

DIRECTOR GENERAL BORDER ROADS

GENERAL MAINTENANCE INSTRUCTION NO. 250

ON OPERATION AND MAINTENANCE OF

CONCRETE PUMP MAKE GREAVES MODEL BP 350D CAP 46 CUM/HR

INTRODUCTION:-

(a) Concrete Pump Greaves BP 350 D capacity 46 Cum/hr, portable type powered by Kirloskar HA 494 air cooled, 4 Cylinder diesel engine fitted with Cold starting device developing 66 HP at 2300 rpm along with quick flushing system (cleaning system) having suitable capacity air compressor, air lines, valves, pressure gauges etc. for cleaning of concrete delivery lines and shall be capable for pumping concrete of water cement ratio up to 0.4 mm and aggregate up to 40 mm size through a pipe line of 125 mm dia up to 300 mtrs horizontally or 80 mtrs vertically at a pressure of 60 bar.

(b) This GMI gives the technical specification and knowhow on the operation, maintenance and repair procedure of subject equipment. Assuming that the technicians in the workshop are fully conversant with the repair and maintenance practices of subject equipment. This GMI emphasizes the special features compliance with procedures enabling to get maximum desire service from the Concrete Pump Greaves BP 350D.

(c) The periodic maintenance must be carried out according to the 'Periodic Maintenance Schedule' described in this GMI to prevent frequent breakdown, reduce maintenance cost, to reduce wear and tear, to give more mileage which in turn prolong the life of equipment. The failure in adhering the guide lines given in this GMI can result in personal injury or serious damage to the eqpt/plant. All information and instruction in the GMI is based on the latest owner's manual and service booklet.

AIM:-

The instructions are issued as guidelines for schedule of preventive maintenance, lubrication of Concrete Pump Greaves BP 350 D manufactured by M/s Greaves Cotton Ltd for regular attention to keep the eqpt/plant in good mechanical condition which must be strictly followed.

ACTION BY:-

- (a) User unit: To carryout periodic inspection and monitor regular/periodical maintenance as laid down in this instruction and record the tasks done in log book.
- (b) Field Workshop:
 - (i) To carryout and monitor maintenance schedule and oil changes as per periodical maintenance laid down in the maintenance instruction and to check the record of maintenance including lubrication.
 - (ii) To advise the user unit in respect of any lapse noticed.
- (c) Mobile Maintenance Team: To ensure that proper maintenance is carried out and submit report accordingly to Task Force Commander and OC Wksp for their necessary action.

DETAILS:-

This instruction includes the following aspects:-

- a) Operating Procedure – Do’s and Don’ts - Appendix ‘A’
- b) Technical Specification - Appendix ‘B’
- c) Recommended Lubricants with Filling Capacity and oil change frequency/periodicity - Appendix ‘C’
- d) Periodic Maintenance schedule - Appendix ‘D’

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OPERATING PROCEDURE

Design features

Concrete Pumps is oil-hydraulic twin cylinder type driven by a diesel engine. The pressure and suction passages in the gate valve housing are round and unobstructed to ensure free flow of concrete. The single rod gate valves are practically maintenance free and enclosed flushing system type. The pumping pistons are lubricated by water and atmospheric pressure from a water container. Concrete pump is equipped with adjustable hydraulic pumps. Concrete pump is portable type and is suitable for towing at speed of up to 20 kmph.

Working System

The concrete in the hopper is sucked from pumping pistons in to the pumping cylinder and then pumped in to the pipeline. There are two reciprocating pistons, i.e. while the piston performing the return stroke sucks the concrete out of the hopper and fills the cylinder with concrete, the piston moving forward pumps the concrete in to the delivery pipe line. Both gate valve plates are arranged in such a manner that during the suction stroke the aperture in the hopper stays open whereas the delivery aperture remains closed. The pistons and gate valves are actuated by the hydraulic cylinders which hydraulically control each other. The suction of concrete back from the pipe line is possible by reversing the stroke cycle.

Jacking the Concrete pump

When jacking the concrete pump, it must be ensured that the pump is standing on adequately solid ground. In soft ground timber chocks should be used. Lower front of concrete pump by retracting the tail wheel. Remove pins of rear jacks. Lower jacks to the ground and secure with pins (insert pins in last hole). Lift front part of concrete pump with tail wheel. Remove pins of front jacks. Lower jacks and secure with pins by inserting the latter in the last hole. Take off the load from tail wheel.

General instructions

The pipeline provided to the pouring point be laid with as few bends as practically possible. The horizontal pipeline should be supported. Vertical pipelines are best supported at the bottom of the first vertical pipe.

