SP
Installation, Operation and Maintenance Manual

SAMengineering

Customised Pump Solutions

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NOTE:
The information contained in this book is intended to assist operating personnel by providing information on the characteristics of the purchased equipment.

It does not relieve the user of their responsibility of using accepted engineering practices in the installation, operation, and maintenance of this equipment.

Any further questions, contact SAM Engineering (Pty) Ltd +27 (0) 11 823-4250.

SAM Engineering (Pty) Ltd SELF-PRIMING SOLIDS HANDLING PUMPS MOTOR DRIVEN: LONG COUPLED TYPE: EI/EB "SP"

GENERAL

LOCATION

By placing your SAM pump on a firm, level foundation, you reduce harmful vibrations and unnecessary noise. Your SAM pump is self-priming and may be located above the source of liquid supply. Best pump operation is obtained by locating the pump as close as possible to the liquid being handled. Keep in mind a pump can push liquid more effectively than it can pull or draw liquid. The actual priming ability of a pump depends upon many factors such as the size and layout of the piping, the type of liquid and its temperature, the specific pump selected and its speed of operation. Additional priming information is given in the SAM Engineering Sales Catalogue. Provide the necessary space around the pump for future inspection and servicing of the unit.

CONNECTIONS

Connections at the easily accessible suction and discharge ports can be made either with hose or pipe. The use of strongly reinforced suction hose will prevent collapsing of the hose during operation. New hose washers should be used at the couplings to prevent trouble causing leaks. All hose or pipe should be independently, supported to eliminate excessive strain on the pump.

ROTATION

Your pump is specifically designed to rotate in a counter clockwise direction when viewing the motor from the pump end.

PIPING

1. Suction piping should be as short as possible using the fewest number of elbows and fittings possible to reduce friction loss and avoid priming problems.

2. The designer of the piping system must be sure that the available NPSH of the system exceeds the required NPSH of the pump. (Refer to pump performance curve for the value of the NPSH required by the pump at the operating point).

3. Suction piping should be the same size as the pump inlet.

4. Any reducer should be of the eccentric type. If a reducer is used in the horizontal run of suction piping, it must be used with the flat part of reducer on the top to avoid air pockets.

5. A horizontal portion of the suction line must have a gradual rise to the pump from the source of the liquid being pumped. Any high point in the suction line will create an air pocket, and will prevent proper pump operation and inhibit priming capability.

6. An installation requiring long pipe lines handling hot or chilled liquids, requires provisions for relieving the expansion and contraction of the pipe to eliminate any pipe stress from acting on the pump casing.

7. It is recommended to use long radius elbows and eccentric reducers whenever possible. These types of fittings reduce friction loss. Tapered reducers should only be used in vertical suction piping.

8. If a suction strainer is used, it should have mesh size equal to or less than the solid handling capability of the pump, and open mesh area equivalent to a minimum of eight times the area of the suction pipe size.

9. Before tightening the suction pipe connection flange, align it exactly with the pump suction flange. Do not pull a pipe into place by tightening the flange bolts and/or couplings. All pipe lines near the pump must be rigidly supported to avoid strain on the pump, which may cause excessive vibration, decreased bearing life and/or increased shaft deflection and seal wear.

10. If a single suction line is installed into a sump, it should be installed away from the sump wall at a minimum distance equal to 11/12 times the diameter of the suction line. If more than one suction line is installed in the same sump, separate the suction lines from each other by a minimum distance equal to three times the diameter of the largest suction line.

11. If there is a discharge from an open pipe into the sump, the flow should be kept away from the pump's suction pipe. This inflow usually carries air down into the sump with the liquid. Liquid with entrained air will increase priming time and reduce pump efficiency. If the discharge into the sump is close to the suction pipe, install a baffle between the inflow and suction pipe at a distance of at least six times the diameter of suction pipe away from the suction pipe. The baffle will allow the air to escape from liquid before it is drawn into the suction pipe.

12. The use of bell type increasers at the bottom of the suction pipe is recommended to reduce inlet velocity. If this can't be done, cut the bottom of the suction pipe at a 45° angle to avoid swirling of liquid.

