



S42 Coal Skid Pump

OPERATING INSTRUCTIONS



MODEL S42

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WARNING

**DO NOT ATTEMPT TO OPERATE THIS EQUIPMENT
WITHOUT A THOROUGH UNDERSTANDING OF THIS
TECHNICAL MANUAL.**

**TO PREVENT DAMAGE TO EQUIPMENT AND/OR
INJURY TO PERSONNEL, THESE INSTRUCTIONS
MUST BE CAREFULLY FOLLOWED.**

**A COPY OF THIS MANUAL SHALL ACCOMPANY THE
UNIT AT ALL TIMES.**

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1. SPECIFICATIONS

S42 SKID MOUNTED CONCRETE PUMP

TYPE:	Swing tube model with dual reciprocating pistons.
POWERED BY:	Air Motor
OUTPUT POWER:	7.5KW
HYDRAULIC OIL CAPACITY:	120 litres.
CONCRETE CYLINDERS:	101.6 mm hardchromed with 610mm stroke
HYDRAULIC PRESSURE MAX:	160 BAR
LINE PRESSURE MAX:	40 BAR
RATED OUTPUT:	6 M ³ /HR
ACTUAL OUTPUT:	5 M ³ /HR
AGGREGATE SIZES:	Up to 10mm that falls within the accepted grading curve for pump mix.
NOTE:	Performance may vary due to material mix or line set up.
FEATURES:	Automatic make up system. Safety dump valve.
HYDRAULIC SYSTEM:	Pressure filtration. Dual hydraulic pilot system for positive swinger tube displacement. Fully automatic stroke adjustment. No valve to set or adjust.
MODULE TARE WEIGHT:	250 Kg (excluding skid)

2. WARRANTY POLICY

WARRANTY

We guarantee each new machine sold by us to be free from defects in material and workmanship for six (6) months from date of shipment, but not to exceed (90) days of service. The obligation under this warranty, statutory or otherwise, is limited to the replacement or repair at our Silverwater factory, or at a point designated by us, of such parts as shall appear to us, upon inspection at such point, to have been defective in material or workmanship.

This warranty does not obligate us to bear the cost of labour or transportation charges in connection with the replacement or repair of defective parts, nor shall it apply to a machine upon which repairs or alterations have been made by a third party, unless authorised by us.

We make no warranty in respect of trade accessories, such being subject to the warranties of their respective manufacturers.

We shall, in no event, be liable for consequential damages or contingent liabilities arising out of the use of, or failure of the machine parts to operate properly.

No express, implied or statutory warranty other than herein set forth is made or authorised to be made by us.



3. INTRODUCTION

Close attention to the information and instructions in this manual will assure a minimum of maintenance with maximum productivity.

Prior to pump operation, the operator must be thoroughly familiar with the operation of the equipment in order that it can be operated in a **SAFE** manner. After the operator has gained experience in the **SAFE** operation of the equipment, he can then work toward high volume concrete placement.

For **SAFE OPERATION OF THIS EQUIPMENT**, the qualifications for the conduct of operators shall be based on the following:

4. ELIGIBILITY

- Equipment shall be operated only by experienced operators, or trainers under the direct supervision of an experienced operator, and no unauthorised person shall be permitted to assist or remain in the immediate vicinity of the unit while it is in operation or during the performance of any maintenance inspection, cleaning, repair or make-ready operations.
- Equipment shall not be operated by individuals who cannot read and understand the signs, notices and operating instructions that form a part of the job (in the language in which printed).
- Equipment shall not be operated by individuals who are not familiar with the operating instructions, received some on the job supervised training and are familiar with the signal codes used at the construction site.
- Equipment shall not be operated by anyone under the age of 21 years.
- Equipment shall not be operated by anyone with seriously defective eyesight or hearing and physical or mental impairment (such as epilepsy, heart disease, or progressive neuro-muscular deterioration), and that this be verified by a physical examination at least annually.
- Equipment shall not be operated while the operator is eating, drinking, reading or is more than two metres distance from the controls.
- Equipment shall not be operated by the operator who has asked to be relieved because he feels physical or mentally unfit.
- Equipment shall not be operated at any new site, or at the start of a new shift, until a visual inspection is made of the condition of the equipment.
- Equipment shall have a sign-off sheet attached to the vehicle where an operator can report any damage, defects, problem or accidents to the next shift operator and work supervisor.

5. PLANNING

The planning of concrete pumping requirements should commence as early as possible in the development of any project and should include consultation with the supplier of the concrete.

At appropriate stages consideration should be given to the following points:

- Management plan and risk assessment.
- Site access and equipment position.
- Obtaining authorized and requirements of regulatory authorities.
- Protection and safety of public.
- Procedures for the setting up of the equipment, pipeline and pumping program.
- Personal protective equipment.
- Communication system.
- Weather conditions.
- Emergency procedures.
- Inspection, maintenance and repair.
- Cleaning of equipment and disposal of waste.

6. SAFETY PRECAUTIONS

Any personnel assigned to repair, trouble shoot or operate the S63X concrete pump should first be thoroughly familiar with the operating instruction manual. Your safety and the safety of others is at all time very important. To work safely, you must understand the job you do. If in doubt, use extreme caution, obtain assistance from trained personnel.

During operation, repair or trouble shooting, problems may arise that seem singular but may be due to several causes. The information in this manual should be used to assist in the safest and best manner to operate the concrete pump.

- After operating the engine, never touch the muffler, exhaust pipe, engine or radiator until they have had time to cool.
- Wear suitable hearing protection if you are exposed to noise which you feel is uncomfortable.
- Wear suitable protective eyewear at all times whilst operating the unit.
- **NEVER** remove the hopper grate cover. It protects against accidental contact with the remixer shaft or other moving parts in the hopper.
- **NEVER** enter the hopper with any parts of your body; it is a **DANGER** area and bodily injury can occur, even if engine is stopped. **REASON** - the accumulator has a stored charge of high pressure oil which can throw the swing tube or rotate the remixer blades. If work must be performed inside the hopper, mechanical disconnection of the hydraulic motor and cylinder that powers the remixer shaft and swing tube respectively must be done prior to entry. Discharge the swingtube - accumulator circuit and stop the engine. Always use **CAUTION!**
- **NEVER** work on that part of the pump that is in motion while the engine is running. Take time and stop engine power system for your protection.
- Hydraulic oil systems can be hazardous. Know the circuit you are repairing – it may have high pressure and injury can occur. If in doubt, stop the entire concrete pump and allow sufficient time for oil pressure to zero. Double check system pressure gauges. Use caution when opening the circuits or components. Pressurized oil can cause severe injury.
- **NEVER** open any parts of the concrete delivery line system without reversing the pump and pumping backward to remove pressure on system.

UTILIZE CAUTIOUS AND SAFE METHODS IN THE REPAIR AND OPERATION OF THE EQUIPMENT, IT PAYS IN MANY WAYS!

7. PRINCIPLE OF OPERATION

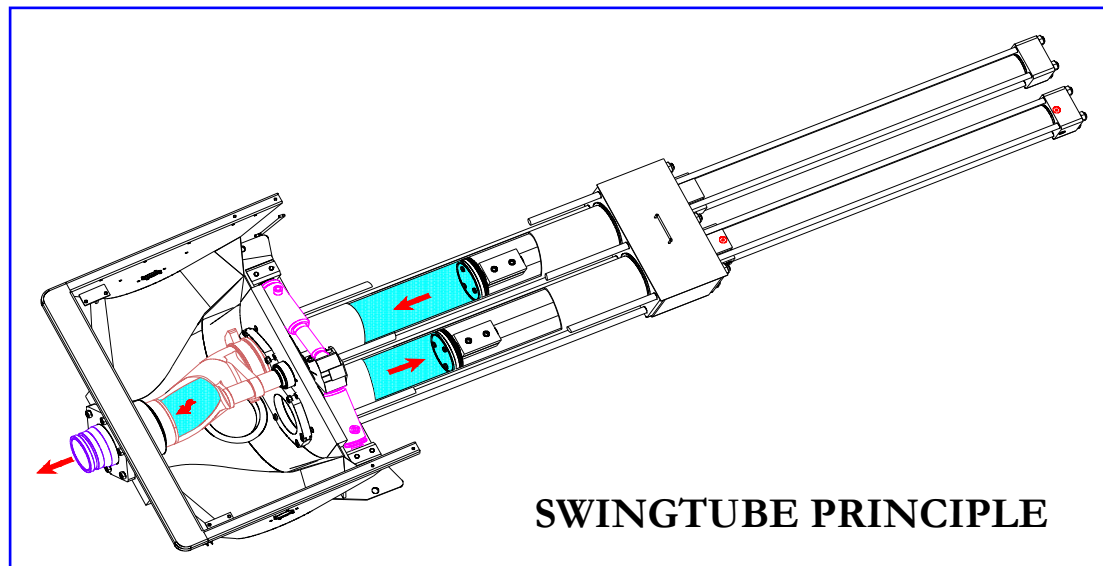


Figure 1 : principle of operation

The concrete pump consists of a receiving hopper, two concrete cylinders and pistons, and a swinger tube concrete valve. A continuous flow of concrete through the delivery line is produced by the sequence of operation of the two concrete pistons and the swinger tube. The swinger tube rocks between the two concrete cylinders under a controlled hydraulic sequence to direct the flow between the two concrete cylinders, the hopper and the discharge outlets. The swinger tube allows one concrete cylinder to be directly open to the hopper on the suction stroke, while simultaneously the other cylinder is directly connected through the swinger tube to the discharge outlet. At the end of the piston travel the direction changes and the swinger tube is shifted to direct the flow output from the other cylinder to the discharge outlet.

The two concrete pistons and swinger tube are driven with hydraulic power. Hydraulic pressure and flow is alternatively applied to the two hydraulic pistons which in turn drive the two concrete pistons. Alternate pressure is applied to the ends of the swinger tube throw cylinder.

Hydraulic pressure applied to the piston head causes one piston (**Master Cylinder**) to move forward on the discharge stroke, while a closed slave loop connecting the piston head ends causes the other piston (**Slave Cylinder**) to move back on the suction stroke. This reciprocating action is controlled by two impulse valves. These impulse valves are located on the ends of the *master hydraulic cylinder* and are hydraulically actuated by the movement of the piston in the master cylinder when nearing the end of stroke.

The pilot signal from the front (*gland*) end of the master cylinder operates an impulse valve which in turn controls the swingtube hydraulic piston changeover valve (*cycle valve*). At the instant the swingtube changes, a second pilot signal

hydraulically switches the main pump to reverse piston direction of the master cylinder. The master cylinder will continue traveling in this direction until nearing the end of stroke, at which point the pilot signal from the rear (*base*) end of the master cylinder will pilot the second impulse valve. The same impulse valve will cause the cycle valve to change back and hence reverse the swingtube and master cylinder motion. The cycling will continue until the hydraulic pump on/off valve is turned off.

The control of both pistons, so they maintain an exact, opposed diagonal relation as they reciprocate, is obtained through two simple by pass ports in the slave hydraulic cylinder. As the piston in this cylinder travels back and forth to the ends it will add or subtract oil from the closed loop connecting the piston areas of each cylinder. Therefore on every stroke the position of the pistons is monitored. Exact piston travel is controlled to allow equal concrete cylinder displacement.

8. CONCRETE MIX DESIGN CONSIDERATIONS

All concretes don't pump equally well. In fact, some don't pump at all. But if the supplier gives special attention to control of the material properties and amount of materials used in his concrete he can produce pumpable mixes. Pumpability is related to several other properties of fresh concrete.

PROPERTIES OF FRESH CONCRETE

Concrete contains cement, water, fine aggregate or sand and coarse aggregate, usually gravel or crushed stone. Admixtures such as air-entraining agents, fly ash or water-reducing agents may also be added. How the fresh concrete behaves depends on properties and proportions of the materials used. Some of the factors that effect pumpability are :-

- **Slump-** The slump test measures the ability of a concrete to flow. Higher slump concretes that are still cohesive flow more readily and are easier to pump. To get a higher slump more water can be put into the mix, less aggregate can be used or a water reducing admixture can be added. Adding water, though, to increase slump will also decrease concrete strength if no additional cement is used.
- **Trowelability-** A concrete that is easy to finish will generally also be easier to pump. Trowelability or finishability is affected primarily by the amount of fine sand, cement and other fines such as fly ash in the mix. Up to a point, the more fines and the higher the mortar volume, the lower the line pressure will be if slump is held constant.
- **Segregation-** Segregation is separation of coarse aggregate from mortar or separation of cement paste from aggregate in freshly mixed concrete. Mixes that segregate easy will be harder to pump.
- **Harshness-** Harsh concrete mixes do not have enough mortar or aggregate fines and because of this they lack cohesion. They are more likely to segregate, aren't as trowelable and are more difficult to pump than mixes that have enough mortar. The slump test can be helpful in detecting harsh mixes. If the slumped concrete breaks off or falls apart when lightly tapped with a tamping rod, the mix lacks cohesion and probably won't be pumpable.
- **Bleeding-** Bleeding is movement of water to the top surface of concrete as heavier materials settle. Mixes that bleed excessively are difficult to pump. Even on jobs where the concrete isn't pumped the use of these mixes should be avoided because finishing will be delayed, flatwork surfaces will be less durable, secondary flooring such as tile may not adhere properly, and sand streaking will occur on vertical surfaces.

WHAT MAKES CONCRETE PUMPABLE

Pumpable concrete can be pushed under pressure through a pipeline system that may include flexible hose as well as smooth steel line. In a pipeline, concrete moves in the form of a cylinder or slug separated from the pipe wall by a lubricating layer of water, cement and fine sand particles. The concrete slug must be able to pass through tapered section (reducers) between the pump discharge port and the pipeline, slide along pipe walls and go around bends in the line. Cohesive mixes will deform as they go through bends or reducers. If the mix is harsh and does not

deform readily, too much friction may develop between the concrete and the pipe walls and create a blockage or rock jam.

When concrete is pumped, water in the mix transmits the pump pressure to the cement and aggregates. But if spaces between aggregates are too large or the cement water paste is too thin and runny, pump pressures cause segregation, forcing water out ahead of the mix. When this happens the lubricating layer is lost, coarse particles interlock, friction between the particles and the pipe wall increases and the concrete stops moving in the line. To keep this from happening, spaces between aggregate particles in the concrete must be made smaller so that the pressure at which segregation occurs is greater than the pressure needed to pump the concrete. Voids or space between aggregate particles are reduced in size by using a range of particle sizes from coarse to fine and by putting enough cement or other fines in the mix.