Each additional pipe should be secured on or to the structure. If possible, the pipeline should run with structure. When placing concrete at great heights, the proportion of the horizontal to the vertical length should be 1:2. When using concrete from batching plants the pump should be positioned in such a manner that the mixer can discharge directly in to the charging hopper. To prevent segregation, chutes, conveyors or similar should be avoided, if possible.

When using ready mixed concrete, if possible, position the pump in such a manner that it can be fed by ready mix trucks from both sides to speed up the turn round of the trucks.

If concrete has to be pumped downward, the concrete pump should be positioned to ensure that the taper pipes are followed by atleast 3 mtr = 10 feet of horizontal pipe (facilitates dismantling of taper pipes).

After the sloping pipelines, S-bends or further horizontal pipes should be used to prevent breakage in the concrete flow column.

Checks and Maintenance before pumping concrete

- a) Check oil level in oil level indicator provided in hydraulic tank.
- b) Check hydraulic system for leaks (tighten all loose connections).
- c) Top up water container (water level should reach to edge of pumping cylinders).
- d) Check lubricant (flushing) for gate valve rods.
- e) Correct reversing of cylinders with reduced delivery of hydraulic pump.

Gate valve plates must travel up to the stop when pump has been started. If necessary, slowly close throttle valves on control block until gate valve hits stop gently. Should the gate valve hit the stop too hard both throttle valves should be opened partially.

Lubrication of pipeline

Before pumping concrete it is necessary to pump into the pipeline a lubricating grout of 2 parts cement and 1 part sand.

Before putting the lubricating grout into the hopper it should be sprinkled with water.

The quantity of the lubricating grout is determined by the diameter and length of pipeline. For a 100 mm = 4" dia pipeline, 100 mtr = 330 feet long, approx. 150kg=330 lbs cement and 75 kg=165 lbs sand are required.

The lubrication grout should preferably be mixed before it is put into the hopper.

First pump the lubricating grout and then the concrete, steadily increasing output. For short distances or for ready mixed concrete a lubrication grout of cement and water can be used.

Putting concrete pump into operation

When the concrete pump is ideally positioned, then proceed as follows:

- a) Jack up concrete pump
- b) Lay pipeline
- c) Start engine and set the prescribed speed
- d) Check before concrete placing
- e) Engage Agitator
- f) Fill with lubricating grout
- g) Engage concrete pump

Once the lubricating has been pumped into pipeline, the concreting can commence. Now place concrete steadily increasing output. The output of the hydraulic pump is adjustable by means of the flow control valve. Turning clockwise reduces output and turning anticlockwise increases output.

Checks and Maintenance during operation

- a) Do not allow the hopper to be pumped empty and it may cause air locks and running the pumping pistons dry results in increased wear (concrete erupts in hopper due to compressed air in the cylinder).
- b) If the flushing agent is excessively contaminated it should be replaced after concrete placing and the gate rod packing set should be replaced as required.

- c) Check level in water box.
- d) If stones have jammed the Agitator, engage reverse momentarily.
- e) If blockages occur (concrete pump stops, safety pressure has been reached) engaged lever to reverse for a few strokes to position 'failure' (reverse pumping), if this does not cure the blockage, i.e. after the concrete pump has been switched to 'operation', the concrete pump should be switched off . Then establish where the blockage is, check the last batch of concrete for pump-ability. Normally the blockage occurs in the reduction pipes of the hose.
- f) Check hydraulic oil level and tighten all connections of the hydraulic system.

Cleaning after operation

After concreting, the pipeline and pump must be cleaned carefully. The supply of concrete should be terminated in good time so that the concrete within the pipeline can be still used on the site. The pipeline contents of the concrete per meter length is as follows:-

- a) Pipeline size 100 mm (4") dia - 7.8 l/m
- b) Pipeline size 125 mm (5") dia - 12.3 l/m
- c) Pipeline size 150 mm (6") dia - 17.5 l/m

Blowing out of pipeline

The reduction pipes have to be emptied and flushed manually. Only the delivery of, equal diameter can be blown out. Fit cleaning head, open cover press in a water soaked jute or paper sack large enough that the trap basket is adequately filled by this plug and rubber ball to prevent "shot-lie" escape of compressed air after completion of the blowing out procedure. Switch on compressor and steadily open air cock, when blowing out the pipeline. Observe the following:

- a) Stand clear of pipe end.
- b) There must not be a bend or hose at end of pipe line.
- c) Keep an eye on the gauge. If after shutting the air connection the pressure drops, it is a sign that due to expansion of the compressed air the concrete is being pushed out of the pipeline. If the pressure drops rapidly, (shortly before the end of the blowing out procedure) then the concrete is flowing too fast. Immediately open cock to enable surplus air to escape. The pipeline may whip and the concrete escaping at high velocity may damage shuttering and injure people.
- d) The pipeline connections must be tight.
- e) The rubber ball must be a tight fit. Otherwise the cement grout will be blown out and the concrete will lose its lubricating properties. There is also a danger of blockage.