VALVES

SAM Engineering (Pty) Ltd does not recommend the use of a valve on the suction line EXCEPT:

a. In cases where positive suction heads are present in the system or

b. Where it is possible for a positive head to develop due to flooding conditions.

c. Sometimes it is advisable to have valves on suction and discharge so that the pump may be isolated during repair.

In any case, if suction valve is used, install with stems in horizontal position to avoid air pockets.

1. If throttling valves are necessary in the discharge line, use a valve size equivalent to the largest pipe size in the line to minimise friction loss. Never install a throttling valve in the suction line.

2. Gate and check valves may be used on the discharge side, but it is not necessary in low discharge head applications.

3. It is recommended to use a throttling valve and check valve in the discharge line to protect the pump from excessive shock or water hammer and reversed rotation when pump is stopped.

4. To minimise piping friction losses:
   a. Keep discharge line as straight as possible.
   b. Use the minimum number possible of elbows and other pipe fittings.
   c. Use long radius elbows and/or eccentric reducers.

5. Do not terminate the discharge line at a level lower than that of the liquid being pumped, unless a siphon breaker is used in the discharge line. Siphoning action may cause damage to the pump.

6. If there is a high discharge head, slow re-priming may be encountered requiring the use of an air-venting device. If a discharge check valve is used an air release line must be incorporated between the discharge check valve and pump to ensure priming.

7. If the system has a long discharge line it is recommended to install a siphon breaker to avoid siphoning out the liquid from pump casing.

AIR RELEASE LINE

It is essential to allow the air to escape from the discharge line to atmosphere during the initial priming and re-priming cycle. In systems with high discharge heads, it may be advisable to install an air release line between the pump casing and discharge check valve to aid their venting. The size of the air release line is selected so that it does not significantly affect the discharge capacity. You may install an air release line through the filler plug hole if necessary. However, the preferred location is in the discharge line - between the pump and the discharge check valve - as close to the discharge check valve as possible.

We recommend the following line sizes for the following ITT pumps.

3DTH & 4DTH	-19mm Line
6ETH	-25.4mm Line
8GTH & 10GTH	-31.7mm Line

NOTE:

1. This line size may be increased or decreased depending on application.

2. Direct the air release line back into the sump (not into the pump suction line) leave the end of the line open to atmosphere. Do not sub merge into the liquid being pumped.

3. The air release line may clog, particularly if a shut off valve is installed in the line and is closed during operation. If this condition occurs, either use a larger line or leave the shut off valve open during pumping operation. To aid in maintaining air release lines, fit them with crosses instead of elbows.

STARTING

Follow the motor manufacturer's instructions carefully. Before starting, fill the pump casing with liquid through the priming plug provided. Your pump has been designed to prime itself in a few minutes. High suction lifts require additional time and reduce the performance of the pump. Should you have difficulty, refer to the "Trouble Guide" paragraph.

SAM self-priming pumps prime and re-prime themselves providing the casing is filled with liquid. Should you lose this liquid from the casing accidentally or by draining purposely, it will be necessary to fill casing with liquid before starting. Check drive coupling and V belt alignment. (Refer "coupling alignment" for instructions).
Check motor wiring.

WARNINGS:

All electrical work must be done by a licensed electrician.

Before working on pump and/or motor be certain that the electrical power is off at the main junction box.

Disconnect the fuse or circuit breaker and have the main switch tagged "DO NOT ENERGISE THIS SWITCH PERSONNEL WORKING ON EQUIPMENT."

Some motors are equipped with built-in thermal overloads to shut off the motors in the event the temperature becoming excessive (as a result of low voltage, poor ventilation, overloaded lines, etc.) These motors will restart automatically as the motor cools down. For safety sake, DO NOT work on any motor without shutting off the electricity.

Never operate an electric motor driven pump without properly grounding the motor frame. Serious injury or death by electrocution could result.

Drain pump casing completely before taking pump apart. It is advisable to flush the inside of the casing with water before taking pump apart.

Never start pump before putting back all necessary guards such as coupling guard and/or belt guard.

LUBRICATION

Bearing lubrication: (Refer to drawing)

Use good grade SAE #30 non-detergent motor oil. Units are shipped without oil and must be filled before starting. Fill bearing housing oil cavity with oil through "filter" provided on top of bearing housing nearest motor until oil starts to drip out of "oil level" hole. ("Oil Level" cast on housing). Install breather to vent any oil vapour.