Concrete mixes that have too many fines may also be difficult to pump. Here, the problem isn't segregation. The mix is cohesive but friction between the concrete and the line may be so great that the pump pressure isn't high enough to move the concrete. This type of pumping problem is more common with high strength concretes or with concretes containing a high proportion of very fine materials such as rock dust. These concretes are sticky and additional pressure is needed to overcome adhesion between the mortar and the pipe walls. Increasing the amount of well graded coarse aggregate in these mixes will help to reduce the fines content and improve pumpability. Use of a coarser sand is also recommended.

EFFECT OF AGGREGATE ON PUMPABILITY

The important properties of coarse aggregates that effect pumpability are maximum size, shape and surface texture, and grading-the range of particle sizes present. If the porosity of the aggregate is exceptionally high, water absorption can also effect pumpability.

Maximum size of the coarse aggregate is considered when choosing line diameter. In a report entitled "Placing Concrete by Pumping Methods" the American Concrete Institute makes the following recommendations:-

- The maximum size of angular coarse aggregates such as crushed stone should be limited to one-third of the smallest inside diameter of the hose or pipe.
- For well rounded aggregate such as river run gravels the maximum size should be limited to 40 percent of the pipe or hose diameter.

Using these guidelines, a 4-inch diameter line would be adequate for crushed stone concretes with up to 1-inch maximum size aggregate and gravel concretes with up to 1 1/2"-inch maximum size aggregate. Experienced pumpers have sometimes found that they get better results if maximum size for angular coarse aggregate doesn't exceed 1/4 of the pipe diameter and maximum size for rounded coarse aggregate doesn't exceed 1/3 of the pipe diameter.

Shape and surface texture of coarse aggregate have an effect on mix proportions although concretes with angular or rounded and rough or smooth particles can be pumped satisfactorily. Concretes made with angular, rough particles usually have to have a higher sand content to be pumpable.

GRADING REQUIREMENTS FOR COARSE AGGREGATES

TABLE 1

	Size No. 467 1 1/2" to No. 4	Size No. 57 1" to No 4	Size No 67 3/4" to No 4	Size No. 7 1/2" to No 4
SIEVE SIZE	PERCENT PASSING			
2 inc	100	100	100	100
1 1/2 inc	95-100	100	100	100
1 inc	-	95-100	100	100
3/4 inc	35-70	-	90-100	100
1/2 inc	-	25-60	-	90-100
3/8 inc	10-30	-	20-55	40-70
No 4	0-5	0-10	0-10	0-15
No 8	-	0-5	0-5	0-5

Grading of coarse aggregate used in concrete to be pumped can be the same as concrete to be placed by other methods. Coarse aggregate grading requirements published by the American society for testing and materials (ASTM) shown in table 1. With regard to pumping, grading of the combined coarse and fine aggregate is more important than grading of the coarse aggregate by itself.

Porosity of the coarse aggregate can effect pumpability if a significant amount of mix water is absorbed by the aggregate during pumping. When absorption causes problems , one solution is to thoroughly wet down the aggregate stockpiles before batching the concrete.

Fine aggregate properties have a greater effect on pumpability than do coarse aggregate properties. Grading is most critical and of particular importance is the portion of the fine aggregate that passes a No.50 sieve. Fine aggregate grading requirements given in a Standard specifications for Concrete Aggregates are shown in table 2. Tighter limits may be necessary when concrete is to be placed by pumping. It is recommended that 15-30% of the sand pass the No 50 sieve and that 5-10% pass the No 100 sieve. Low cement content concretes made with coarser sands bleed more and are harder to pump. Adding more sand to these mixes won't help pumpability.

GRADING REQUIREMENTS FOR FINE AGGREGATES

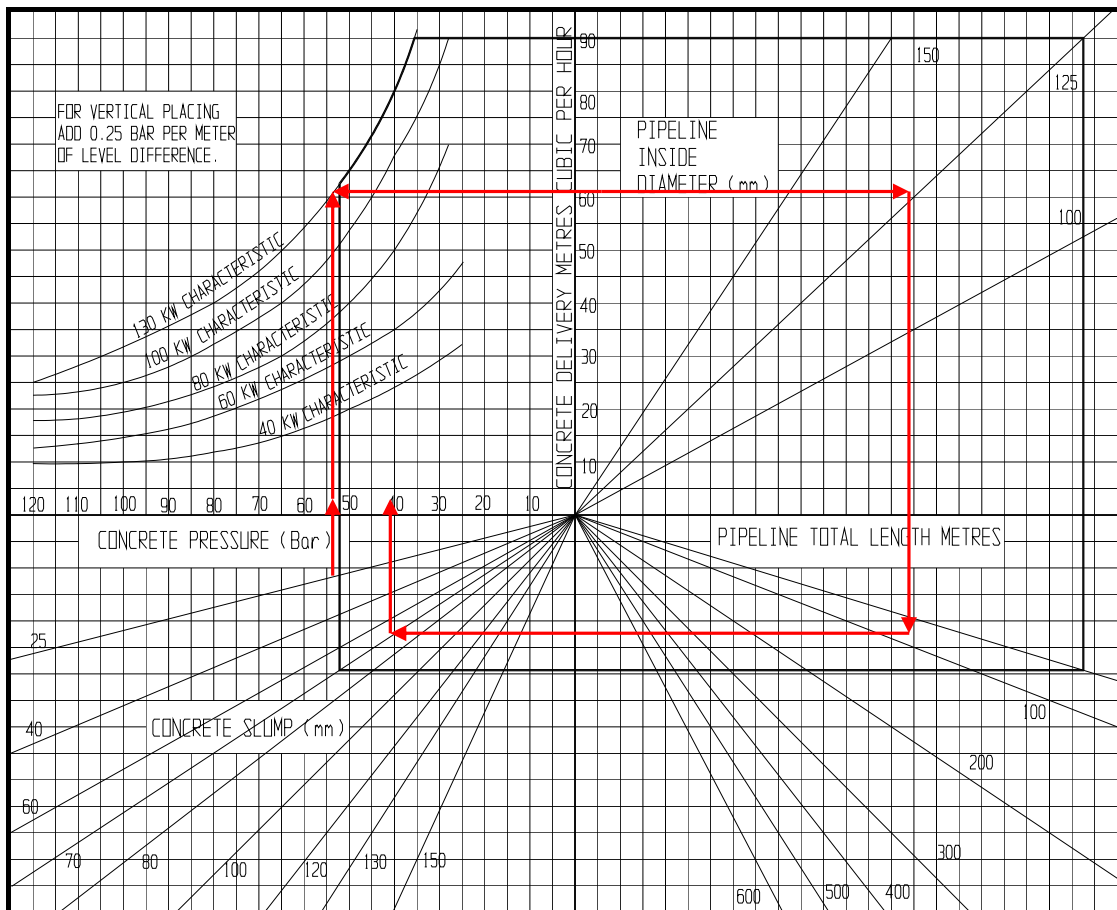
TABLE 2

SEIVE SIZE	
3/8 inc	100
No 4	95 – 100
No 8	80-100
No 16	50-85
No 30	25-60
No 50	10-30
No 100	2-10

If available sands are deficient in the finer sizes they can be blended with selected finer sands or an admixture such as flyash or stone dust can be added to make up the deficiency in fines. Too many fines can also cause problems. Finer materials have more surface area that has to be coated with the cement water paste. So if there is too much fine sand or stone dust in a mix, more water will be needed to get the required slump. This extra water has several harmful effects:-

- It reduces strength.
- It increases shrinkage.
- It makes concrete less watertight.
- It may cause dusting of floors.

PERFORMANCE NOMOGRAPH



The application of the performance nomograph will allow an approximation of the input power required to perform the pumping function, considering known values.

EXAMPLE

Concrete Delivery =	60m ³ /hr
Pipeline I.D. =	125mm
Pipeline Total Length =	100m
Concrete Slump =	70mm
Concrete Head =	40m

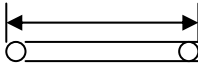
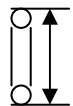
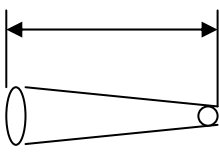
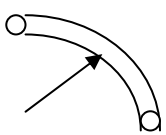

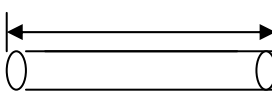
By selecting the desired pumping rate on the vertical axis and then plotting the known values in a clockwise direction a pumping pressure will be determined. Add 0.24 bar/mtr of pumping head to the pumping pressure and continue in a vertical direction. By projecting the desired pumping rate to the left the required pumping power will be indicated at the intersection with the concrete pressure.

Example shown on nomograph on previous page

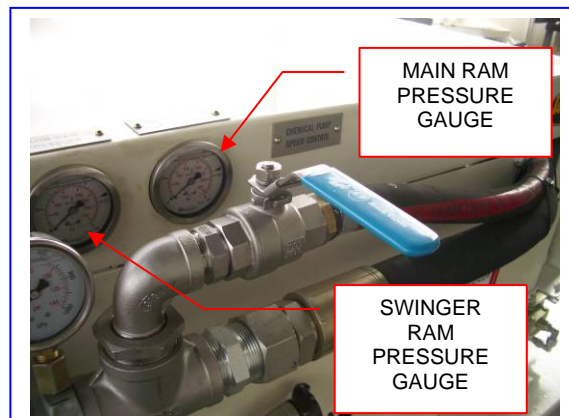
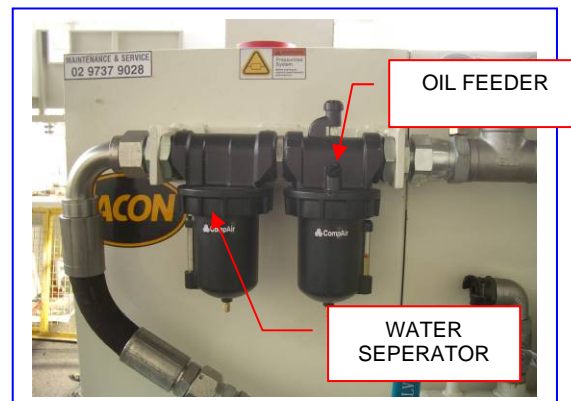
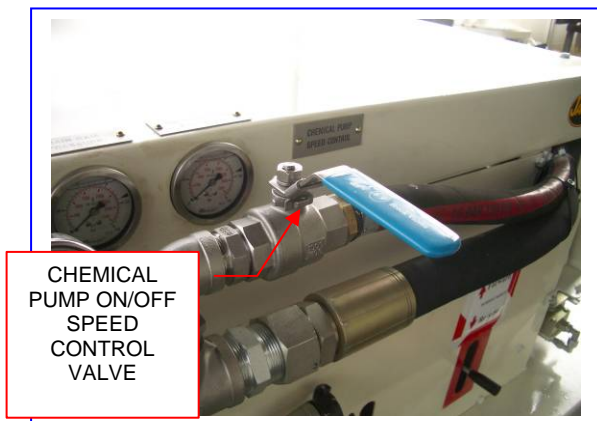
Pumping pressure due to line length = 40 bar.
Pumping pressure due to head = $0.24 \times 40 = 9.6\text{bar}$.
Total pumping pressure = 49.6bar.
Total pumping power (60m³/hr @ 49.6bar)= 130kw.

Therefore the minimum power required to pump as per specifications in example is 130 KW.

HORIZONTAL DISTANCE CONVERSION TABLE

Pipe Shape and Diameter		Slump (cm)				
Shape	Diameter	23 - 18	17 - 14	13 - 9	8 - 5	
Straight Pipe						
	100mm	X 1	X 1.3	X 1.7	X 2	
	125mm	X 1	X 1.2	X 1.5	X 1.8	
	150mm	X 1	X 1.1	X 1.3	X 1.6	
 Vertical 3mtr	100mm	X 6	X 7	X 9	X 10	
	125mm	X 5	X 6	X 8	X 10	
	150mm	X 4	X 5	X 7	X 8	
Tapered Pipe						
 1.5 mtr	UP TO 100mm	175mm-150mm 150mm-125mm 125mm-100mm	8 m 15m 30m	15m 30m 45m	23m 45m 75m	30m 60m 105m
	UP TO 125mm	175mm-150mm 150mm-125mm -	6m 13m -	13m 25m -	19m 38m -	25m 50m -
	UP TO 150mm	175mm-150mm - -	5m - -	10m - -	15m - -	20m - -
Bend Pipe						
 0.5mtr Radius	90'	100mm	8 m	16 m	24 m	32 m
		125mm	7 m	13 m	20 m	27 m
		150mm	5 m	11 m	16 m	21 m
 1mtr Radius	90'	100mm	6 m	12 m	18 m	24 m
		125mm	5 m	10 m	15 m	20 m
		150mm	4 m	8 m	12 m	16 m
Hose						
 7 mtr	100mm	20 m	30 m	40 m	50 m	
	125mm	18 m	25 m	30 m	40 m	
	150mm	15 m	20 m	25 m	30 m	

9. OPERATOR CONTROLS



1. PUMP ON/OFF CONTROL VALVE: When actuated either forward or backward will start the pump in forward or reverse direction. In center position pump will not cycle.
2. CHEMICAL PUMP CONTROL VALVE: Turn ball valve either on or off to enable and disable the pump.
3. AIR MANIFOLD: Connect air supply to this manifold and control air supply to air motor by opening or closing ball valves. Pressure gauge indicates air pressure to air motor.
4. CHEMICAL PUMP SPEED CONTROL VALVE: Speed can be adjusted by the amount of turning angle between the off/on position of the ON/OFF ball valve.

5. OIL FEEDER/WATER SEPERATOR: Supplies lubricating oil to the air motor and also prevents water entering into air motor.
6. PRESSURE GAUGES: Shows system pressure in the swing ram & main ram system.

10. PUMP OPERATING INSTRUCTIONS

LOCATION OF THE PUMP

- Locate the pump where it can be made as level as possible and the hopper as low as possible where two or more Ready-Mix Trucks will have easy access to the hopper at all times.
- It is usually best to place the transport line to farthest point of discharge first. It is easier to take line off and wash clean than it is to add, as it requires “priming” and blockages could occur.
- The manner in which flexible rubber hose is used with steel rigid pipe lines will have an effect on the movement of the line due to the pulsating flow of the concrete. The rubber hose will elongate and contract due to the pulsating flow of concrete. When the transport line is laid out on the job this should be taken into consideration.
- Rubber hose and steel pipe bends cause considerably more back pressure than straight pipe lines. Use as much straight pipe as possible to reduce pumping pressure. Avoid bends whenever possible.
- Vertical and down hill pumping are more difficult than horizontal pumping. Vertical pumping causes high pumping pressures. Down hill pumping can be difficult because the concrete can, at times, flow faster than the pumping rate causing a vacuum and separation of the concrete which can cause a blockage. A back pressure must be kept in the line at all times during down hill pumping.