Flushing of pipeline

By subsequent flushing of the pipeline, remainants of cement are removed from the pipe walls. For this purpose, open cleaning head and insert a rubber ball. Close cleaning head. Open air cock briefly so that the rubber ball is some-what pushed into the pipeline. Vent the pipeline and insert another rubber ball via the water connection till space between two rubber balls with water depending upon the length and diameter of pipeline approx. 20 to 50 ltrs. Then push the two balls with the water cushion through the pipeline by means of compressed air. Same as Blowing out procedure.

Cleaning Concrete pump

It is advisable to hose down the concrete pump occasionally during operation to prevent setting of spilled concrete. When pumping is completed, the water container, Agitator and Gate valve housings should be cleaned inside and out.

For cleaning of the gate valve housing alternatively bring pumping pistons forward, switch off concrete pump and scrap off any concrete.

Apply a strong water jet to pumping cylinders and inner walls of control housing, particularly the path of gate valve rods in the half sections of gate valves, until clear water flows. Pour some oil in the suction openings and gate valve rods and then run the pump for a few strokes. If the pump is laid off for a long period all Gate valve parts should be greased.

Periodically apply to the whole pump concrete removal agents and then hose down. After drying apply a wax or silicon corrosion inhibitor. **Do not at any time allow hands or arms anywhere near gate valves during cleaning operations.**

Do's

1	Before starting the machine, make sure that nobody is standing in the immediate vicinity of the engine or driven machine.
2	Engine oil level should never be below minimum mark and same should not also exceed maximum mark.
3	Check tension and change belts only when engine is at standstill. Refit belt guard, if provided. When new belts are fitted, check the belt tension after 15 minutes running time and retighten new V-belts.
4	If the speed regulator has been removed for any reason, the engine must not be started under any circumstances.
5	If the V-Belt fails, shut down the engine immediately to prevent engine overheating.
6	Increase Engine oil change frequency when operating below -10°C
7	If the engine is to remain idle for an extended time, it is necessary to take protective measures to prevent rust formation.
8	If the engine runs fewer hours than the prescribed utilization norms, oil should be changed atleast once in a year.
9	The pipeline provided to the pouring point be laid with as few bends as practically possible

Don'ts

1	Do not fill oil into the Dust collector of the pre-cleaner, if provided.
2	Never fill the fuel tank while the engine is running. Observe cleanliness and do not spill any fuel.
3	Do not actuate the starter for more than 10 seconds. If the engine does not start wait a minute then try again.
4	Never clean air cleaner with gasoline/petrol/fuel. Never clean the inner element (Dry type Air cleaner) and always replace it.
5	Do not allow battery acid to come into contact with skin or clothing and do not rest tools on the Battery.
6	Do not at any time allow hands or arms anywhere near gate valves during cleaning operations

TECHNICAL SPECIFICATION

Description	Concrete Pump make Greaves model BP 350D Cap 46 Cum/Hr
<u>Engine</u>	Kirloskar HA 494 vertical inline, 4 stroke, 4 Cylinder air cooled direct Injection diesel engine
Power output	66 BHP @ 2300 rpm
Torque	20.56 kgm
Bore x Stroke	100 x 120 mm
Total displacement	3770 cc
Compression Ratio	18 : 1
Direction of rotation	Counter Clockwise looking from FWE
Starting Arrangement	Electric start
Firing Order	1-3-4-2
Lubrication	Forced feed 'G' rotor pump
Lube oil temperature	90 to 125 ⁰ C
Minimum Oil pressure	1.5 kg/cm ² at Idle, 3.0 to 4.5 kg/cm ² at Rated speed
Valve clearance in cold condition	0.15 mm
Injector opening pressure	260 ± 10 kg/cm ²
Fuel timing	9 ⁰ at 1500 – 1800 rpm, 14 ⁰ at 2300 – 2500 rpm
Bumping Clearance	0.9 to 1.1 mm
Dry weight of engine	421 kg
<u>Concrete Pump</u>	
Maximum theoretical concrete output (Rod / Piston side)	46 / 33 cum/hr
Maximum concrete Pressure (Rod / Piston side)	60 / 86 bar
Maximum number of (Rod / Piston side)	25 / 18 per minute
Maximum Horizontal placing distance (Rod / Piston side) *	300 / 430 meter
Maximum Vertical placing distance (Rod / Piston side) *	80 / 120 meter
Piston displacement 2 cylinders	61 liters
Pumping Cylinder dia X stroke	180 x 1200 mm
Drive power	48.6 kw
Driving speed	2100 rpm
Dia of concrete delivery pipe	125 to 150 mm
Compressor maximum air pressure / flow	7 bar / 35 cfm
Feeding Hopper height	1380 mm
Dimensions (L x B x H)	4550 x 2160 x 1950 mm
Dead weight inclusive of Hydraulic oil & Fuel	3000 kg
Battery	12V x 88 AH