Also, provision is made on the housing to install "constant level oiler." ("Oiler" cast on housing.) This oiler can be supplied as an optional item. Under normal service, drain and refill housing cavity oil yearly. However, oil level should be checked regularly.

BEARING CAVITY OIL CAPACITY:

3DTH & 4DTH	:56 fl. oz.
6ETH	:68 fl. oz.
8GTH	:68 fl. oz.
10GTH	:68 fl. oz.

Seal cavity lubrication

Use good grade SAE #30 non-detergent motor oil.

Fill seal cavity with oil through hole provided on top of bearing housing nearest pump casing, until you see oil through hole opening. Install breather to vent any oil vapour.

NOTE: It is recommended that the seal cavity oil be drained (through the drain hole) and replaced with clean grade SAE #30 non-detergent motor oil every 6 months.

The mechanical shaft seal is a wearing part that will eventually need to be replaced. A leaky seal must be replaced quickly to prevent damage to the pump. Any overflow of liquid through the breather (vented plug) is an indication of a possible seal failure.

Oil capacity of seal cavity

3DTH	:20 fl. oz. minimum
4DTH	:20 fl. oz. minimum
6ETH	:20 fl. oz. minimum
8GTH	:20 fl. oz. minimum
10GTH	:20 fl. oz. minimum

Motor bearing lubrication: Follow motor manufacturer's specification.

FLEXIBLE COUPLINGS

A flexible coupling should not be used to compensate for misalignment of the pump and driver shafts. The purpose of the flexible coupling is to compensate for temperature changes and to permit end movement of the shafts without interference with each other while transmitting power from the driver to the pump.

TYPES OF MISALIGNMENT

There are two forms of misalignment between the pump shaft and the driver shaft, as follows:

1. Angular misalignment-shafts with axes concentric but not parallel.

2. Parallel misalignment-shafts with axes parallel but not concentric.

Angular misalignment

A check for angular alignment is made by inserting the taper gauge or feelers at four points between the coupling faces and comparing the distance between the faces of four points spaced at 90-degree intervals around the coupling. The unit will be in angular alignment when the measurements show that the coupling faces are the same distance apart at all points.

Parallel misalignment

A check for parallel alignment is made by placing a straight edge across both coupling rims at the top, bottom and at both sides. The unit will be in parallel alignment when the straight edge rests evenly on the coupling rim at all positions. Allowance may be necessary for temperature changes and for coupling halves that are not of the same outside diameter. Care must be taken to have the straight edge parallel to the axis of the shafts. Angular and parallel misalignment is corrected by means of shims under the motor mounting feet. After each change, it is necessary to recheck the alignment of the coupling halves. Adjustment in one direction may disturb adjustments already made in another direction. It should not be necessary to adjust the shims under the pump.

COUPLING ALIGNMENT

The faces of the coupling halves should be spaced far enough apart so that they cannot strike each other when the driver rotor is moved hard over toward the pump. Due allowance should be made for wear of the thrust bearings. A minimum dimension for the separation of the coupling halves is specified by the manufacturer, usually 3.2mm, the necessary tools for approximately checking the alignment of a flexible coupling are a straight edge and a taper gauge or a set of feeler gauges.

GROUTING

When the alignment is correct, the foundation bolts should be tightened evenly but not too firmly. The unit can then be grouted to the foundation. The base plate should be completely filled with grout and it is desirable to grout the levelling pieces, shims or wedges in place. Foundation bolts should not be fully tightened until the grout is hardened, usually about 48 hours after pouring.

FINAL CHECK OF ALIGNMENT

After the grout has set and the foundation bolts have been properly tightened, the unit should be checked for parallel and angular alignment and, if necessary, corrective measures taken. After the piping of the unit has been connected, the alignment should be again checked.