START – UP PROCEDURES

Prior to starting the unit, the following steps should be carried out:

- Check the hydraulic oil level. This must be at least half way up the sight gauge. Do not start until this is achieved.
- Check the oil level in the lubrication box (water box), it should be at least half full. Do not over fill as the oil will spill out as the pistons move. Use old hydraulic oil in the lubrication box.
- Grease all joints on the pump. It is very important as parts will fail quickly without grease.
- Ensure the unit is on level ground.
- To ensure the pump does not operate on start up, check that the pump control valve is in stop position.

NOTE: *The lubrication oil box must be drained periodically and thorough cleaning of the system is required to remove cement paste and fine sand or other contaminants.*

- As a “safety precaution “ before starting the engine. **MAKE SURE THE GRATES ARE OVER THE HOPPER** covering the re-mixer arms and swinger tube. Always warn anyone that may assist you that you are starting the engine and warn else to stand clear of the pump.
- Before starting connect Air intake, check the following to make sure that controls will not cause the pump to operate until ready, the position of controls as follows:
 - a) Pump selector is in the “stop” position (center).
 - b) Chemical dosing unit to be “OFF” position.

STARTING THE CONCRETE PUMP

1. Start the concrete pump
 - a) Be at the control panel.
 - b) Place pump direction valve in forward.
 - c) Check the pressure in the accumulator circuit at the gauge on panel. This should be in the operating range of 70 Bar to 100 Bar.
2. The concrete pump is now ready to cycle. Increase the PUMP speed by adjusting the air inlet.

11. CONCRETE PUMPING

PRIMING THE PUMP FOR OPERATION

Starting the pumping operation requires that a coating of lubricating grout be pumped through the concrete valve unit and into the line so that the regular concrete mix will flow smoothly.

The grout should consist of two parts sand to one part cement, mixed to the consistency of thick soup. The grout coats the line ahead of the concrete mix to ensure lubrication of the concrete and prevents packing when the line is being filled during the primary operation.

The amount of grout needed will depend on the length of line and harshness of the material being pumped. It will generally require about 30 litres to lubricate the system. Experience will indicate that more or less grout will be required, depending on the length of the line, consistency of the concrete mix and whether pumping up hill or down hill.

Start the pump cycling with grout in the hopper and at the same time start the flow of concrete from the ready mix truck into the hopper.

Note: Engine speed should be 1800 RPM until concrete flows from the end of the delivery line. When good steady flow appears, the pump speed can be adjusted as desired and volume control output will be set for required output performance. One or more cubic meters of grout for priming the pump and delivery line may be required by a ready mix truck depending on the line length and if the layout is up hill or down hill. **Lubricating the pump is not the place to be conservative until you are thoroughly familiar with the pump's capabilities.**

DELIVERY LINE INFORMATION & SAFETY TIPS

The concrete pump is capable of developing a high pressure on the concrete at the discharge outlet of the pump. However, average pumping will normally be somewhat less than the maximum.

1. The transport system shall be capable of withstanding the maximum pumping pressure of 120 Bar. (Check with the manufacturer on products not supplied by Jacon).
2. Pressure are the highest at the concrete pump outlet and reduce uniformly to zero at the discharge end of the transport line under normal pumping condition.

WARNING: If a dry pack of blockage does occur in the delivery system, high pressure will be developed and contained within the **ENTIRE** delivery system from the pump to the point of pack or blockage. Use cautionary procedures under these conditions.

3. **WARNING:** It is the responsibility of each pump owner/operator to check with the manufacturer of the delivery system pressure capability that is not supplied by Jacon. Failure to observe this rule can result in serious personal injury and damage to equipment.

4. Pumping pressure can be reduced by using a larger diameter delivery system or reducing the pumping rate.

5. Check each component in the delivery system for worn or damaged parts.

CONCRETE PUMP PRESSURE CAN BE DANGEROUS!

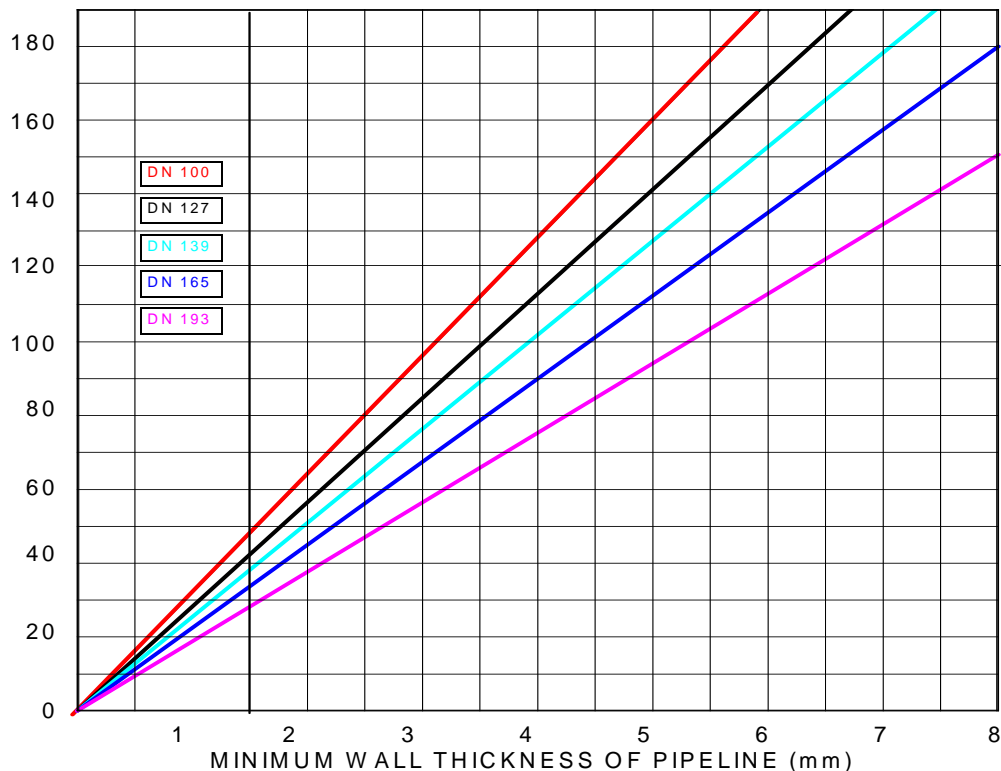
PIPELINE

In addition to the technicality of the concrete pump, the pipeline used and clamping devices and its condition are vital factors for trouble free pumping.

Steel pipes of various wall thickness and diameters are used for pumping concrete. The individual pipe sections with lengths of 1 m, 2 m or 3 m are connected by means of various types of clamping devices with different flanges and seals.

To reduce pumping pressure and keep the wear of the pipeline to a minimum, it is recommended to use larger diameter pipes whenever higher delivery outputs are involved.

Following is the graph to determine the necessary minimum wall thickness against the deformation (without considering fatigue) of the concrete steel pipe ST52 Seamless Steel Pipes to DIN Specification 2448.



CAUTIONS:

1. Jacon stresses the usage of **SHOULDERED** delivery systems and clamping devices that are specifically designed for **Concrete Pumping** applications. All concrete pumps delivered from the Jacon Pump factory are equipped with this type of delivery system.
2. Pumping pressure can be reduced by using a larger diameter delivery system or reducing the pump rate (volume output).
3. Check each components in the deliver system for worn or damaged parts.
 - a) Check for worn hinge pins.
 - b) Rounded or worn locking shoulders.
 - c) Rubber gaskets that are distorted, worn or filled with concrete.
 - d) Bent or stretched locking clamp.
 - e) Check for cracks or fatigue marks in casting.
 - f) Check for tripped nuts and bolts or stretched bolts.

Note: All toggle couplings must be secured by a suitable locking device where:

- (i) Air clean-out is used.
- (ii) Pumping pressure may exceed 40 Bar.
- (iii) Vertical pipelines.

DELIVERY PIPE INSPECTION

All metal pipeline components must be checked regularly for wear a damage.

PIPES: The wall thickness of each pipeline segment shall be measured and recorded in the log book supplied with the delivery with each new unit.

It is recommended that the pipeline be tested at least monthly.

Minimum pipe wall thickness for pumping pressures can be read off the chart (see *page 32*).

Note: Aluminium pipeline is not to be used for pumping concrete.

DELIVERY HOSE INSPECTION

1. Check hoses for rubber separation, tears and cuts.
2. Inspect the shoulder end on each end of the hose for internal wear and the condition of the shoulder for rounded corners and dents. Clean shoulders of any dried concrete for proper seal.
3. Inspect the crimping or connecting application which holds the metal insert to the hose.

Note: Check with your vendor for pressure rating of hoses and crimping.

Throughout the concrete pumping industry, many types of delivery systems and couplings are used. In the best interest of safety, each manufacturer can supply maximum rating and proper care of the components they design. This information must be obtained from the manufacturer prior to any usage.

WARNING:

Never use banding or strapping method of securing the metal male ends to hose on the concrete pumps. The high pressure of this pump will “Block” and force the metal male end out of the hose, causing a dangerous condition.

IDENTIFYING A “BLOCKAGE” IN THE DELIVERY SYSTEM - SAFETY INFORMATION

When a blockage occurs in the delivery system, the main ram pressure gauge will reach the maximum 300 Bar. The needle will remain at this point and at the same time high pressure oil dumping over the relief valve may be heard, along with lugging of the engine and no stroking of the concrete pump. **Immediately switch the pump off** with the switch. Move the direction switch from **forward** to **reverse**, start the pump and cycle it until no more concrete rises in the hopper. This will relieve the pressure from the “blockage” back to the concrete pump. Shut the engine off.

CAUTION: It is possible there will still be pressure contained in the delivery system. *Extreme caution* must be used when opening the clamping devices on any part of the delivery system. Warn all persons in the immediate area of this danger, clear the area of persons prior to opening the clamp and protect eyes and body while opening clamp

After the “blockage” has been cleared return the pump direction switch to FORWARD, start the pump up at a low volume rate until a steady flow of concrete is being discharged.

NEVER ATTEMPT TO CLEAR A BLOCKAGE IN THE PIPELINE SYSTEM WITH PUMP PRESSURE.

PROBABLE CAUSE OF A BLOCKAGE

A blockage is a pack that will not allow the concrete to flow through the delivery system. Many contributing factors can create a blockage as outlined below:

- A non pumpable mix design. (Too coarse sand, high percentage of large rock and poor gradation of components in the mix design).
- Foreign matter in mix (cans, sticks, etc.) Sand Balls (poorly mixed concrete)
- Bleeding of water and pastes from mix. During long standing times between cycles of the concrete pump this situation can develop especially on vertical systems. To remedy this problem cycle the pump in reverse. Let the pump cycle one or two strokes in reverse, then cycle one or two strokes forward. This will keep the concrete moving which will slow down the amount of bleeding from the mix.
- Kinking of the discharge hose or system.
- Sudden reduction of the concrete flow through a reducer in the system. When a reducer is used, always use the longest possible reduction section available; this will allow the flow of concrete to gradually reduce through the section. A shorter reducer will cause the sudden restriction of the aggregate within the flow of the concrete and will eventually cause a blockage. When pumping with a reducer start the pump at a lower engine

speed than normal, then increase the speed gradually until a desired flow is obtained.

- Restriction within the delivery system due to concrete buildup. A dirty system that has not been cleaned properly from previous use leaving sand and dried concrete on the internal surface. As the concrete flows through the pipeline this may lead to a pack in the system. The time and effort to maintain a clean delivery system will ensure against down time due to a pack.

WARNING: Use extreme caution when a blockage in the delivery line occurs. Pressure will be developed and contained within the ENTIRE delivery system from the concrete pump to the point of the blockage.

CLEANING THE PUMP

It is very important that the operator knows and follows the correct procedure for cleaning the pump. Because there are moving parts in the hopper and outlets, the operator must use caution when cleaning the pump. **The operator shall never place hands or feet in the hopper** or outlets when cleaning the pump. When it is necessary to clean a pack out of the hopper or outlet, the operator must make sure that power to the pump is completely shut down with the engine turned off and all hydraulic system pressure discharged and that only a tool is used to clean out the pack not the hands or feet. The operator shall also warn everyone that may assist him in cleaning the pump that they must **never place their hands in the hopper** or outlets.

1. Pump the remaining material out of the hopper until it is nearly empty. Switch the pump off. **CAUTION:** When the concrete is low in the hopper it may spurt air and concrete upwards. **Use protective eyewear.**
2. Open the discharge door in the bottom of hopper and wash the entire hopper clean with water
3. Disconnect the outlet reducing bend piece and delivery line.
4. Start the pump cycling and flush the hopper and outlets with water until all concrete is flushed from the pump. Ensure that the concrete has been flushed as far back as the piston face.

CLEANING THE PIPELINE

Water is safer to use than compressed air when cleaning out the pipeline. Wherever possible it is always recommended to use water rather than compressed air. When cleaning the pipeline the following precautions should be observed:

- All personnel involved in the clean-out procedure must wear protective clothing and equipment as necessary, ie. goggles, helmet, safety shoes and glasses.
- All components of the pipeline being cleaned must be secured against movement during purging.
- No person shall be in line with the direction of the discharge from the pipeline.
- The person in charge of the clean-out procedure must have visual or audible, interference free communication with a responsible assistant positioned to monitor the discharge end of the pipeline during the clean-out.
- No part of the pipeline shall be disconnected nor shall the pipeline be left unattended unless it has been established that the pipeline is free of internal pressure.
- The clean-out personnel shall ensure that all waste be disposed of in a manner so as not to contaminate the environment.

CLEANING THE PIPELINE WITH WATER

a) Using the Concrete Pump

- i. Close the hopper door and completely fill hopper with water.
- ii. Start the pump cycling at ½ the engine speed. Water will force all the concrete in the pipeline to discharge. Water will flush lines clean.
- iii. Disconnect delivery line from back of hopper outlet and open hopper door to discharge all water.

CAUTION: As the wear plate and ring progressively wear by-passing of water will occur. This leakage will retard the capability to clean out the water at the end of life of normal wear parts. This diminishing capability is also a function of the line length, diameter, concrete consistency, and time delay of concrete sitting in the pipeline.

b) Using a Water Pump

- (i) Put clean-out ball into the pipeline
- (ii) Attach the clean-out head to the pipeline.
- (iii) Apply the water pressure. This will push the ball and concrete out of the line.

