT

3.1 Lifting

The central lifting point is designed for vertical lifting only and must not be used to pull the unit sideways. Before lifting ensure that the lifting point is not bent or damaged.

Do NOT use a lift truck with forks under the fuel tank and do NOT lift with the hoses attached.

3.2 Road Trailer Version

There is provision for a lighting board on the rear of the unit. Remove the two pins through the open ends of the U-section and fit the lighting board against the rubber buffers at the back. Replace the pins to retain the lighting board in place.

3.3 Site Trailer Version

The site trailer is limited to off road use and subject to a maximum speed of 10kph (6mph).

3.4 Skid Mounted and Pod Units

All units have provision for lifting from a central lifting point through the canopy. The unit must be located on firm level foundations. For details of any special attachment points provided for pod units, refer to the GA drawing supplied.

3.5 Trailer or Wagon Carriage

Transportation on a trailer or wagon will require the unit to be strapped down. On the trailer mounted units, front and rear location points for straps are incorporated into the unit: There are two shallow U-channels on the 'A'- frame at the front and a turned up lip on the lighting board channel at the rear of the unit.

A strap can be fitted directly across the A frame located by the channels provided.

At the rear of the unit remove the two lighting board retention pins from the channel section. Place the strap along the bottom edge of the channel and replace the pins.

Under no circumstances should straps be passed over the top of the canopy or around the doors.

For security purposes, U shaped hoops are welded to the chassis behind each wheel. These may be used as additional points for strapping down the unit for transport.

4. SERIAL NUMBER

The serial number plate is fitted, either to the chassis and/or on the pump bearing housing, or on later units inside the control panel door.

This serial number must be quoted in any enquiry for spares or service.

STERLING **Sterling Fluid Systems**
Reading
RG31 7SP ENGLAND
Tel: 0118 932 3123 Fax: 0118 932 3302

CE | **Type** | **Nett** **kg** | **Serial No.**

5. OPERATING INSTRUCTIONS

5.1 Before Starting

Where instructions in this section are followed by (LH) or (RH) this indicates either the left hand or right hand side of the unit looking from the pump (towbar) end.

5.1.1 Read this the safety and operating instructions on the pump and in this handbook carefully.

5.1.2 Position the pump set where it can be levelled for before use and apply hand brake to prevent movement.

5.1.3 Unclamp the jockey wheel and lower it to level the pump set. Clamp in position.

5.1.4 Unclamp the rear prop stand (RH), lower into position and lock so that the pump set is prevented from movement in operation.

5.1.5 Suction and delivery connection flanges are double drilled thus allowing each quick release hose connection to be rotated to most orientations. Undo the retaining nuts and rotate the quick release connections to suit the application.

5.1.6 Connect suction and delivery hoses making sure that there are no sharp bends in the lines. Where the hoses pass over sharp edges or abrasive surfaces ensure that they are protected by suitable means to prevent chafing. Ensure that the suction hose end is fully submerged.

5.1.7 Select and fit a suitable strainer for the job in hand. Note that most 'off the shelf' strainers are for general purpose use. As such they may not protect the pump against oversize solids. For applications where stones, etc. may be drawn in, then a strainer with holes slightly smaller than the pump solids handling capacity must be employed. Refer to the Technical Data section for details on specific pumps.

5.1.8 Check for sufficient fuel - tank gauge (LH).

5.1.9 Check for sufficient engine lubricating oil - dipstick (LH).

5.1.10 Check for sufficient engine coolant – Ensure the engine is cold, remove the radiator filler cap (LH) or the filler cap in the top hose. The correct level is when coolant is just visible at the base of the filler neck. If an expansion bottle is fitted check the level is between the Max and Min level marks on the bottle.