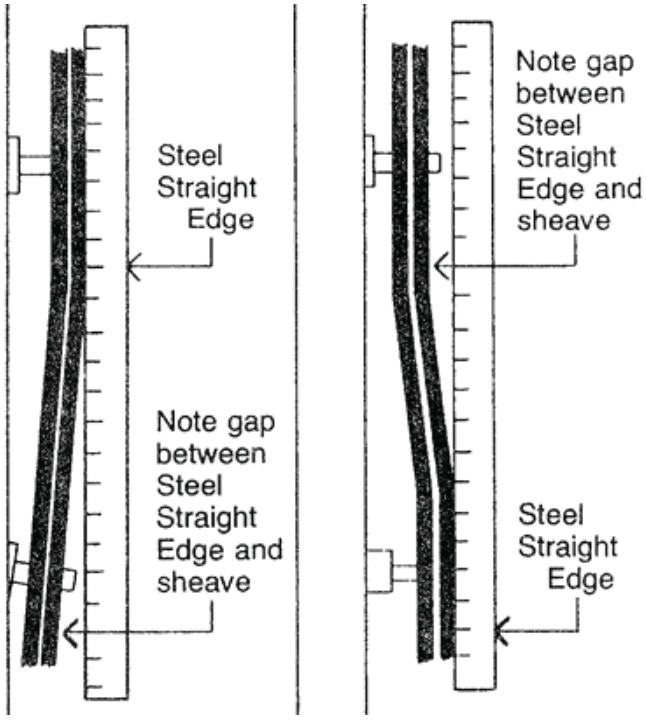
V-BELT ALIGNMENT

Although alignment is not as critical in V-belt drives as in others, proper alignment is essential for long belt and sheave life. First, make sure that drive shafts are parallel. The most common causes of misalignment are nonparallel shafts and improperly located sheaves. Where shafts are not parallel, belts on one side are drawn tighter and pull more than their share of the load. As a result, these belts wear out faster, requiring the entire set to be replaced before it has given maximum service. If misalignment is in the sheave, belts will enter and leave the grooves at an angle, causing excessive belt cover and sheave wear.

CHECK SHEAVE MOUNTING AND ALIGNMENT

V-Belt drives do not require alignment to as close tolerances as most other types of drives - but unless the belts enter and leave the sheaves in a relatively straight line, wear is accelerated.

The two most common causes of misalignment are shown: (a) the shafts of the driver and driven machines are not parallel, and (b) the sheaves are not located properly on the shafts. To check alignment, all you need is a straight edge or, for drives with longer centres, a steel tape. If these aren't available, you can, as a last resort, even use heavy string. Just line the straight edge or tape along the outside face of both sheaves as shown in the illustration. Misalignment will show up as a gap in between the sheave face and straight edge, or perhaps as a "break" in the tape or string. Make sure that the width of the outside land is equal on both sheaves, when using this method.



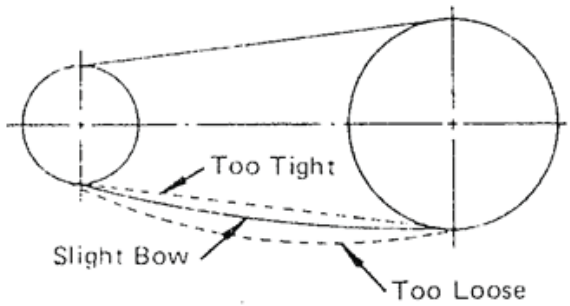
V-BELT DRIVE TENSIONING METHOD

Before attempting to tension any drive it is important that the sheaves be properly installed and aligned. The V-belts should be placed over the sheaves and in the grooves without forcing them over the sides of the grooves.

Step 1: With all belts in their proper groove, adjust the centres to take up all slack and until the belts are fairly tight.

Step 2: Start the drive and continue to adjust until the belts have only a slight bow on the slack side of the drive while operating under load. See sketch.

Step 3: After a few days of operation, the belts will seat themselves in the sheave grooves and it may become necessary to readjust so that the drive again shows a slight "bow" in the slack side.



The drive is now properly tensioned and should operate satisfactorily with only an occasional readjustment to compensate for belt and groove wear.

IMPELLER RUNNING CLEARANCE

The impeller running clearance, the distance between the impeller vanes and wear plate, is adjusted at the factory prior to shipment to .020"-.030". To adjust this clearance in the field, shut down the pump, disconnect power supply to the pump and use the following instructions.