CLEANING THE PIPELINE WITH COMPRESSED AIR

- a) Fit clean-out ball into the pipeline.
- b) Attach clean-out head to the pipeline.
- c) Apply the air gradually (for safety reasons as well as not to make too much mess at the pipeline discharge point).
- d) Repeat the same process but use two balls with a slug of water between them, this will ensure the pipeline is thoroughly clean.

CAUTION: Never disconnect any part of the pipeline unless it has been absolutely established that all pressure has been released.

12. PUMP HYDRAULIC SYSTEM

For quick reference, see Hydraulic Schematic on page 54.

The hydraulic pumps are driven by the air motor directly through the flywheel housing.

The main pump circuit has a main ram pressure gauge (8), which indicates the system pressure developed. The output from the main pump flows to the cycle valve (10) and the master relief valve (9). Valve is set at the factory. If it becomes mis-adjusted, it could be detrimental and cause component failure. Adjustor procedure is outlined in trouble shooting.

With the pump control valve ON (13), main pump output is directed through cycle valve (10) to one of the hydraulic cylinders, depending on the position of the spool in the cycle valve (10). The oil from the other hydraulic cylinder returns through cycle valve (10) to tank.

CAUTION: With no concrete in the pump system, slight cycling may still occur resulting in piston and swingtube movement.

The secondary or accessory hydraulic pump (1) powers two circuits; accumulator (17) for swing tube (12), pilot for cycling hydraulic cylinders. To operate the concrete pump you must have accessory (accumulator) (12) circuit power. The pressure in the secondary circuit is maintained by an unloading valve (5) via an in line pressure filter which has a 25 micron replacement element. The unloading valve (5) is adjustable and should be set for 100 Bar. As it works and discharges due to circuit use, it will drop to about 40-50 Bar and recharge to 100 Bar. The check valve maintains the charge in the accumulator from discharge backward. The accumulator has a diaphragm design which is filled with **DRY NITROGEN ONLY** under pressure. The charge should be a maximum of $\frac{1}{2}$ of the hydraulic pressure setting for the unloading valve as seen on gauge (8); i.e., if accumulator is running at 80 Bar the dry nitrogen charge should be at 40 Bar maximum.

Checking the accumulator dry nitrogen charge is easy. With the oil warm, slowly bleed the accumulator using the accumulator bleed valve to discharge accumulator. The accumulator gauge needle will descend slowly to a point where it will drop sharply to zero. This midpoint indicates the approximate nitrogen charge. Swing tube gauge indicates the pressure in the secondary-accumulator circuit.

When pressure arrives at 100 Bar, the unloading valve (5) opens the circuit to tank and the check valve traps the pressure in the accumulator on stand-by for use.

Cycling of the hydraulic cylinders is controlled by the cycle valve (10) which is a 3 position spool moved by pilot pressure from end to end. The pilot pressure originates in the accumulator circuit. This pilot line feeds into the A & B leg of the swing ram cylinder control valve.

When master cylinder extends forward and activates the impulse valve (16), the accumulator pressure is ported past pilot check valve (14) to cycle valve (15) forcing its spool to the right porting accumulator oil through on/off valve (13) to the swing tube throw cylinder. As this pilot sequence is occurring two other functions happen simultaneously. The pilot pressure that feeds through pilot check valve on the lower line also opens the top pilot line through the crossover dotted line (port). This action allows the oil in the pilot line from the right side of valve which is now under pressure from the valve spool moving to the right to be discharged to tank easily through the upper check valve through impulse valve (16), which is spring loaded closed and vented (ported) to tank in this resting position. Also as

the swing valve throws across to the right, pressure is developed from the accumulator on the top line from valve to valve. Notice the “Tee” in this line with a pilot line going to the right side of cycle valve (10). Therefore as the top line pressurises, the right side of valve will pressure force its spool to the left as shown.

This action will port main pump (1) output from cycle valve (10) to the slave cylinder head to start it on its forward stroke. Since there is a closed slave loop on the rod side of the cylinders, the master cylinder will begin to retract. As it moves backward it will allow impulse valve (16) to spring set to the closed position again which will vent the pilot line to tank and block accumulator pressure. During the middle part of the cylinder travel both impulse valves are in the center position. Also both check valves are closed which locks the pilot circuit of swing valve and cycle valve. As the slave cylinder moves forward and the master cylinder moves backward it will actuate impulse valve from its closed position to port accumulator pressure to the top line of the check valve. This action reverses the entire cycle circuit which changes both main cylinders travel direction and the swing tube throw cylinder.

The closed slave loop circuit maintains an equal stroke length for both cylinders with check valves (11). The ends of slave cylinder are ported on each end. When the slave loop requires oil the slave cylinder is bottomed out forward and the master cylinder has not moved backward far enough to contact the impulse valve for cycle change. For this moment the main pump will high pressure. Nothing is wrong! If the closed slave loop has an excess of oil it will compensate. If slave cylinder has bottomed out to the rear before master cylinder has completed its forward movement to contact the impulse valve for cycle change, a stall condition will result for a moment since the main pump will continue to drive master cylinder forward but under a high pressure condition. Nothing is wrong; the circuit will automatically compensate. Remember the slave cylinder is bottomed, therefore the oil in the slave closed loop will be under pressure and port (bypass) out of line to the main line connection for the slave cylinder returning to the tank circuit through cycle valve. While release of oil is occurring, the master cylinder is allowed to move forward to complete its stroke making contact with the impulse valve to allow change cycle.

CAUTION: The accumulator circuit has high pressure oil stored. It can be dangerous. Always use caution and assume the circuit may be charged. Work on any of the systems it powers may cause bodily harm due to instantaneous unexpected movement. Warn all personnel working around the concrete pump. Circuits are; swing tube, mixer, outriggers, water pump, compressor and pilot cycling of main cylinders. Always stop engine and discharge the accumulator systems. However, never assume it is totally safe. Use additional caution.

13. MAINTENANCE AND LUBRICATION

GENERAL INFORMATION

The Jacon concrete pump is designed for long, trouble-free performance. Nevertheless, breakdown is possible if proper maintenance is not performed at specified intervals. Maintenance and lubrication procedures detailed in this section are of the utmost importance and avoid costly breakdowns and loss of valuable production time.

DAILY INSPECTION, MAINTENANCE & LUBRICATION

1. Perform the following maintenance at the beginning of each day's operation in addition to the start of procedures listed in the pump operation instruction. Grease all fittings every two hours of operation and once after clean up of concrete pump.

Note: Where lubrication is specified use heavy grease.

2. Check the oil level in the concrete cylinder oil box. It should be half full when the pump is operating. Water or water anti-freeze solution can be used but for best life and positive suction of pistons, oil is best.

WEEKLY INSPECTION, MAINTENANCE & LUBRICATION

Perform the following checks and maintenance at the end of each week's operation in addition to the daily inspection and maintenance.

Note: The Division of Industrial Safety may require properly dated detailed reports of inspection to be made where there is doubt as to the proper supervision over safe maintenance of this type of equipment.

- Check that the maximum pressure output of the main pump is correct (refer to setting main pump pressure in trouble-shooting and repair section).
- Check the pump controls for proper operation.
- Check that the accumulator circuit pressure drops to ZERO when the accumulator dump valve is open.
- Check the hydraulic oil level in the oil reservoir tank.
- The concrete pistons should be checked ONLY if an excessive amount of cement slurry collects in the oil behind the pistons. This will have a high wear factor on the piston and o'ring. Always wipe the cylinder with oil when installing a new piston cup and fill the lubrication box with oil before cycling the pump.
- Check all delivery system pipes and hoses for damaged or weak areas. Make sure there is no build-up of cement in the coupling.

- Check for damaged parts, hydraulic leaks and the deterioration of hydraulic lines and fittings.
- Tighten all loose nuts and bolts.
- Check the in line hydraulic oil filter element indicator gauge. Green is okay, red means replace cement.

HYDRAULIC OIL

The type of hydraulic oil used in the concrete pump and the condition in which the hydraulic oil is maintained, will have a direct effect on the performance and the life of the component parts in the pump's hydraulic system. The pump is supplied with an oil that best meets the operational requirements and conditions of the pump, some of which are: the operational requirements and conditions of the pump, some of which are: the operating temperature range of the oil, the lubricating quality of the oil in this temperature range. Make certain that, when oil is added or changed, the oil is the same or equal to the oil recommended, and that no additives are included that will change the quality of the oil.

FOR TEMPERATURE BELOW-10⁰ C USE SHELL OIL TELLUS T- 22

For normal ambient temperature, we recommend hydraulic oil with a Viscosity of 4.5⁰ E at 55⁰C, ie. an ISO grade 46 hydraulic oil. Special attention has to be given to the pour point at local operating temperature. If the oil foams, air bubbles will temperature can be great which will substantially affect pump performance and life expectancy. The correct oil level must be maintained and checked regularly, otherwise there is possibility that air may be drawn into the system, with a resultant **DANGER OF CAVITATION**. If cavitation occurs, the oil will become aerated, the efficiency of the pump reduced and control will become sluggish. Aeration will impair unit lubrication and possibly lead to high temperature and failure of pumps.

Oil replacement should be a minimum of once a year and preferably twice a year. If pump operation is in extremely contaminated atmosphere frequency of change should be shortened. Here oil sample lab analysis is recommended.....

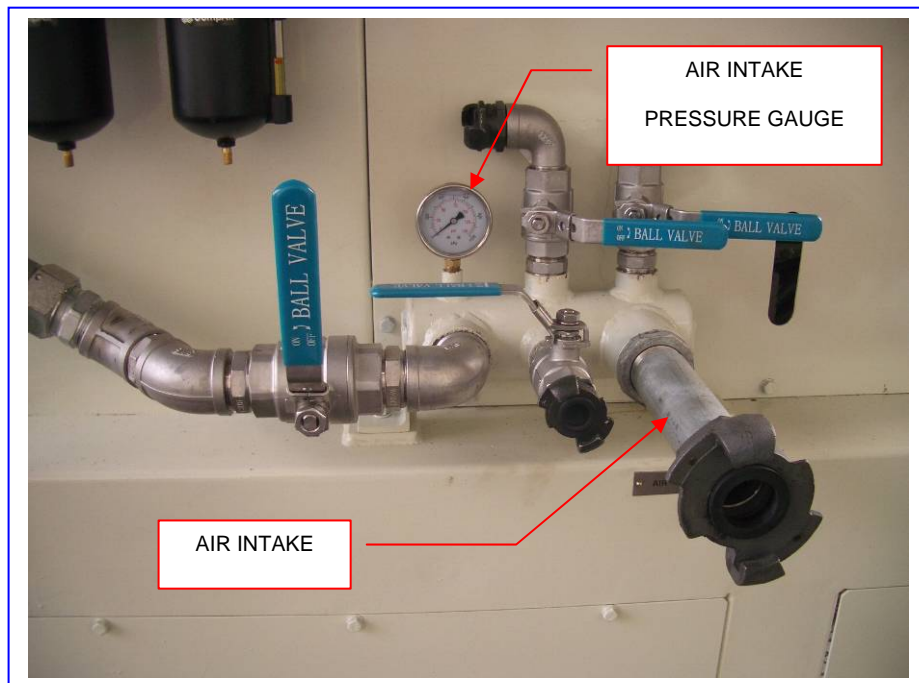
14. TROUBLE SHOOTING & REPAIR

- **Concrete Pump will not cycle – No Pressure on pump gauge check:**

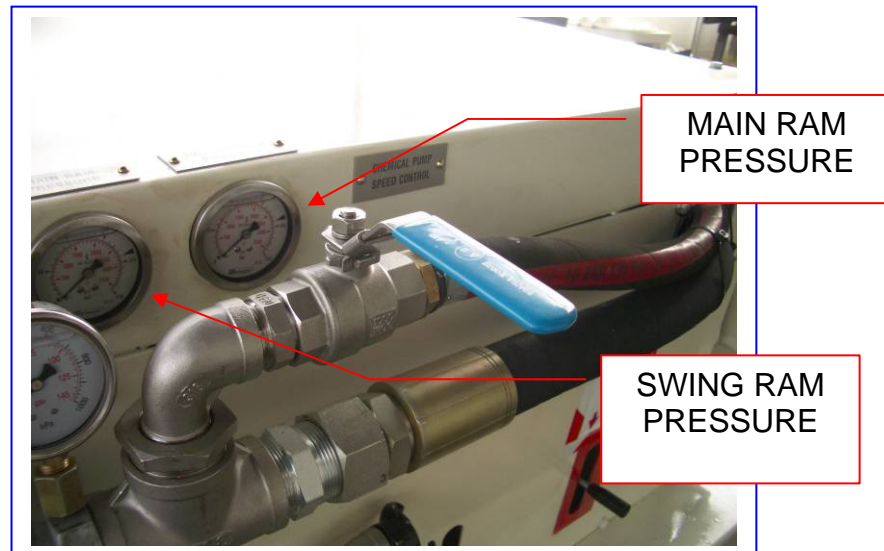
1. Motor running
2. Pump is turned “on”
3. Pump control is in “forward”

a) Check for possible control valve problem:

- i. Disconnect air intake.
- ii. Discharge all pressure in hydraulic system
- iii. Check the control valve functions in forward/reverse and the detents work correctly.



- Concrete Pump will not cycle – High Pressure on pump gauge check:
 1. Place pump direction valve in “reverse” position, turn pump control “on” again and cycle a few strokes. If pump cycles the problem is a blockage in the delivery line system. If no cycling and the hydraulic pistons are on the end of their stroke (one of the piston connector blocks will be in the water box open) the pump has lost stroking. Possible Impulse Valve problem.



Check:

Which cylinder's piston connector block is positioned in oil water box?

- a) If the master cylinder is in the water box it means that piston is retracted. The probable cause of malfunction is the front impulse valve on the master cylinder adjacent to the water box. Shut air motor **OFF**. Discharge the swing tube accumulator circuit. Wait for several minutes to allow circuit pressure to zero. **USE CAUTION** always when opening any hydraulic circuit; it may have high pressure. Remove impulse valve. Inspect the valve spool, it should move freely against its spring action. If it does not move freely, contamination is the cause. Repair and install.
- b) If the slave cylinder's piston connector block is positioned in the water box it means the impulse valve adjacent to the rear cylinder cap of the master cylinder is stuck. **USE CAUTION** always when opening any hydraulic circuit; it may have high pressure. Disconnect air intake and discharge accumulator before removing impulse valve. Inspect for damage, clean and install.
- c) If impulse valves function, cause of stroke loss may be the spool in the cycling valve (15) or the valve is not moving freely. Shut off engine and discharge accumulator. Remove spool from the control block carefully. Inspect for free movement. Check for contamination or burrs.