5.1.11 Check that oil is present in the pump seal reservoir (RH over the non return valve housing).

5.1.12 Ensure that the batteries are charged and ready for use (RH).

5.1.13 Check the air filter monitor (LH below engine air cleaner). If reading is >12" remove filter and clean.

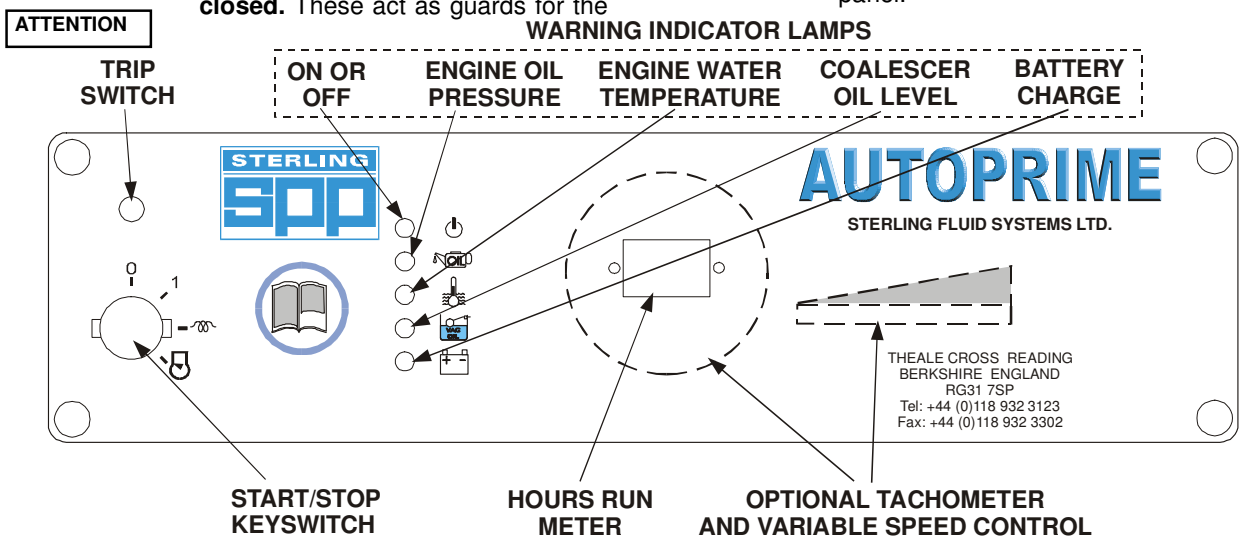
5.1.14 Check coalescer oil level - dipstick (RH). Ensure dipstick is fully tightened.

5.1.15 Ensure drain cocks in discharge line and volute are closed (RH).

5.2 Starting

5.2.1. **Ensure canopy doors are latched closed.** These act as guards for the rotating machinery inside.

5.2.2. Lift the flap on the back of the pump set to reveal the starting/monitoring panel.



The panel comprises:

a) Four position keyswitch (Off, 1, Heat, Start)
b) Trip switch / circuit breaker
c) Hours run counter (*or a tachometer with variable engine speed control)*
d) Five warning indicator lamps
- On / off indicator
- Engine oil pressure
- Engine water temperature
- Coalescer oil level *(Optionally, this low oil level warning may be provided with automatic engine shutdown)*
- Battery Charge

5.2.3 Turn the ignition switch to the '1' position. The 'ON' indicator will show green and all three red warning lights will flash, providing a check that all circuits are healthy.

5.2.4 Turn the keyswitch to the 'Heat' position and hold for 5 seconds, turn the keyswitch on to the 'Start' position. Release the keyswitch once the engine has fired is running.

5.2.5 If the engine fails to start, return the keyswitch to the 'O' (OFF) position and repeat the start sequence within 15 seconds.

5.3 After Starting

The pump will prime automatically once the suction hose is submerged.

5.4 Stopping

5.4.1. Turn the keyswitch to the 'Off' position. The unit will stop and the key can be removed.

5.4.2. Open the discharge cock to drain the discharge line. Close after draining is complete.

5.4.3. Open the volute cock to drain the volute. Close after draining is complete.

5.4.4. If the pump is not required immediately, close and lock the control panel and ensure that both doors closed and locked.

5.5 Problem Solving by Operator

In all the cases below, **STOP** the pump before attempting to correct the problem. Do **NOT** open the pump doors with the pump running.

Engine running but not pumping:

5.5.1. Check suction pipe for leaks, ensure all hose fittings are air tight.
5.5.2. Check for blockage of the strainer, and clear any debris.
5.5.3. Check for damage to the suction hose both externally and internally, replace damaged hose.

Pumping reduced with surging:

5.5.4. Check that the impeller is clear of debris and remove debris, if present.

5.5.5. Check the non-return valve is clear.

Pump fails to prime after starting:

5.5.5. Check suction hoses for leaks and ensure all hose fittings are air tight.

5.5.6. Check that volute drain cock is closed.

5.5.7. Check that the non-return valve is free of debris and can seal when closed.

Engine stops:

5.5.8. Check engine fuel level, and refuel if necessary.

5.5.9. Check warning indicator lamps and correct any faults indicated.

5.5.10. Check the trip switch and reset. Repeated resetting of the trip switch indicates an electrical fault, call service engineer.

6. PUMP MAINTENANCE CHART

Highlighted tasks in italics below are to be done by the pump operator, other tasks by the pump service engineer. For engine maintenance periods refer to the engine operators handbook included within the pump documentation pack.