1. Drain pump casing completely by removing drain plugs from both suction and discharge chamber.

2. Remove clean-out cover by unscrewing the two hand knobs.

3. Reach inside the pump casing through the cleanout hole with a feeler gage and measure the gap between the impeller vanes and wear plate. Measure this gap at each impeller vane. If this gap is not within the allowable limits of .020"-.030", adjust this clearance as follows:

    a. Unscrew the three jackscrews and jam nuts. Partially loosen the bearing carrier caps crews.

    b. Adjust the jackscrews and cap screws until the front clearance between the impeller vanes and wear plate falls within the allowable range of .020"-.030". Tightening the jackscrews will increase the front clearance and tightening the cap screws will decrease the front clearance. Tighten one set of screws and loosen the other to go in the direction required. Tighten locknut.

Note: Maximum allowable bearing carrier (110) pull back movement is 1/8", (i.e. from the condition when impeller is "just" touching the wear plate you can push back the bearing carrier assembly by 3.2mm.

SHAFT AND BEARING REPLACEMENT

If shaft or bearing replacement is necessary, follow these instructions. (Shut down the pump and disconnect power supply to the pump before working on pump.)

1. Install the front (impeller end) bearing on the shaft.

2. Slide the carrier retaining ring onto the shaft.

3. Install the rear (coupling end) bearing on the shaft.

4. Install the retaining ring onto the shaft (38). Add shims (107) between the retaining ring and the bearing if required to lock the bearing on to the shaft axially.

5. Install O-ring into the bearing carrier groove.

6. Slide the bearing carrier with O-ring over the rear bearing such that rear bearing slides into the bearing carrier. Install the retaining ring (106) in place.

7. Insert shaft assembly with bearings and carrier into the housing.

CLEANING OR REPLACING CHECK VALVE

(Shut down the pump and disconnect power supply to the pump before working on the pump.) Drain pump casing completely by removing drain plugs. Access to suction check valve can be made by removing the check valve cover plate from the top of the suction chamber of pump casing. Reaching through the check valve cover plate hole, remove the two shoulder screws and check valve keeper plate. Now slide off check valve. Pull the check valve assembly out of the pump casing through the cover plate hole. Inspect the sealing surface of the check valve and make sure it is in good condition and free of debris.

CLEANING IMPELLER

Drain pump casing completely by removing drain plugs. Remove hand knobs, remove clean-out cover and using coat hanger, remove debris from the impeller eye area and if necessary wash it off with garden hose. Check O-ring on the clean-out cover replace it if necessary.

DISASSEMBLY

If you need to replace impeller, wear plate, shaft seal, front oil lip seal, bearing or check valve, follow these steps:

1. Drain pump casing completely by removing drain plug from both suction and discharge chamber.

2. Drain seal cavity oil by removing drain plug from bearing housing.

Note: A mixture of oil and water does not necessarily indicate a seal failure. Inspect seal for damage and replace if needed.

3. Drain bearing cavity oil by removing drain plug.

Note: If oil is mixed with water, shaft seal and front oil lip seal must be inspected for failure.

4. Remove bearing housing support cap screws from base.

5. Disconnect coupling or V Belt.

6. Remove cap screws, which holds seal plate to casing.

7. Pull complete assembly including bearing housing assembly, seal plate and impeller from pump casing.

8. Remove impeller nut & impeller washer from the shaft. Pry out the impeller using wedges behind the impeller.

Note: Check impeller for any broken vanes or wear. If it is necessary, replace it.

Refer to impeller-nut torque value before reinstalling impeller nut.

9. Remove wear plate by removing locknut through the clean-out cover hole. Check wear plate for wear. Replace if required.

10. Remove seal assy from seal well as follows:

    a. Remove spring and rotating element of the seal.

    b. Pry out the stationary element gently from the seal cavity by using screw driver. OR if seal plate is removed from the shaft, the stationary seal will slide out of the shaft along with seal plate. Be careful not to damage stationary element by letting it hit the shaft.

Note: Before reinstalling seal assy make sure that the rubber O-ring and both mating silicon-carbide rings, rubber bellows and shaft surface under seal are in good condition. Make sure to lubricate with water before reinstalling. If necessary, replace seal assembly.

11. Remove cap screws to disassemble bearing housing from seal plate.

Note: Check gasket - if worn, replace it.

12. Remove the shaft assembly with bearings and bearing carrier out of the bearing housing.

13. Check both lip seals, replace if necessary.

14. Remove the snap ring from the bearing carrier which will allow the bearing carrier to slide off the shaft, along with O-ring.