- Concrete Pump will cycle but not develop High Pressure.
 1. If master cylinder bottoms out but does not develop pressure check relief valve adjustment.
 2. Check for bypass on Master and Slave cylinder. Possible worn or broken piston rings
- **Low or No Accumulator Pressure**
 - a) Safety dump valve poppet jammed open.
- **Swingtube Throws Slow** – See Pump Hydraulic System:
 - a) Setting of accumulator is low, should be 103 bar high side.
 - b) Low dry nitrogen charge in bladder bag of accumulator. Charge should be approximately $\frac{1}{2}$ of hydraulic setting.
 - c) Over charging accumulator will act similar to no charge. Example: by charging to 140 bar with hydraulic setting at 140 bar there will be no stored energy to throw swingtube or cycle valving.

15. PRESSURE ADJUSTMENTS

Maximum pressure is set at the main relief valve located on block (9)

SWINGTUBE ADJUSTMENT AND REPLACEMENT OF PARTS

CAUTION: ANY WORK ON THE SWINGTUBE OR HOPPER AREA REQUIRES ABSOLUTE DISCHARGE OF ACCMULATOR SWINGTUBE CIRCUIT WITH ENGINE STOPPED. DISCONNECT THE HYDRAULIC LINES TO THE SWINGTUBE THROW CYLINDER AND REMIXER MOTOR AND CAP TO PROTECT FROM CONTAMINATION.

The clearance between the wear plate and ring should be no greater than 1-2mm. Excess will cause loss of concrete paste and fines which will create blockage problems in the swingtube or delivery line system.

SETTING THE CLEARANCE

Loosen the clamping bolt of the bell crank, tighten the 1 ½ " nyloc hex nut on the back end of the swingtube pivot shaft. A piece of paper placed on the wear ring and plate should easily be pulled through. The wear ring should be able to turn freely. If the ring is too tight against the wear plate heat build-up will result in poor snap action of the swingtube throw. This will cause incomplete throw and jamming problems.



REPLACEMENT OF WEAR PLATES (RING AND PLATE)

Loosen the 1" UNF nyloc hex nut on the swing pivot shaft. This will allow the swingtube assembly to move backward toward the hopper outlet. Remove the 4 nuts on the pump outlet flange and remove the flange. Carefully pry the swingtube pivot arm backward sufficiently to gain clearance to remove the wear plate first. Two bolts hold the plate to the hopper cylinders. Remove the screws and nuts and lift plate out. Now the ring can be slipped forward off the end of the swingtube.

The wear plate and ring are made from Hi-resistance wear material.

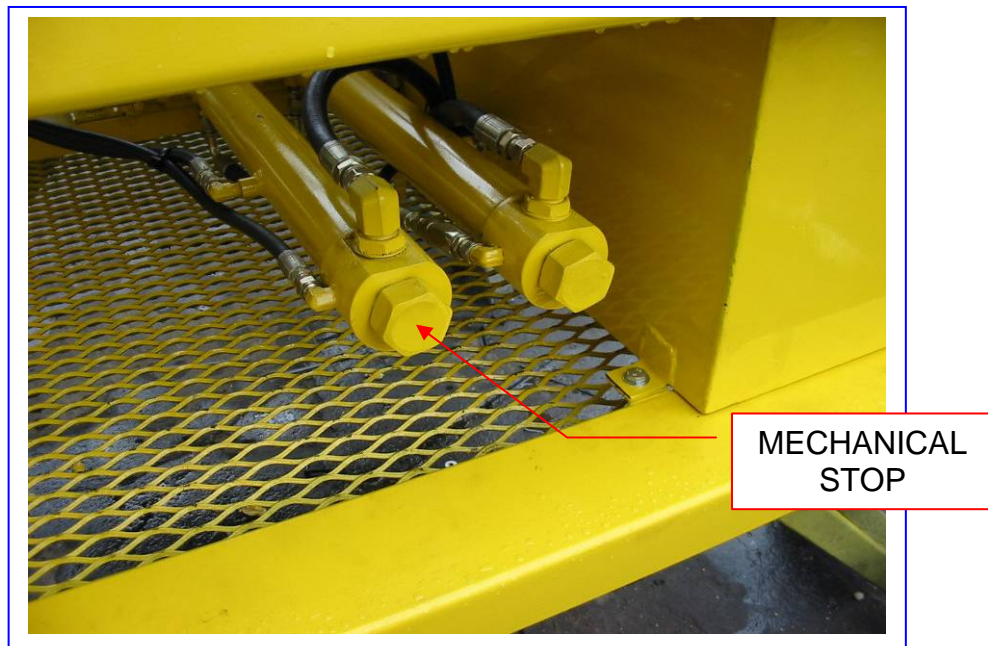
CAUTION : SHOULD BE EXERCISED WHEN INSTALLING THE NEW WEAR PLATE. THE MATING SURFACE OF THE WEAR PLATE AND HOPPER FLANGE MUST BE ABSOLUTELY CLEAN. NO SEALING MATERIAL IS REQUIRED. REMOVE ALL CONCRETE BUILD – UP FROM THIS AREA. FAILURE TO KEEP CLEAN ON INSTALLATION WILL RESULT IN A BROKEN WEAR PLATE IMMEDIATELY.

16. CHANGING THE PISTON CUPS

(When concrete slurry is evident in the water box the piston cups need to be changed)

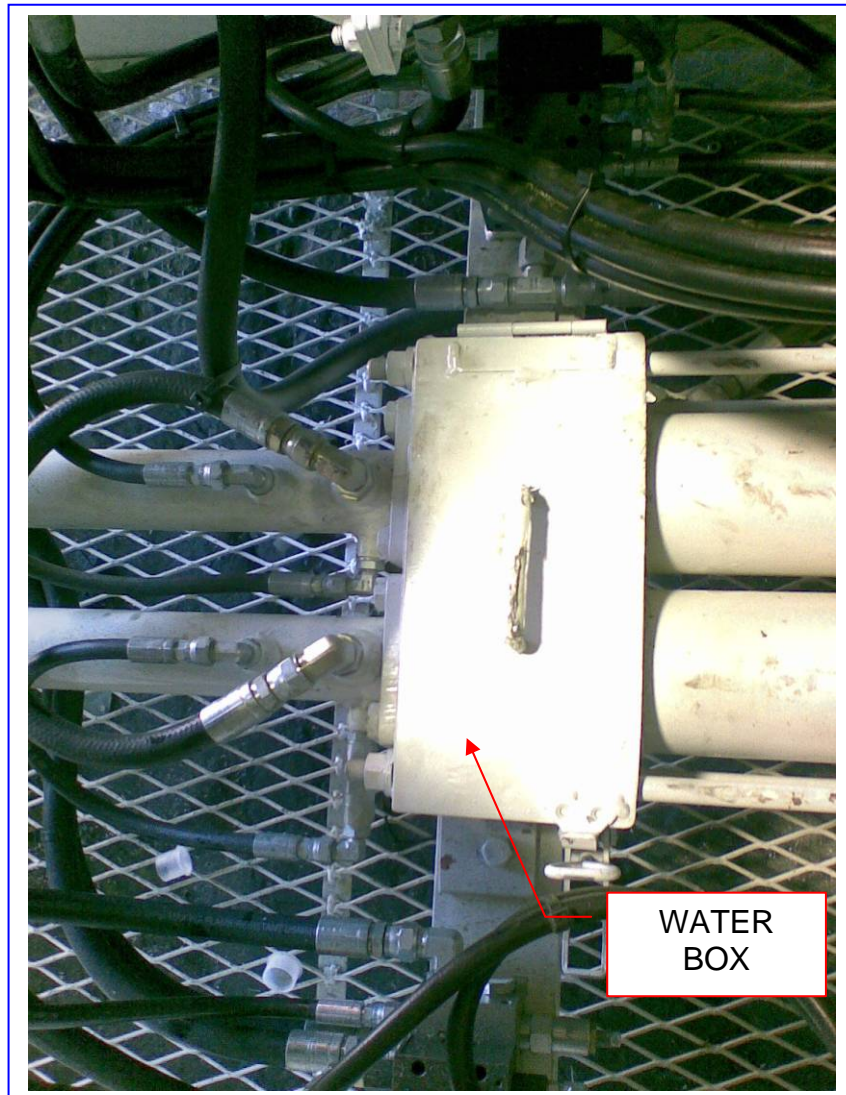
REMOVING THE PISTON CUPS

THE PISTON CUPS CAN ONLY BE REMOVED AND INSTALLED ONE AT A TIME. THIS PROCEDURE DESCRIBES HOW TO INSTALL THE PISTON CUPS FROM THE WATER BOX.



- Prepare the work area and ensure clear access into the water box.
- Screw out mechanical stop located on rear of cylinder to allow only enough distance for piston cup removal
- With the engine running, select “forward” from the control console and bring one of the piston/couplings back into the water box.
- Switch off engine and discharge the swinger ram accumulator circuit, and remove control console keys. Fit out of service or Danger tag to unit.
- Drain oil from the water box.
- With the exposed coupling in the water box, remove the lock nuts and then the Allen head cap screws from the coupling.
- The coupling can now be removed, from the water box.
- Using a pry bar or large screwdriver gently pry or lever out the piston assembly from the cylinder, working from the step on the piston. Use the top edge of the water box as a lever point.
- Remove the piston assembly from the water box.
- Remove any concrete buildup from the bolt heads and unscrew from piston body.
- The backing plate and piston cup can now be removed from the piston body.
- Ensure the piston body is clean particularly the bottom of the O-Ring groove.
- Check the tapped holes in the piston body to ensure the screws will fit easily when reassembling.

- To remove the remaining piston assembly, select “Forward” and “Pump on” from the control console then start the engine.
- As soon as the cylinder starts to reverse select “Lock” and bring the other piston/coupling back into the water box. Repeat the above procedure.



INSTALLING THE PISTON CUPS

THE PISTON CUPS CAN ONLY BE REMOVED AND INSTALLED ONE AT A TIME. THIS PROCEDURE DESCRIBES HOW TO INSTALL THE PISTON CUPS FROM THE HOPPER END.

- With the clean piston body liberally apply grease to the O-Ring groove and fit a new O-Ring. It is important to make sure the O-Ring sits snug into the groove around the piston.
- Refit the piston body only (Without the piston cup) into the cylinder from the water box. Fit and bolt up the coupling tight.
- Start the engine, run the piston to the hopper end and stop engine.
- Discharge the swinger ram accumulator using the dump valve and remove the hydraulic hoses from the swinger ram hydraulic cylinder and cap ends.
- Apply grease to out side edge of the piston cup and push over the pins until it starts to go into the cylinder. (Ensure the flat face of piston cup is facing the water box)
- Using a suitable piece of timber tap the piston cup into the cylinder until it rests firmly up against the piston body. Check to ensure it has located onto the spigot of the piston body.
- Refit two standard bolts to the piston assembly and do up tight, then remove the two modified pins and replace with remaining two standard bolts.
- Prepare the second piston body with O-Ring and fit to its mating piston rod with the coupling. This is done at the water box.
- Start the engine and reverse the cylinders so the second one is now at the hopper end.

(NOTE: YOU WILL HAVE TO MANUALLY PUSH THE SWINGER TUBE ASSEMBLY ACROSS TO OPPOSITE SIDE TO GAIN ACCESS INTO CYLINDER)

- Repeat the above procedure to install the second piston cup.
- Replace the swinger ram hydraulic hoses and fill the water box with oil.
- Start the engine and charge the accumulator circuit with the dump valve. (Note, the swinger tube assembly could move during charging, so keep well clear of the hopper)
- The unit is now ready to operate.

NOTE: *IT IS RECOMMENDED TO INSPECT THE INSIDE DIAMETER OF THE CYLINDERS FOR ANY SCORING WHEN REPLACING THE PISTON CUPS.*

17. GLOSSARY OF TERMS & THE FUNCTION & PURPOSE OF DIFFERENT PARTS.

Relief valve -

Bypass valve - is fitted to control block and is used as a safety medium to protect the pump hydraulic system in cases where overload, or blockage occur, and when pump signal circuit malfunctions, returning oil to tank, when a relief valve is by passing heat is generated because oil is going through a restricted passage at high pressure.

Unloading valve -

Bypass valve - is also fitted to control block and is a type of relief valve, but unloads the oil pump when it has charged up the nitrogen bottle to its pre set pressure, unloader valves do not generate heat as oil is returned to tank at "ZERO" pressure.

Accumulator

Is a means of " storage of energy" the bottle is fitted with a rubber bladder which has a "pre-charge" of "dry nitrogen gas", when a volume of oil under pressure is applied from rear section of oil pump through an internal "check valve" the oil compresses the rubber bladder to allow a volume of oil to be stored in the bottle, the "check valve" stop the oil from returning to the pump. The accumulator bottle gives the "swing valve" a snappy action, when the pre-charge is lost, the swing valve will be sluggish or lazy.

Poppet

Relief valve, unloader and safety dump valves - are located under the relief valve, unloader and safety dump valve cartridge heads. These valve are "hydraulic balanced" type valves, a small "JET" is fitted to Poppets and allows oil from each circuit to pass through to balance the Poppets so they are hydraulically held on their seats to ensure "pressured oil" (without bypass). Should a foreign object block the "jet", the poppet will lift off its seat causing oil pressure to drop to zero and by pass to tank.

Impulse valves

These valves are located in the control block (Slid No.) and near the water box. Their purpose is to signal the end of each stroke, they are three way spring off-set valves, and in their natural state allow the pilot signal on each side of the "Swing valve" four way spool to be open to tank.

Pilot signal

Is a volume of pressurised oil that forces the swing valve four-way spool to rise or lower, thus changing direction of the swing valve from right to left.

Four-way spools

Are hardened lengths of metal with three grooves machined around their circumferences, the width of these grooves are equal to two grooves of a total of five groove machined in the control block to give a pumping action, for example when the spools are in the bottom position pressure goes to Port B, tank pressure goes to Port A, and when lifted, to Top position, pressure goes to port A, tank pressure goes to Port B. This causes the main rams to go backwards and forwards for a pumping action, the swinger tube to go left and right.

Oil Cooler

This optional extra is sometimes fitted to pumps when they are to be operated in high temperature areas or when heavy hard pumping or long high output pours to be carried out with not a lot of time between trucks.