PERIOD	TASK
After first 500 hours of operation	IMPORTANT (Also required 500 hours after fitting a new vacuum pump) Replace the four coalescer filter elements. Replace the coalescer oil and oil filter.
Daily	***Check and top up the coalescer oil. Check and top up the engine oil.*** ***Check and top up the diesel fuel. Check the fuel filter and drain off any water.*** ***Check and top up the mechanical seal oil reservoir level.*** ***Check and top up the engine cooling water.***
Weekly or 100 hours	***Check security of all fasteners & fittings. Check battery electrolyte level.*** ***Check condition of battery connections. Check security of battery mountings.*** ***Drain any water from coalescer. Check visually for leaks.***
Monthly or 500 hours	Check priming tank air filter, clean if dirty. Check fuel filler filter. Check vacuum pump belt tension. Check for contamination of coalescer oil Check the condition of the vacuum pump belts and renew if necessary. Grease the drive end pump bearings with 15grms of grease.
6 monthly or 3000 hours	Check and clean the level sensing probes. Check electrical connections. Check condition of non-return valve & flap. Replace the four coalescer air filters. Change mechanical seal coolant/lubricant. Change coalescer oil and oil filter. Check the vacuum pump drive belts and renew if necessary. Clear and clean or replace the small air filter on the solenoid valve.
9 monthly or 4500 hours	Grease pump end pump bearing with 15 grams of grease.
Annually or 6000 hours	Check condition of impeller and wear plate. Check and replace the coalescer & priming tank knitmesh filters.
Bi - annually or 12000 hrs.	Repack pump bearings with grease.

The maintenance schedule is given for guidance only. Site operating conditions may override the suggested maintenance intervals. Adjustments to time scales will also have to be made if the pump is idle for long periods.

IMPORTANT - ***Prior to movement or transport, check the following items:-***	
Wheel nut security.	Tyre condition.
Towing hitch condition and security.	Tyre pressures.
Brake adjustment (For road trailer where brakes are fitted)	
Towing 'A' frame fasteners.	Axle fasteners.
Lifter and stay fasteners.	Engine to pump & chassis fasteners.

Note: Due to the initial stretch of new vacuum pump drive belts, it is necessary to check and re-tension the drive belts after the first **50 hours running time** on all new pumps and following the fitting new drive belts. (See section 7.9)

7. MAINTENANCE & SERVICE INSTRUCTIONS

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These instructions are for trained pump service engineers.

Where instructions in this section are followed by (LH) or (RH) this indicates either the left hand or right hand side of the unit looking from the pump (towbar) end

7.1 Preparation for Maintenance

Electric Shock & Accidental Starting Hazard ISOLATE the equipment from any mains supply connected before any maintenance work is done.

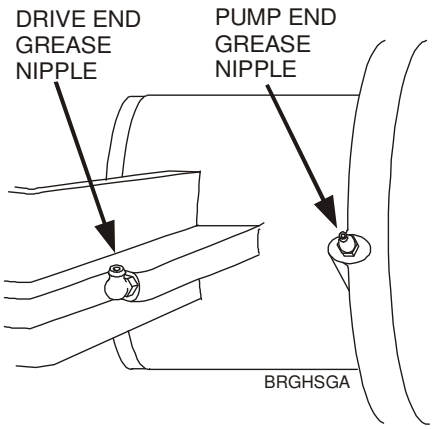
For diesel engine driven pumps disconnect the negative battery lead to prevent inadvertent starting.

To avoid the possibility of maintenance personnel inhaling dangerous fumes or vapours. It is recommended that maintenance work be carried out away from the pump location by removal of the pump unit to a suitable maintenance area.

No special tools are required for dismantling and re-assembling, however, it is important to ensure the suitable lifting equipment is available and that the work is carried out in a clean area.

7.2 Pump Bearings

The pump shaft runs on three bearings: a roller bearing on the impeller end of the shaft and a pair of angular contact bearings on the drive end of the shaft. These bearings are grease lubricated.



Grease is applied through two grease nipples, one for the roller bearing and one for the pair of angular contact bearings located on the left side of the bearing bracket. Do not over grease. Ten strokes (15 grams) of a hand held grease gun at the specified intervals are sufficient.