15. Remove snap ring from the shaft.

16. Check the bearings. If they feel rough when turning by hand, replace the bearings. Remove bearings from the shaft using a hydraulic press.

17. If your pump is supplied with a shaft sleeve, the sleeve is locked in place with a roll pin and an O-ring to prevent leakage under the shaft. To remove shaft sleeve, push the roll pin into the shaft (shaft has a drilled through hole) and pull the sleeve from the shaft along with the O-ring. Push the roll pin out of the shaft. Pump with slotted shaft sleeve, pull the sleeve along with O-ring from the shaft. If roll pin is damaged, pull roll pin out of shaft. Replace shaft sleeve, O-ring and roll pin if necessary. Check O-ring and shaft sleeve. If damaged, replace as necessary. When reinstalling the sleeve onto the shaft, make sure that the roll pin is installed flush or max. 0.13mm under the sleeve O.D.

Follow the above procedure in reverse to reassemble the pump.

Note: (1) Make sure all gaskets, O-rings, and sealing surfaces of the check valve are in good condition before reassembly. Replace as is necessary.

(2) Make a heavy bead of "GASKET ELIMINATOR" Loctite #518 or equivalent all around the outer edge, inner edge and around the mounting holes on the wear plate before reinstalling wear plate onto the pump casing for sealing.

Use following impeller nut torque value during installation:

IMPELLER NUT INSTALLATION TORQUE		
Pump Model	**Nut Size**	**Torque Value**
3DTH	25.4mm-14 Esna Nut (Short)	125-150 ft. lbs
4DTH	25.4mm-14 Esna Nut (Short)	125-150 it. lbs
6ETH26	25.4-14 Esna Nut (Short)	125-150 ft. lbs
8GTH8	25.4-14 Esna Nut (Short)	125-150 it. lbs
10GTH9	25.4-14 Esna Nut (Short)	125-150 ft. lbs
6ETH28	25.4-12 Esna Nut	150-175 ft. lbs
8GTH14	25.4-12 Esna Nut	150-175 ft. lbs

NOTE: Before installing impeller onto the shaft, apply coat of Loctite grade 242 into the impeller bore to help prevent corrosion.

TROUBLE SHOOTING

Between regular maintenance inspections, be alert for signs of motor or pump trouble. Common symptoms are listed below. Correct any trouble immediately and AVOID COSTLY REPAIR AND SHUTDOWN.

Will not prime

CAUSES	CURES
1. No liquid in pump casing.	Fill pump casing with liquid being pumped.
2. Loose suction inlet and/or suction check valve cover plate.	Tighten bolts.
3. Worn suction inlet gasket and/or cover plate gasket.	Replace with new gaskets.
4. Loose suction chamber drain plug.	Tighten plug, use pipe dope or Teflon tape.
5. Worn pump shaft seal assy.	Install new seal
6. Loose clean out cover and/or worn clean out gasket.	Replace with new gasket and tighten hand knobs.
7. Air release line clogged.	Clean air release line.

Suddenly stops pumping

Clogged suction line or suction strainer.	Clean suction line and strainer.

Stops pumping until motor is stopped and re-started

CAUSES	CURES
Collapsing suction hose lining.	Replace suction line and strainer.

Slowly stops pumping

1. Clogged impeller, volute suction line or check valve.	Clean out debris from impeller eye area, suction check valve. (Follow instructions on other pages)
2. Loose clean out cover.	Clean sealing surface and o-ring gasket and tighten hand knobs.

Excessive leakage (oil and liquid being pumped) through seal cavity vented hole

Worn pump shaft seal.	Replace seal (follow instructions on other page).