When fitted oil coolers must be used from the first truck load to last, an oil cooler can not be expected to cool a tank full of hot oil after some hours work are carried out. The oil cooler, takes off the small amount of H.P. put into the oil as heat to inefficiency and restrictions found in all hydraulic systems, it is can not capable of getting rid of excess temperature already put into a tank full of hot oil after hours of pumping as well as cool off oil being used during pumping.

Swing valve hydraulic ram

The purpose of this ram is to move the swing tube from left to right, it gets its oil volume supply from the accumulator powered (swing valve) four-way valve oil circuit.

Oil pump main ram pressure gauge -

Which relates to main rams pressure gives the operator an insight as to “load” required to pump different materials and also to “monitor” the pump performance. Gauges should always be in good working order and tested at regular intervals. They allow vital information in case of break downs.

Swing ram pressure gauge -.

Gives the operator same details as the main oil pump gauge but for the swing tube oil circuit. The same care and attention should be given to the swing ram pressure gauge as describe above.

Swing Tube -

Is the Concrete valve, this swings from side to side in time with the main rams to pump or suck concrete up in pipeline, it should be cleaned carefully after all jobs to ensure no build up of concrete occurs inside.

DANGER : never adjust or touch the swing tube when engine is running as serious personal injury could result.

Piston cups

Are fitted to the ends of the main hydraulic ram shafts and give a seal so suction and pressure can be applied to the concrete. Clean piston faces after every job by hosing from the hopper.

Control block -

Is a module of steel machined and milled to contain and organise a combination of functions allowing “automatic” cycling of the pump. Most of the hydraulic circuit system is internal in the control block. All testing should be carried out by factory representatives or dealer.

Oil Filters -

The pump is fitted with several filters, for hydraulic oil, fuel. They should be replaced regularly.

Make-up needle valve -

This needle valve fitted to the front gland block on the master cylinder is used to manually over-ride the “automatic” closed loop system, to ensure rapid quick change over. As pumps age internal leakage occurs and some adjustment is called for. Long hard pushes also require attention of the needle valve.

Wear plate & Wear ring

These items are used to ensure ease of maintenance as the pumping swing tube ages. The gap between the ring and plates should be checked at regular intervals excess wear or gap causes blockages and loss of slurry and fines.

Hopper grease seal

This seal ensures that slurries do not penetrate the swing tube bearings, regular grease filling protects this seal.

Clevis pin

Connects a hydraulic ram to the swing tube sub-assembly grease or anti-seize type lubricants should be applied at regular intervals.

Slave ram

The slave ram is so called because it has no function in the “automatic” pilot circuit. The slave ram, however, does control the “long” and “short” stroke adjustments.

Master ram

It controls the automatic cycling of the pump by striking the front and rear impulse valves.

Accumulator dump valve

This valve allows “dumping” of all pressurised oil in the accumulator circuit to tank. This is a safety valve. Check regularly for its safe and correct operation.

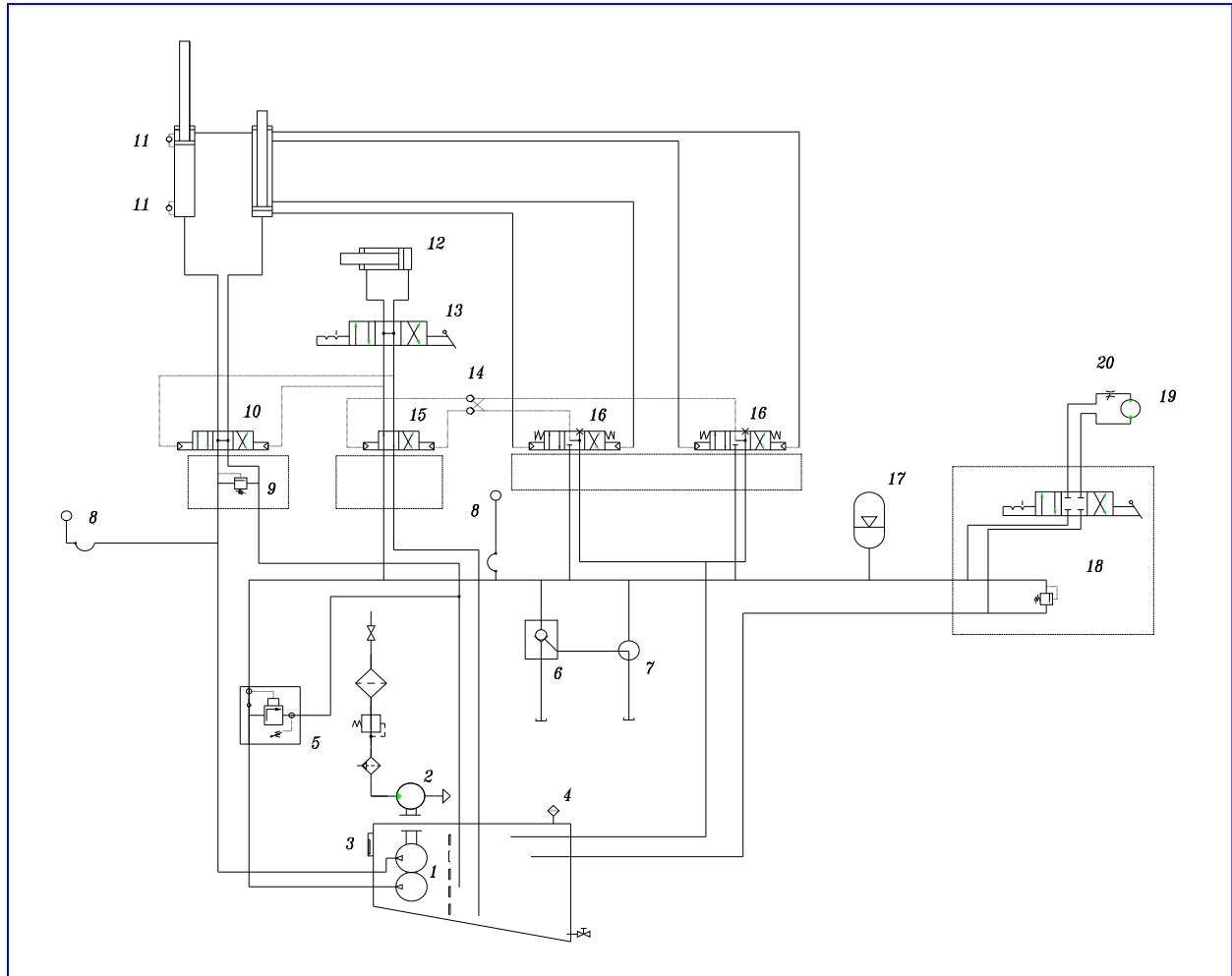
18. REFERENCE MATERIAL

HYDRAULIC SCHEMATIC PARTS LIST

ITEM	DESCRIPTION	PART NO.	QTY
1	Hydraulic Pump	JSP-SDV20106S3S1AA	1
2	Air Motor	JSDL-RM410	1
3	Level Gauge	JSA-13663	1
4	Filler / Breather	JSA-SES3-10-S080-0-0-0	1
5	Unloader Valve	JSA-LT06-A06-3/150B40/02M	1
6	Accumulator Dump Valve	JSA-B69840F	1
7	Dump Valve Actuator	JSA-3KHG1/4"-1125L	1
8	Pressure Gauge 250 Bar	JSA-SPG063-250-1-RBU	2
9	Relief Valve Cartridge	JSA-B1445	1
10	Main Ram Cycling Valve	JSA-4D01-3-R07-0302-B1	1
11	Make Up Check Valve 1/4"	JSA-S6	2
12	Swing Ram Cylinder	JSA-SLM-2" x 4"	1
13	Pump On/Off Control Valve	JSA-1MDCV45/JDC RA1044	1
14	Double Pilot Check Valve	JSA-Z2S6-1-6*/	1
15	Swing Ram Cycling Valve	JSA-4WH10D4*/	1
16	Impulse Valve	JSA-4D01-3-R08-0302-B1	2
17	Accumulator 0.7 LTR	JSA-602611	1
18	Medium Pressure Filter	JSFS-MDFBN3HC110G10A1.1/B	1
19	G11/2 BSP FILTER	JSA-F602G12WJ	1
20	G11/2 BSP LUBRICATOR	JSA-L606G12W	1