7.3 Mechanical Seals

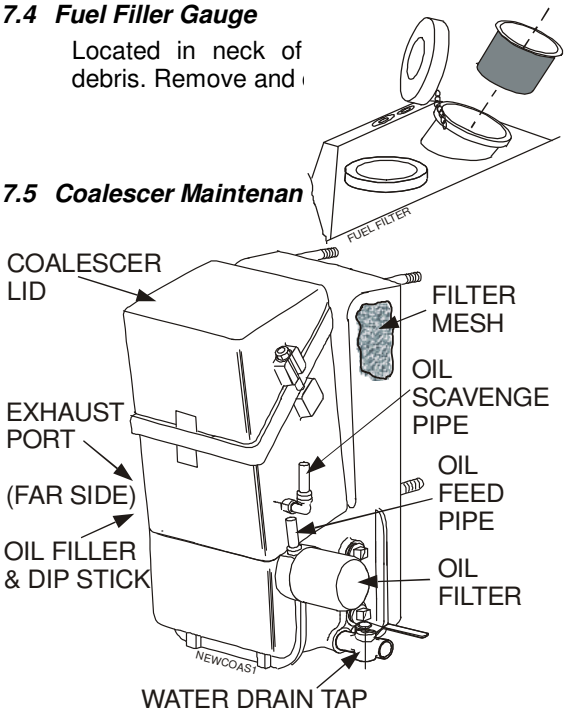
The mechanical seals are cooled and lubricated by oil. The oil reservoir is mounted on top of the non-return valve cover. The system oil capacity is approximately two litres. The bottle should be filled to the MAX mark when the unit is cold.

ATTENTION **Only use oil of the correct grade (see Technical Data section).**

7.4 Fuel Filler Gauge

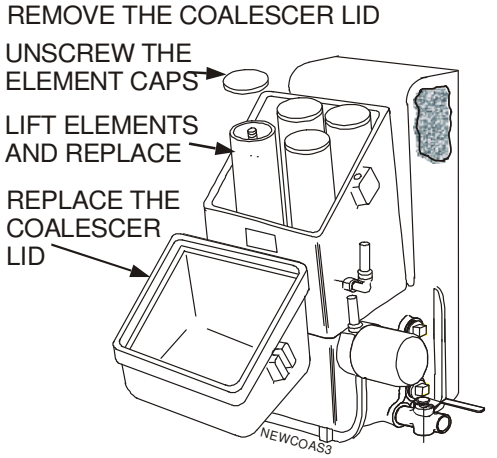
Located in neck of
debris. Remove and

7.5 Coalescer Maintenan



elements cannot be cleaned, new elements must be fitted when required thus:

REMOVE THE COALESCER LID

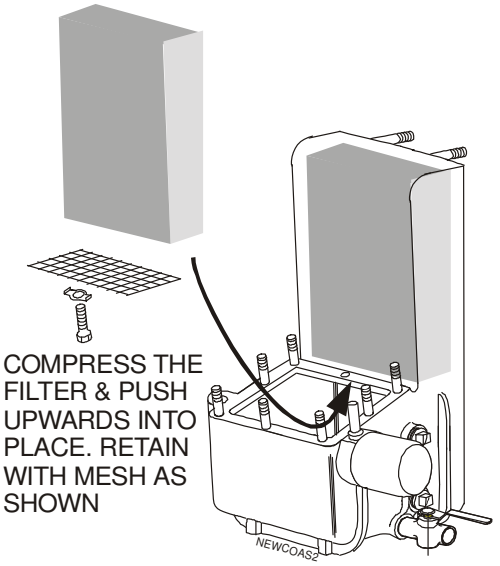


Ensure that the seals at the top and bottom of each filter element are fitted correctly.

ATTENTION **Do not over tighten the retaining knob as this will distort and crush the filter element**.

7.7 Coalescer Filter Mesh

Every year or more frequently if the pump has been operating in a dusty atmosphere or when the coalescer oil has become dirty, it is recommended that the priming tank filter mesh is replaced.



Drain the coalescer oil, disconnect the oil feed pipes and remove the coalescer lid and the coalescer element housing complete with the filter elements. Remove the mesh retaining the filter to give access for removal of the knitmesh filter.

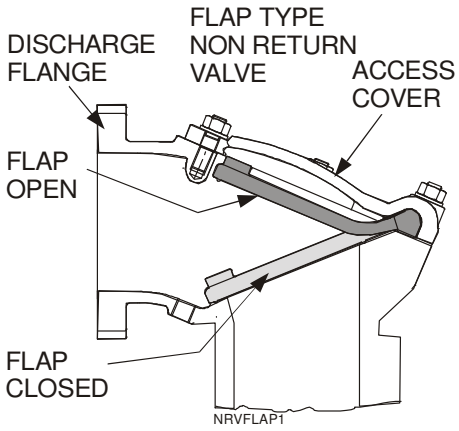
It is recommended that a new gasket is fitted before re-fitting the coalescer element housing.