* Depending upon job site conditions and concrete mix

**RECOMMENDED LUBRICANTS WITH FILLING CAPACITY
AND OIL CHANGE FREQUENCY/PERIODICITY**

Particular	Specification	Grade of Lubricants (IOC Grade)	Filling capacity	Periodicity/Frequency
Engine (with Oil filter)	SAE 15W 40	Servo Pride XL 15W40	12.5 ltrs	After every 500 Hrs
Engine (without Oil filter)			11 ltrs	
Hydraulic Tank	Greaves HI 68 Oil	Servo System HLP 68	300 ltrs (Approx.)	First change at 500 Hrs and thereafter every 2000 Hrs
Gear box Agitator	Gear oil SAE 90 EP	Servo Gear Super 80W 90	0.65 ltr	First change at 50 Hrs and thereafter every 500 Hrs
Compressor	SAE 20W40	Servo Pride XL 15W40	1.00 ltr	First change at 150 Hrs and thereafter every 1000 Hrs
Flushing system single rod valve system	Greaves HI 68 Oil	Servo System HLP 68	6.00 ltrs	If flushing oil is excessively contaminated, replace flushing oil and packing set of gate valve rods
Cooling System	-	-	-	Recommended cleaning intervals after every 250 Hrs
Fuel tank capacity	Diesel Fuel	-	65 ltrs (Approx.)	

PERIODIC MAINTENANCE SCHEDULE

S/No	Operation	Daily	Weekly	Monthly	50	150	250	500	750	1000	2000	5000	9000
A	ENGINE												
1	Check oil level in the sump and top up if necessary. Check oil leakage and rectify if any	*											
2	Check oil level in the Air Cleaner (oil bath type) and top up if necessary. Check condition of Air Cleaner (dry type)	*											
3	Drain the Sludge from the fuel tank		*										
4	Check condition of Battery and lead connections						*						
5	Check condition of Fuel strainer						*						
6	Check V-Belt tension						*						
7	Check Safety system provided in engine						*						
8	Check the condition of Fasteners								*				
9	Check the function of Starter Motor & Alternator									*			
10	Check the Valve clearance									*			
11	Check the condition & function of the Injector									*			
12	Check the function of Flame heater									*			
13	Clean the Cooling system						*						
14	Change oil in Air cleaner (oil bath type)							*					
15	Change Air cleaner element (Dry type)								*				
16	Change Engine Lube oil							*					
17	Change Lube oil filter element/cartridge							*					
18	Change Fuel filter insert (Pre-filter element/Cartridge)							*					
19	Change Fuel filter insert (Micro filter element/Cartridge)							*					
20	Change V-Belt									*			
B	CONCRETE PUMP												
21	Check oil (Hyd tank) and water level (Water Container),top up if necessary	*											
22	Clean the Concrete pump	*											

S/No	Operation	Daily	Weekly	Monthly	50	150	250	500	750	1000	2000	5000	9000
23	Check oil level in Agitator gear box and Compressor, Top up if necessary		*										
24	Check operating pressure of safety valve		*										
25	Clean Suction filter-Compressor			*									
26	Check fixing bolts of components mounted on chassis frame for tightness			*									
27	Check & Replace throw-away filter cartridge when the warning Buzzer blows up	*	*	*	*	*	*	*	*	*		*	*
28	Change oil in Agitator gear box				*			*		*	*		
29	Change oil in Compressor					*				*			
30	Change oil in Hydraulic tank							*			*		

Note:

- a) Daily, Weekly and Monthly maintenance is based on average pumping operation of 8 Hrs per day.
- b) If the flushing oil is excessively contaminated, replace packing set of gate valve rods and flushing oil.