REFERENCE MATERIAL

HYDRAULIC SCHEMATIC

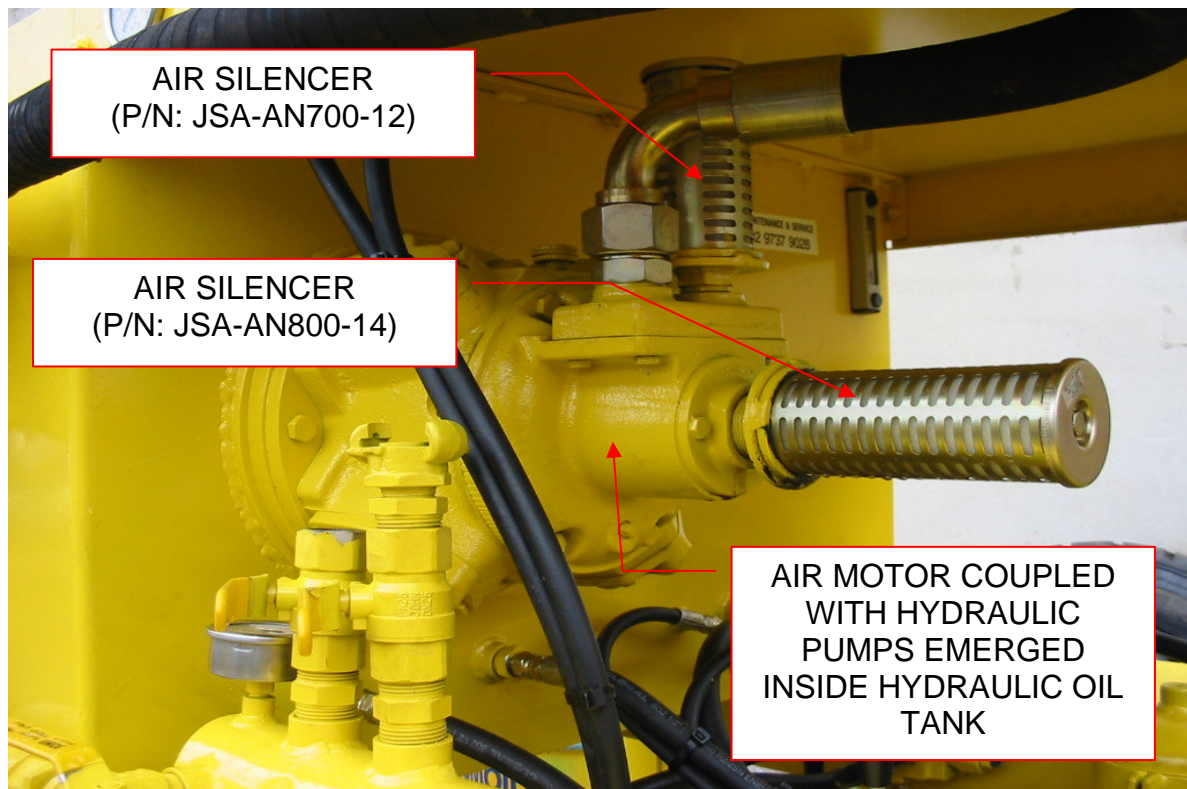


SLIDES

SLIDE NO. 1 Hydraulic Oil Level



SLIDE NO. 2 AIR MOTOR AND HYDRAULIC PUMP



SLIDES

SLIDE NO. 3 SAFETY DUMP VALVE



SLIDE NO. 4 SAFETY DUMP VALVE ACTUATOR



SLIDES

SLIDE NO. 5 ACCUMULATOR UNLOADER VALVE



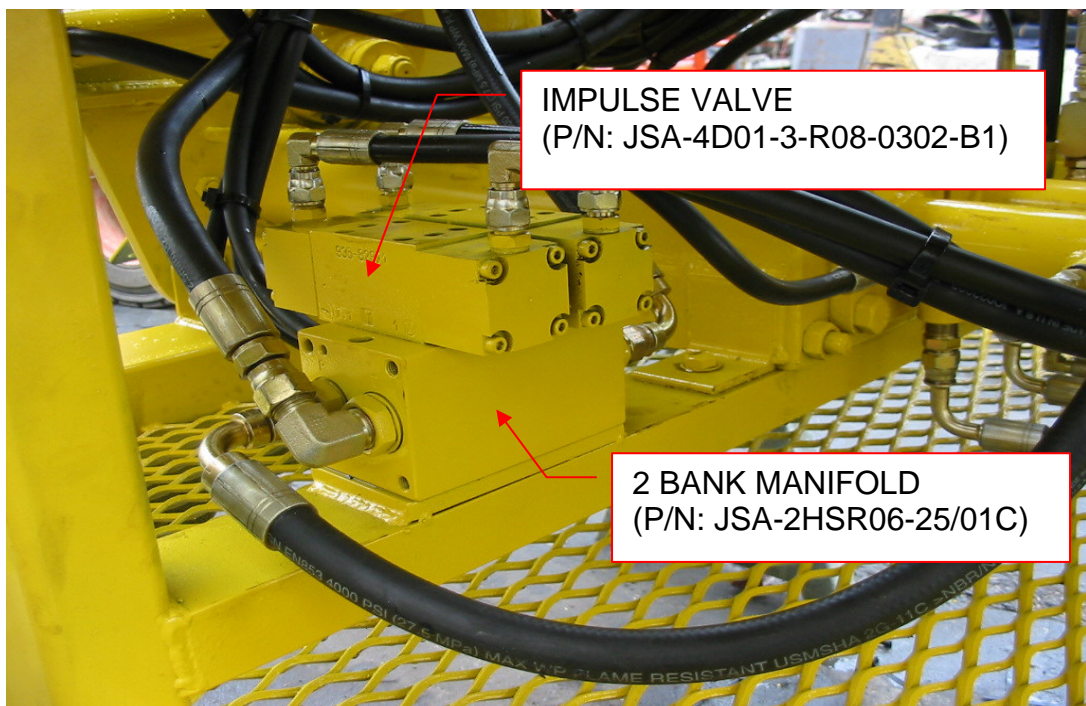
SLIDES

SLIDE NO. 6 PUMP CONTROL VALVES



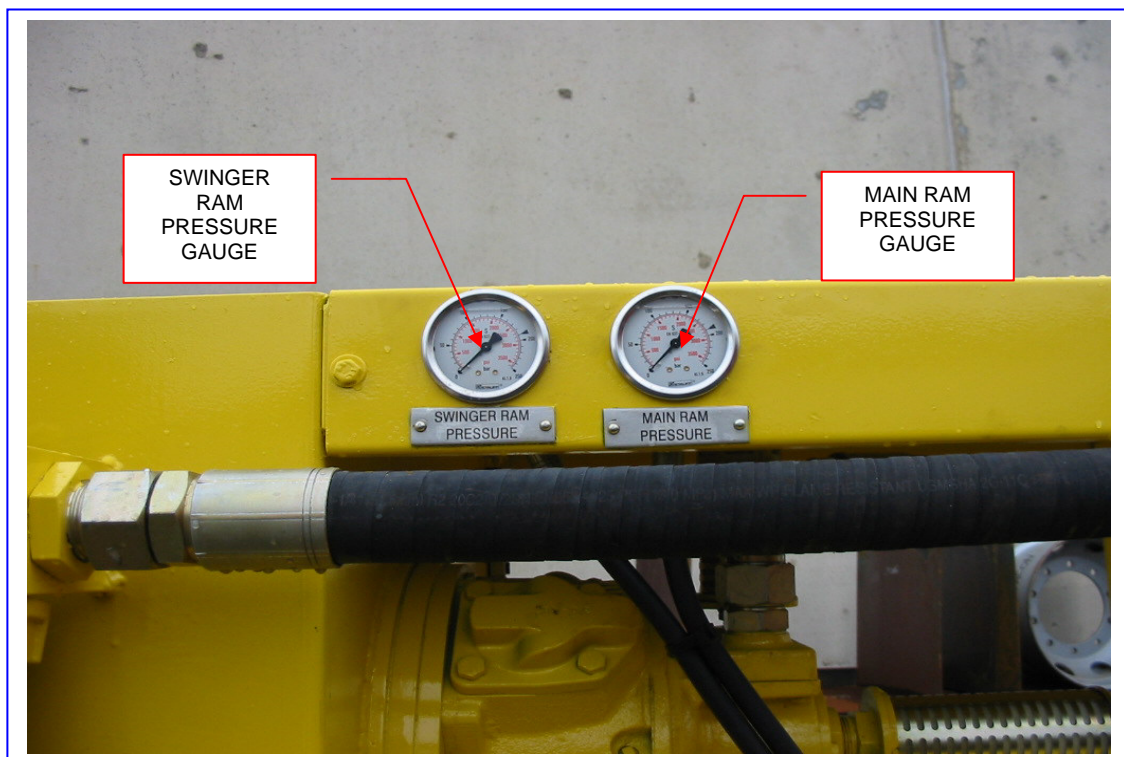
SLIDES

SLIDE NO. 7 IMPULSE VALVE BLOCK



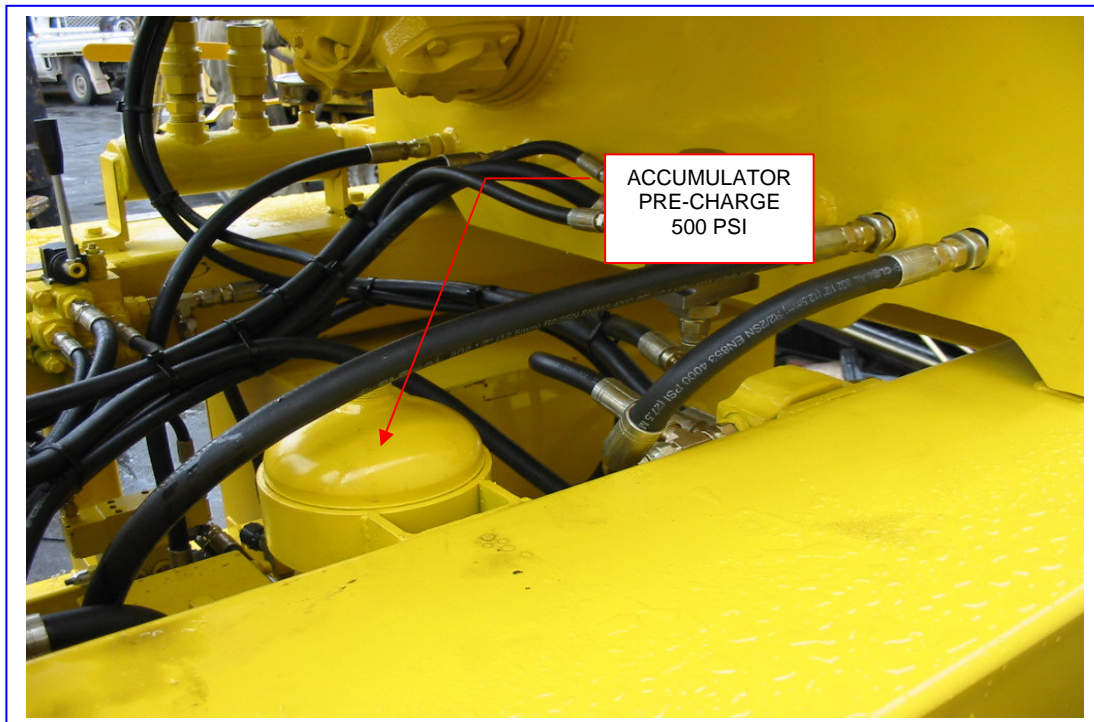
SLIDES

SLIDE NO. 8 PRESSURE GAUGES



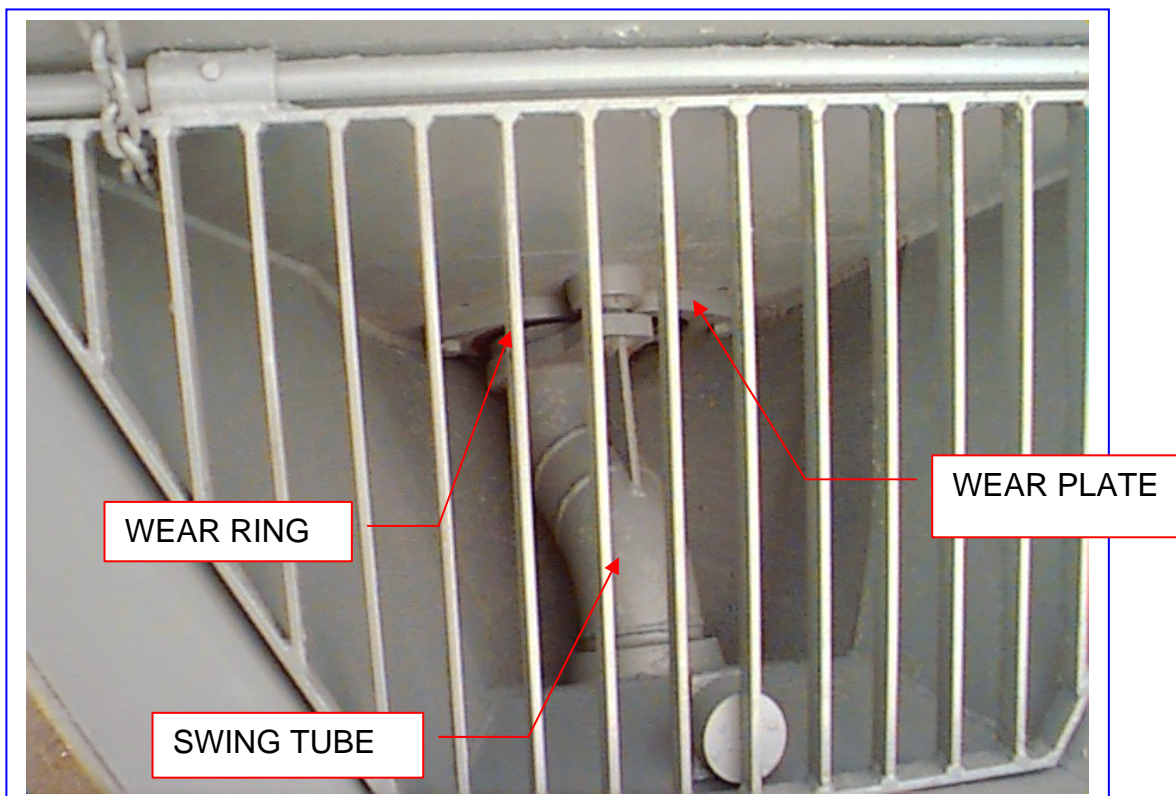
SLIDES

SLIDE NO. 9 ACCUMULATOR



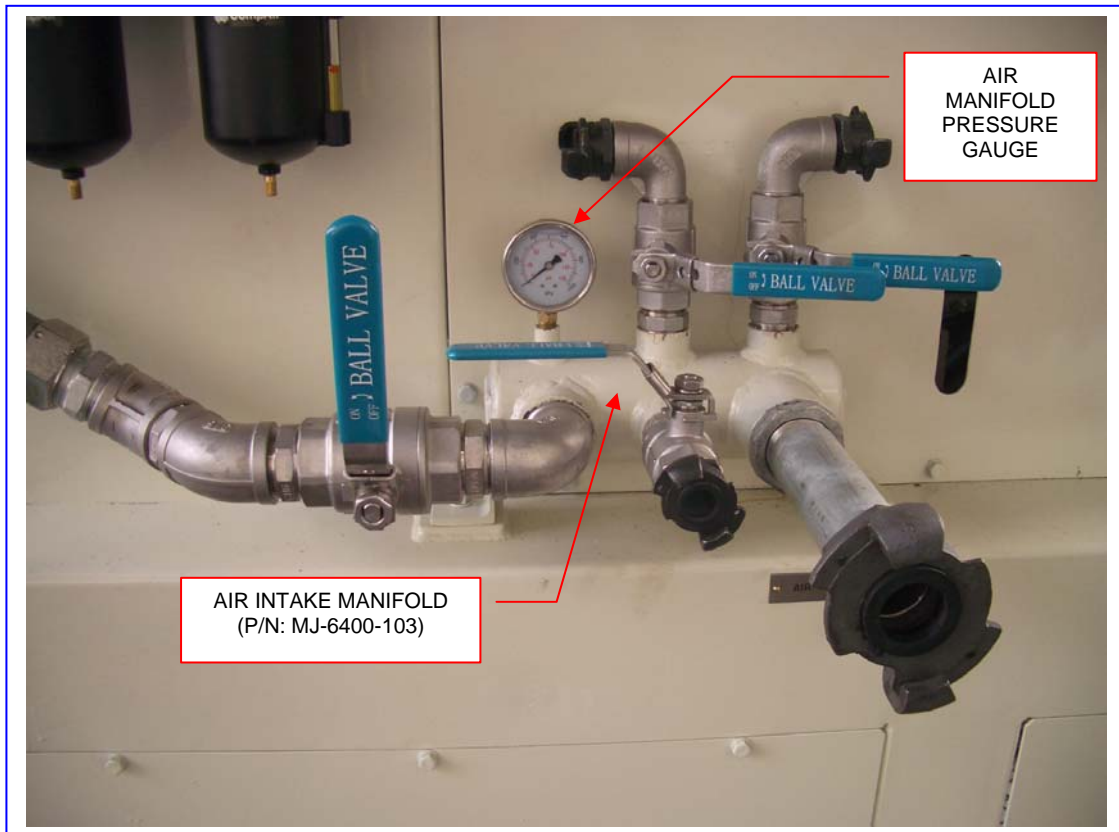
SLIDES

SLIDE NO. 10 WEAR PLATE & WEAR RING

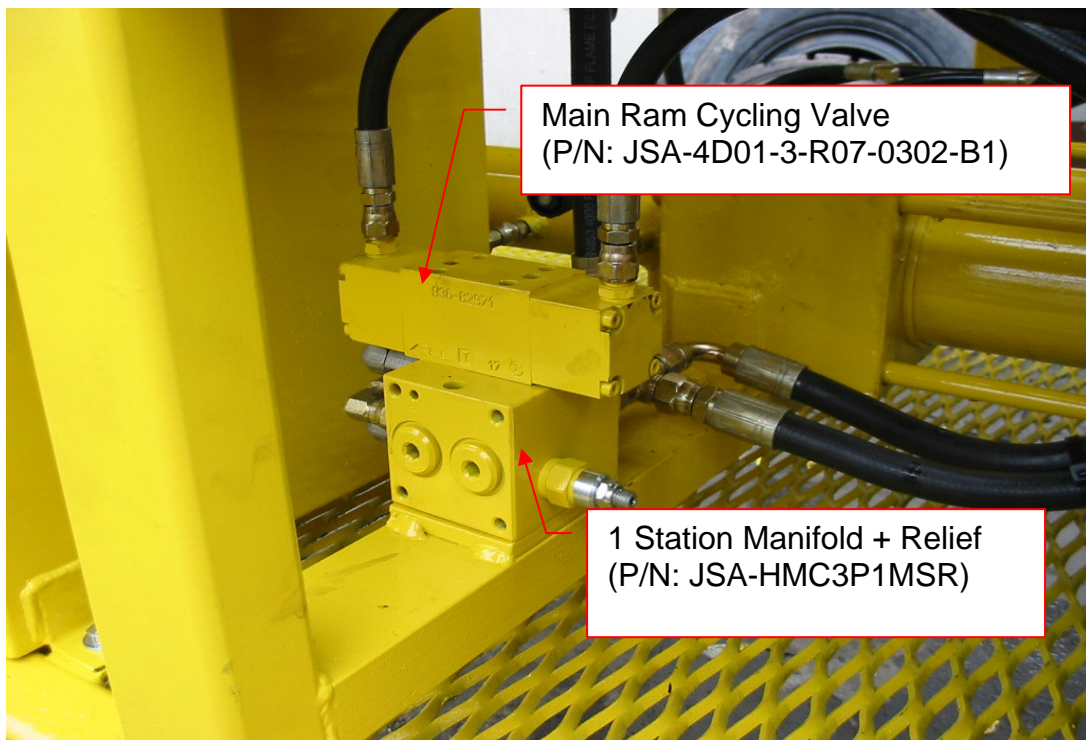


SLIDES

SLIDE NO. 11 AIR MANIFOLD

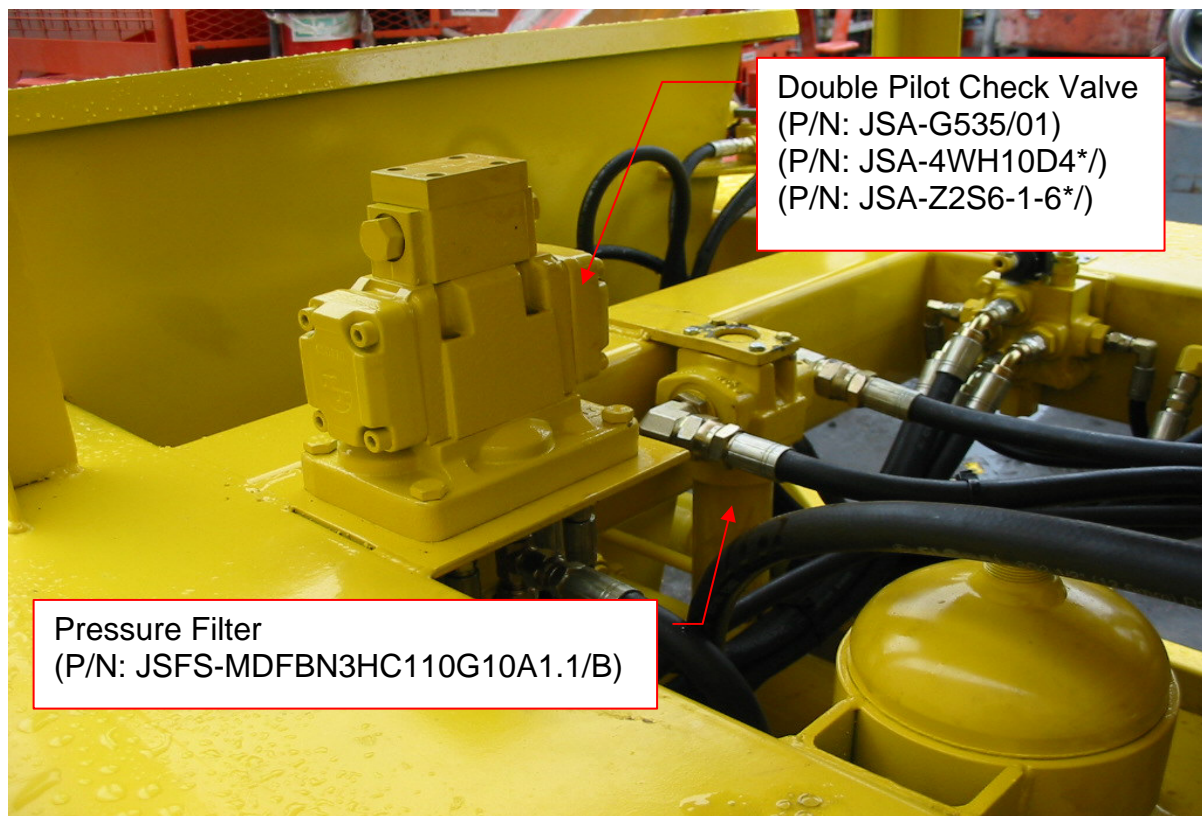


SLIDE NO. 12 MAIN RAM CYCLING MANIFOLD



SLIDES

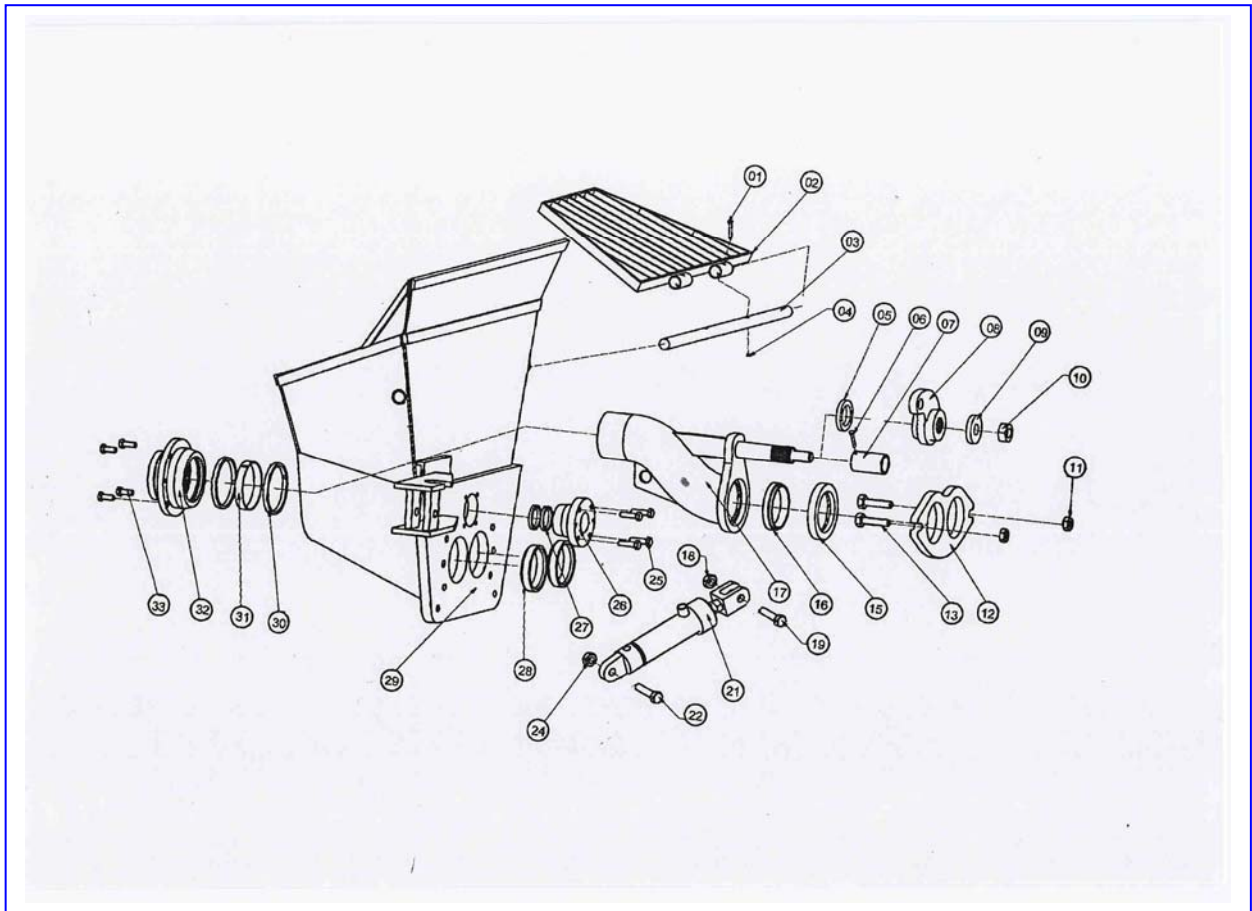
SLIDE NO. 13 SWING RAM CYCLING VALVE



OPERATING AND MAINTENANCE MANUAL S42 SKID MOUNT COAL UNIT**SH-4200-001****HOPPER ASSEMBLY****SPARE PARTS LIST**

ITEM NUMBER	PART NUMBER	DESCRIPTION	QUANTITY	PRICE AUD\$
1	SH-4200-001			
17	SH-4200-004	SWINGTUBE WELDMENT	1	
32	SH-4200-008	OUTLET HOUSING WELDMENT	1	
7	SH-4200-011	Hardened Sleeve	1	
26	SH-4200-012	S10 Flanged Bearing	1	
5	SH-4200-013	S10 Thrust Bearing	1	
9	SH-4200-016	S10 Thrust Washer	1	
28	SH-4200-018	S10 Anti-Chip Ring	2	
12	SH-4200-019	S10 Wear Plate	1	
8	SH-4200-020	BELL CRANK WELDMENT	1	
15	SH-4200-031	S10 Wear Ring	1	
29	SH-4200-033	HOPPER WELDMENT	1	
6	JSFA-M6 x 20 S/H Capscrew	M6 x 20 S/H Capscrew	1	
10	JSFA-3/4" UNF Nyloc Nut	3/4" UNF Nyloc Nut	1	
13	JSFA-1"UNFx3" Hex Hd Bolt	1"UNFx3" Hex Hd Bolt	2	