The oil feed pipes should be cleaned in a similar manner and blown through with an air line.

7.8 Non-Return Valve

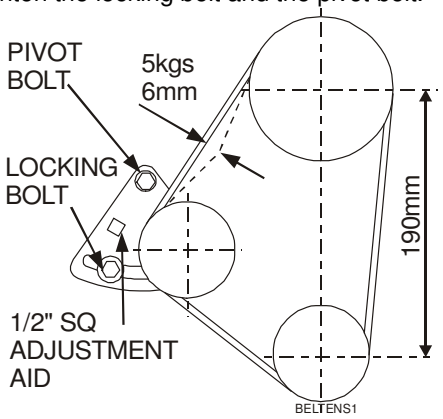
The non-return valve should be checked regularly for freedom of movement, absence of debris and good seating. The valve seat should also be checked for damage or wear.

The flap type non-return valve is built in to the pump casing and located under a cast cover on top of the pump behind the discharge flange. It consists of a hinged rubber disc resting on a seat machined onto the volute. The disc and seat can be examined through the discharge flange once the quick release hose connection is removed. Check that the disc sits cleanly onto the seat and that nothing is trapped between the hinge and the casting (both above and below). Check that the disc is not worn or torn and that the seat is not excessively pitted. A more detailed examination can be undertaken by removing the cover on top of the valve. Replace the cover gasket when refitting the valve cover.



7.9 Vacuum Pump Belt Tension

To adjust belt tension, loosen the pivot and locking bolts and using a spanner on the adjustment aid, slide the pulley outward. When the correct belt tension is obtained re-tighten the locking bolt and the pivot bolt.



ATTENTION **Do not under-tension belts under any circumstances**.

7.10 Vacuum Pump Belt Replacement

Remove the vacuum pump drive guard if fitted.

Slacken and remove the belt tension device by removal of the pivot bolt and the locking bolt.

From the main pump drive coupling, remove the three screwed pins from the rubber coupling to give a gap between the engine

drive plate and the rubber coupling.

Remove the old belts, if still present.

Check both sets of pulleys for any signs of wear or contamination with oil or grease, clean or replace if necessary.

Note: Gauges are available for checking the pulley grooves.

ATTENTION **Fitting new belts to worn or damaged pulleys will lead to premature belt failure.**

Carefully fit the new belts. These will be a tight fit and care must be taken not to damage them by using excessive force.

Replace the three screwed pins to connect the rubber coupling to the engine drive plate.

Replace the belt tensioner and re-tension the belts as in Section 7.9.

Replace the drive belt guard.

Run the pump for 30 minutes and recheck the belt tension as in Section 7.9

For new belts, check the tension after the first 50 hours of operation.

ATTENTION **Under tensioning of the belts will lead to premature belt failure.**

Over-tensioning of the belts may lead to premature failure of belts, or the vacuum pump clutch or bearings.

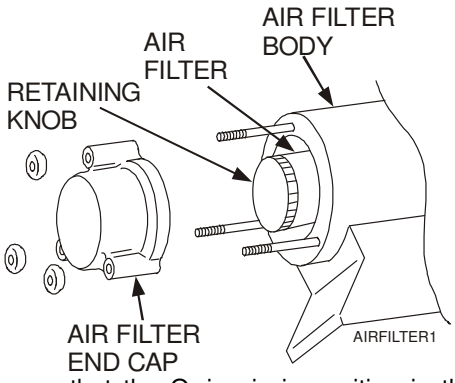
7.11 Priming Tank Air Filter Maintenance

The priming air filter is mounted in the filter housing on top of the priming tank. Access is from left hand side of pump.

With the pump stopped, open the volute drain valve to ensure that priming tank pressure is dissipated. Unscrew the three knobs holding the end cap and remove the end cap. Ensure that the sealing O-ring is not lost. Undo the knurled knob retaining the filter and carefully withdraw the filter element. Inspect for mechanical damage or blockage. Ensure that the central stud holding the filter has not been loosened or bent.

Washing in water and drying before re-use should clean stainless steel filters. If white fibrous filter is fitted, this must be replaced.

Replace filter with care and do not over tighten the retaining knob as this can damage the filter.