Will not hold prime

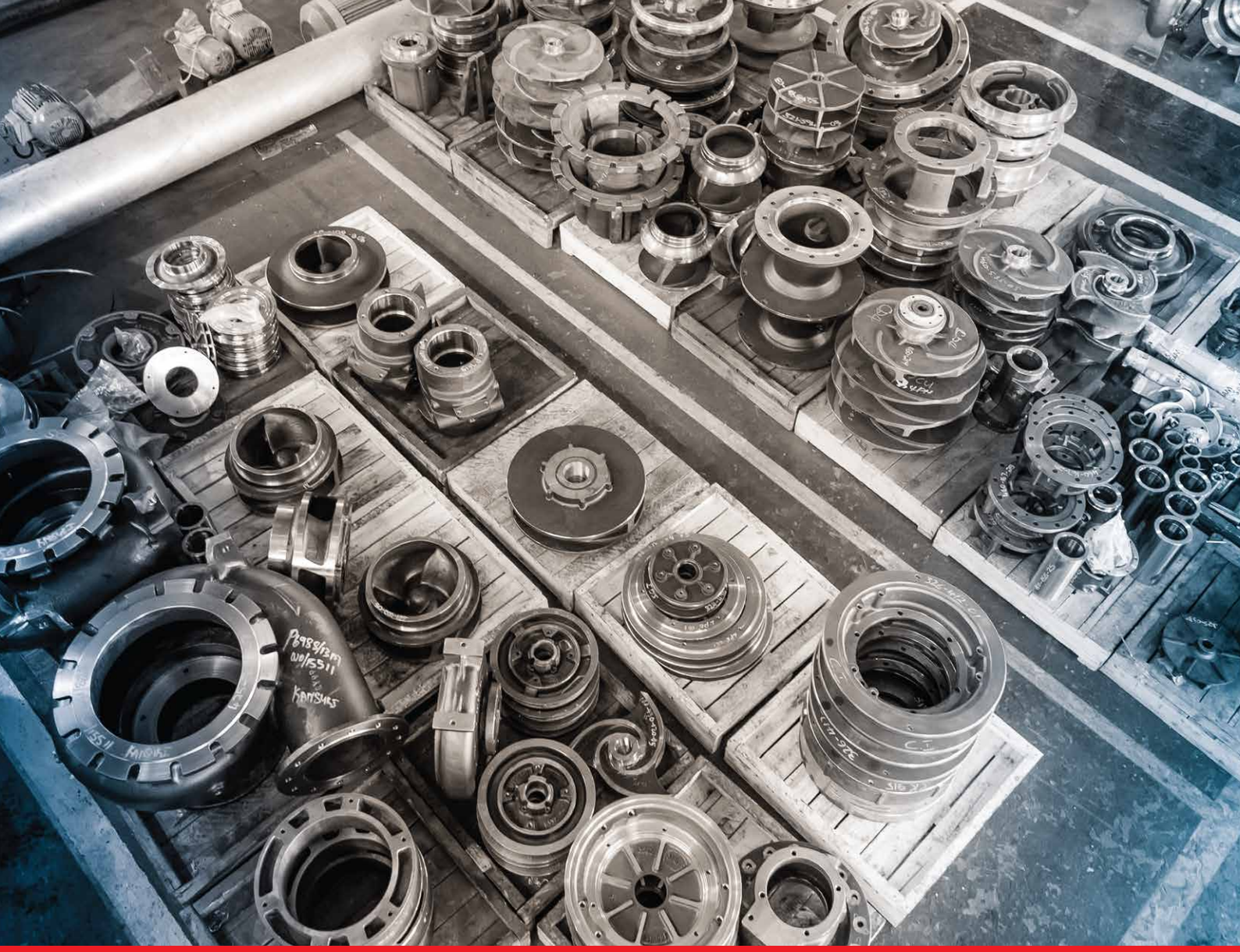
1. Dislodged or worn check valve.	Clean or replace check valve – clean sealing surface.
2. Loose cleanout cover.	Check gasket, replace if necessary. Tighten cover plate.
3. Loose check valve cover plate.	Check gasket. Replace if necessary. Tighten cover plate screws.

Poor performance

1. Dislodged or worn check valve.	Install new impeller, seal or wear plate.
2. Motor not up to speed: a. Low voltage b. Worn bearings.	 a. Larger lead wires required. b. Replace or rebuild.
3. Excessive clearance between impeller and wear plate.	Adjust to 0.5mm to 0.7mm clearance. (Follow instructions on other pages)

Noisy operation

1. Worn motor bearings.	Replace.
2. Low discharge head.	Throttle discharge.
3. Impeller clogged.	Remove clean-out cover and clean impeller.
4. Worn coupling or misalignment.	Replace or realign coupling.
5. Units opening at extreme left or right end of performance curve (capacity too high or too low).	Adjust for best performance point of operation.



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