11	JSFA-1" UNF Hex Nut 12 TPI	1" UNF Hex Nut 12 TPI	2	
19,22	JSFA-3/4"UNFx3" Hex Hd Bolt	3/4"unf x 3" hex hd bolt	2	
18,24	JSFA-3/4" UNF Nyloc Nut	3/4" UNF Nyloc Nut	2	
21	JSA-SLM 2" x 4"	2" x 4" Stroke Hydraulic Cyl	1	
25	JSFA-M10 x 40 Hex Hd Bolt	M10 x 40 Hex Hd Bolt	4	
33	JSFA-M12x30 Hex Hd Bolt	M12 x 30 Hex Hd Bolt H/T	4	
27	JSSE-4306000	U-Seal	2	
30	JSSE-4379200	U-Seal	2	
31	JSSE-8502400	S10 Bearing Strip @ 400mm	0.4mtr	

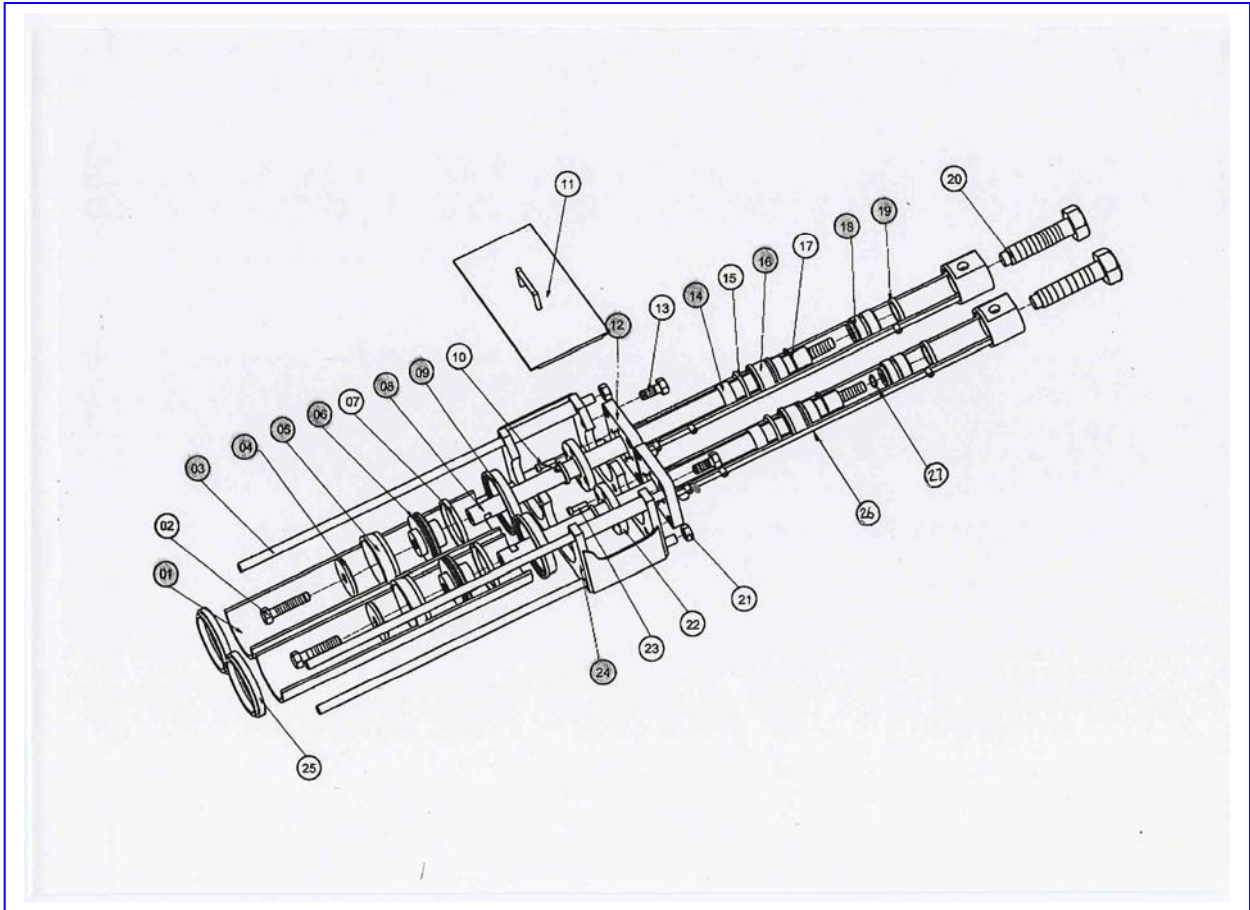
HOPPER EXPLODED VIEW



OPERATING AND MAINTENANCE MANUAL S42 SKID MOUNT COAL UNIT**PM-4200-001-A****MODULE ASSEMBLY 4" CYL****SPARE PARTS LIST**

ITEM NUMBER	PART NUMBER	DESCRIPTION	QUANTITY	PRICE AUD\$
1	PM-4200-001-A			
1	PM-4200-002	4" CONCRETE CYLINDER	2	
26	PM-4200-003	HYD.CYL WELDMENT	2	
24	PM-4200-006	S10 Waterbox Complete	1	
8	PM-4200-007	1 1/4" PISTON ROD	2	
18	PM-4200-008H	S10 Hydraulic Piston	2	
16	PM-4200-009	S10 Gland Housing	2	
22	PM-4200-010	S10 Gland Retainer Plate	2	
9	PM-4200-012A	S10 Waterbox Adaptor	2	
4	PM-4200-013	4 1/2" Piston Plate	2	
6	PM-4200-011	S10 Concrete Piston	2	
3	PM-4200-016	S10 Concrete Cylinder Tie Rod	4	
5	PM-4200-4.0" piston cups	USE PM-4200-019	2	
19	JSSE-TYPE914 2"	2" Piston Seal	2	
17	JSSE-BS-135	O-ring	2	
17	JSSE-BS-135B/Up	Back up Ring	2	
14	JSSE-0821420	1 1/4" VEE PACK	2	
27	JSSE-BS-117	O-Ring	2	
10	JSSE-4501500	1 1/4" ROD WIPER	2	
15	JSSE-BS-139	O-Ring	2	
7	JSSE-4540000	4" Piston B/up Ring	2	
20	PM-4200-018	S10 Cylinder Stop Bolt	2	
25	SH-4200-017	CONC.CYL ADAPTER	2	
2	JSFA-5/8"UNF x 2 1/2" Hex Hd	5/8" UNF x 2 1/2" Hex Hd Bolt	2	
13	JSFA-5/8"UNFx1 1/2" Hex Hd Bolt	Hex Hd Bolt H/T	8	
23	JSFA-M8 x 25 Capscrew	M8 x 25 S/H Capscrew	8	
21	JSFA-5/8" UNF Hex Nut	5/8" UNF Hex Nut	6	

MODULE ASSEMBLY



Other Slides