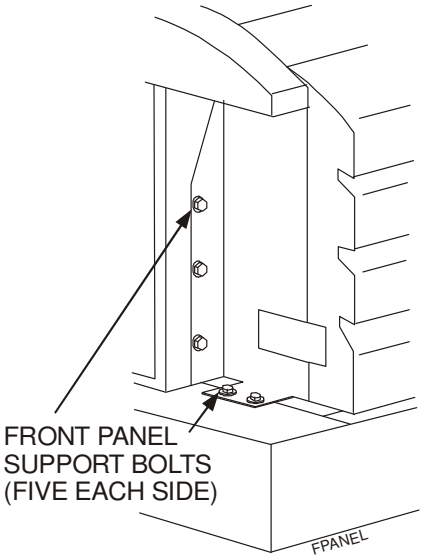


Ensure that the O-ring is in position in the end cap and replace the end cap. Replace the three knobs and tighten.

7.12 Priming Tank Knitmesh Replacement

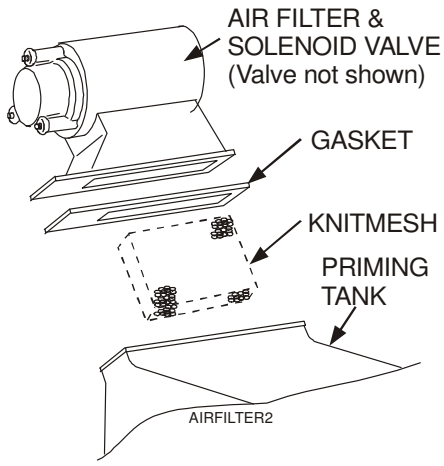
The priming tank is mounted at the front of the pump behind the moulded panel.

Drain the volute. Disconnect suction and delivery hoses. Remove the suction quick release connection if required for easier access or handling purposes. Disconnect the battery negative lead.



Open the doors and remove the ten bolts (five each side) holding the front panel support to the canopy frame (six off) and tank shroud (four off). Lift off the front panel and its support

Loosen the clamps that hold the vacuum pipe to the solenoid valve and the top of the vacuum pump. Disconnect the vacuum pipe.



Remove the terminal box cover from the solenoid valve and disconnect the wiring inside. Note the positions of the terminations for reconnection.
Separate the filter housing from the priming tank by removing eight nuts and the rubber gasket. The knitmesh can now be removed from the priming tank.
Clean the knitmesh filter in water and dry it. Inspect the filter and the rubber gasket and replace any damaged items.

7.13 Level Sensing Probes & Priming Control Box

The level sensing probes should be withdrawn and cleaned periodically to keep them in workable condition. Wipe any deposit from the stainless steel tips.

The control box and cables to the level sensing probes are sealed units for which no customer maintenance is required. If these items fail they may be replaced and/or returned to SPP Pumps for examination.

7.14 Pump Impeller and Front Wear Plate

The impeller can be inspected for wear and corrosion after the suction quick release connection has been removed. Check the inlet duct for signs of damage or blockage.

The impeller to wear plate clearance should be 0.3 - 0.5mm.

A more thorough examination can be conducted after the inlet duct and front wear plate have been removed. The front wear plate is clamped between the inlet duct and the volute of the pump.

Disconnect the battery negative lead to prevent accidental starting of the pump.

Remove the priming tank. Remove the front section of the tank shroud. Remove the nuts retaining the inlet duct and remove the duct. Remove the front wear plate by screwing two M16 bolts into the jacking holes on the wear plate.

Inspect the impeller and wear plate for damage and corrosion.

Before re-assembly ensure all ‘O’ rings are in good condition, clean and well greased. Impeller to front wear plate clearance can be altered by shimming. Measure the clearance with a feeler gauge inserted through the suction. When measuring the clearance temporarily fit the nuts and clamp the front wear plate to the volute to ensure that the wear plate is fully home.

Refit the inlet duct, priming tank, front shroud, front panel and Quick release connection.

8. PUMP FAULT FINDING

Refer to the operator’s problem solving routines in section 5.5 and ensure that these faults are not present.

These checks to be done by trained service engineers:

8.1 Checking the operation of the priming system

Disconnect the suction hose. Place a flat board over the suction fitting to check that the priming system and vacuum pump is working.

If a vacuum gauge is fitted to the suction the vacuum pump should produce a vacuum of 9 metres water.

8.2 Check the vacuum pump drive belts

The vacuum pump drive belts run between the pump shaft and the electric clutch on the vacuum pump. See the maintenance instructions in section 7.5 for the belt tensioning method.

8.3 Check the vacuum pump clutch

The vacuum pump clutch is electrically operated. If the clutch is disengaged the belts still turn but the centre of the clutch will be stationary.

The clutch requires 12 volts to actuate it. This voltage controlled by a timer and supplied via a relay by wire No 22 of the wiring loom. If the wiring is disturbed during investigations ensure that it is replaced correctly.

The priming system electrical circuit is protected by a circuit breaker mounted on the control panel. If this trips out, push the central button to reset. If the breaker will not reset or is constantly tripped then there is an electrical fault.

The electrical supply to the clutch is controlled by the level sensing probes, via a timer. If there is no electrical supply to the clutch, check that the power light is illuminated on the priming control box. If this is on then disconnect the clutch and check if there is 12 Volts across the wires. If there is then the clutch has failed and should be replaced.

If the 12 Volt supply is not provided to the clutch, check the continuity of the cables and rectify any bad connections.
If the control box does not provide the 12 Volt supply for the clutch the control box is faulty and must be replaced.

8.4 Check the solenoid valve

The electrically operated solenoid valve is connected to the top of the priming tank. The valve is reliable but If a fault is suspected it is most likely to be a problem with the wiring. Wire No 28 of the loom supplies 12 Volts, wire No 8 is an earth return.

8.5 Priming filter blockage.

The priming tank air filter is mounted in the top of the priming tank. To remove and check the filter condition, follow the instruction given in the maintenance section of this manual.

8.6 Priming tank knitmesh filter blocked

It is extremely unlikely that the priming tank knitmesh filter will ever become sufficiently blocked to prevent priming. Instructions for dismantling the unit and removing and cleaning the knitmesh filter are given in the maintenance section of this manual.

8.7 Volute non return valve not sealing

The volute non-return valve needs to seal if the priming system is to function. The non-return valve can be examined by removing the discharge quick release coupling - see the relevant section of the maintenance instructions. Ensure that there is nothing jammed under the valve especially at the back around the valve hinge.

8.8 Air leak in priming system

It is extremely unlikely that there will be air leaks at any of the priming system sealing faces. Leaks may occur if the suction quick release fitting has been moved or the priming tank has recently been dismantled. If the vacuum pump is working but not achieving full vacuum fit a quick release connection cap and gauge to the suction pipe. Run the unit to achieve a vacuum, as indicated by the gauge, then turn the unit off. Note how long the vacuum takes to decay. A pump in full working order will achieve a vacuum of 9 metres water and hold it for in excess of five minutes.

8.9 Vacuum pump

If the vacuum pump is considered to be at fault no attempt should be made to dismantle it. Obtain a replacement unit.

To check the operation of the vacuum pump, disconnect the pipe running between the priming tank and the vacuum pump.

Warning:- The pipe is stiff and very difficult to remove. Do not disconnect the pipe while the unit is running. If any solid objects, grit or mud are drawn up the pipe they will cause serious damage to the internals of the vacuum pump. Disconnection of this pipe should only be considered as a last resort. Conduct other investigations before resorting to this course of action.

Once the pipe between the vacuum pump and the coalescer has been disconnected start up the unit and place a small clean board over the inlet to the vacuum pump. The board should be held in place by the action of the vacuum pump. Turn the unit off before refitting the pipe.

The oil in the coalescer is used to both lubricate the vacuum pump and create an effective seal. If the vacuum pump performance is poor check the coalescer oil level, after having drained any excess water.

8.10 Fault Finding Guide

Unit does not start

- Fuel consumed.
- Trip switches need resetting.
- Warning lights on & shutdown circuit activated.
- Battery with low charge level.
- Refer to engine supplier's manual for engine checks.

Unit does not prime

- Volute drain tap open.
- Air leak in priming system.
- Air leak in suction hoses or fittings
- Blockage in suction hoses or strainer.
- Non return valve not sealing.
- Internal damage to pipe from solenoid valve to vacuum pump.
- Solenoid valve not operating.
- Solenoid valve blocked.
- Priming tank air filter blocked.
- Priming tank knitmesh blocked.
- Vacuum pump belts loose or broken.
- Vacuum pump electric clutch not engaged.
- Vacuum pump failure.
- Suction head too great.

Unit does not pump

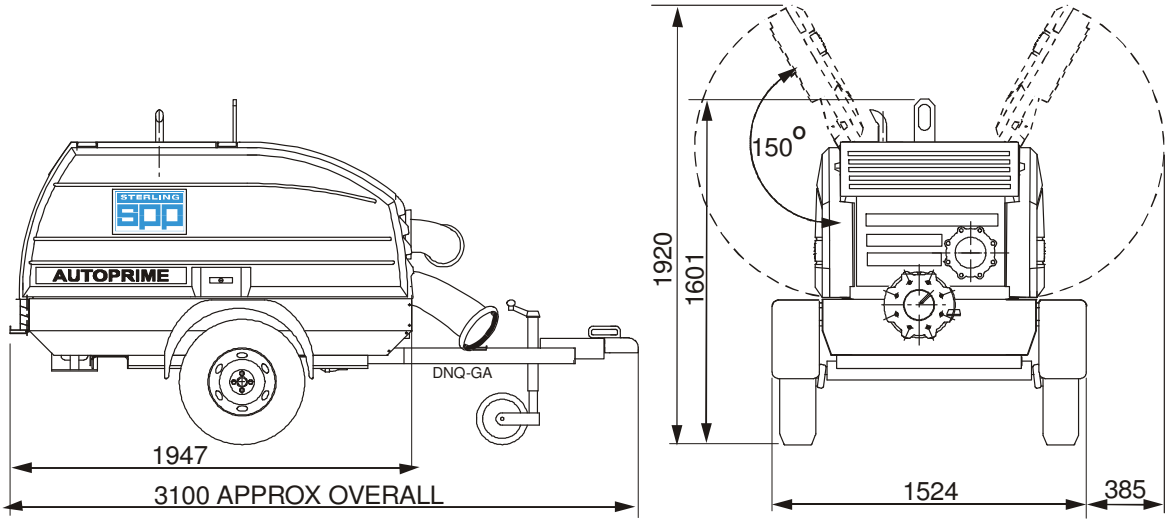
- Blockage in delivery hoses.
- Blockage in impeller.
- Excessive impeller clearances.
- Broken Impeller.
- Pump drive coupling disengaged.
- Delivery head too great.

9. TECHNICAL DATA

9.1 QI Pump Data

PUMP TYPE	QI 100	QI 150	QC 150M QP 150M	QC 200 QP 200	QHH80
VACUUM PUMP	65 cfm 110 m^3/h				
SOLIDS PASSAGE CAPABILITY	40mm dia. x 65mm.	55mm dia. x 80mm.	55mm dia. x 80mm.	75mm dia. x 90mm.	18mm dia.
ENGINE TYPE	Isuzu 3CD1	Isuzu 3CD1	CAT C2.2NA Perkins 404D-22		Isuzu 4LE2
FUEL TANK CAPACITY	220 litres				
APPROX. RUNNING TIME (at full load)	50 hours	42 hours			26 hours
IMPELLER FRONT PLATE CLEARANCE	0.3mm to 0.5mm 0.012" to 0.020"				
MECHANICAL SEAL COOLANT/LUBRICANT Capacity:- 2 litres	Mobil Velocite Oil No. 6 or Texaco Rando HD10				
BEARING LUBRICANT	Grease: Texaco Multifak All Purpose EP2 or equivalent conforming to DIN 51825:KP2\K-30				
VACUUM PUMP OIL Above 30° C	Texaco Regular Motor Oil 30 or equivalent conforming to API CC 5F, CCMC G2 D1, MIL-L-2104B or MIL-L-46152B				
Capacity 5 litres Below 30° C	Texaco Ursatex 10W-30 or equivalent conforming to API CC 5F, CCMC G2 D1, MIL-L-2104B or MIL-L-46152B				
COALESCER FILTER	Bosch 0451-103-093 or Crossland CF367				
BATTERY	12V (345A cold cranking current)				
TRAILER TYPE:	Two Wheel Road Trailer with Fixed or Variable Height Tow Hitch				
Tyre Size	185R13C				
TYRE PRESSURES	58 psi (4 bar)				
APPROX WEIGHT FIXED TOW HITCH	1093kg	1123kg			1122 kg
APPROX WEIGHT VARIABLE TOW HITCH	1133 kg	1155 kg			1157 kg
APPROX WEIGHT. POD ONLY	953 kg	978 kg			977 kg

9.2 General Arrangement



10. SPARES & SERVICE

SPP Pumps operate a comprehensive Spares and Service support network throughout the world, and can be contacted as follows:

SPARES & SERVICE	**Telephone:**	**+44 (0)1189 323 123**
For spare parts, supply only.	ask for -	**Spares Dept.**
For breakdowns, spare parts and on-site fitting, pump installation, commissioning, and service contracts.	ask for -	**Service Dept.**
For breakdowns, outside office hours.	Telephone :	**+44 (0)1491 201 613**
Spares & Service Office SPP Pumps Limited 1420 Lakeview Arlington Business Park Reading, Berkshire RG7 4SA ENGLAND	General Fax line: Direct Fax line:	**+44 (0)1189 323 302** **+44 (0)1189 303 259**

Copies of this manual are available from the SPP Pumps Spares & Service Department by quoting reference number W72-008E and the relevant revision number.

11. ENGINE OPERATORS HANDBOOK

The specific engine operator's handbook from the manufacturer is included within the pump documentation pack.