

DIRECTOR GENERAL BORDER ROADS
GENERAL MAINT INSTRUCTION NO. 147

ON

PARKER "SOPTMIX" ASPHALT AND BITUMINOUS MIXING PLANT

1. Aim : To summarise operation and maintenance tasks including precautionary measures. The utilisation of "Spotmix" plant in the organisation has been low. Improvement in operation and maintenance is required to achieve better utilisation and maximum output. The following instructions lay down the procedure for proper operation and maintenance of "Spotmix" plant. These instructions are in addition to GMI No.40.

2. "Spotmix" plant is primarily designed for on the spot production of asphalt in connection with the patching works, small road surfacing works and similar jobs. The main points of "Spotmix" plant are given below :-

(a) Rotary Feed Ring. The rotating feed ring attached to the drying cylinder receives the aggregate at a convenient hand shovel height. As it rotates, three built-in scoops form chutes which discharge aggregates into the dryer. The feeder is driven by a regulated chain drive from the No.2 countershaft.

(b) Rotary Drying Cylinder. The rotary drying cylinder which gives large drying capacity and constant aggregate temperature is 9 feet long x 2 ft. 6 inches diameter and fitted with lifters to produce dense cascading of materials through the heat from the powerful oil burner. Oil is supplied to the burner from a built-in tank and pump and 'atomizing' air comes from a small compressor. A chimney with its base fitting snugly round the feed end of the drying cylinder draws the hot gases from the drying cylinder. An adjustable damper controls the amount of draught.

(c) Rotary storage ring. A rotating storage ring is attached to the discharge end of the drying cylinder, where two or three batches of aggregate can be stored at the desired temperature until required. The storage ring is fitted with lifting buckets and as the ring rotates, the hot aggregate is lifted and tipped into a batching chute.

(d) Batching chutes. Batching chutes a simple but effective device, holds just one batch (approximately 300 Lbs) when the chute is full. The batching chute discharges direct into the paddle mixer through a door operated by a lever which simultaneously closes door at the top of the chute as it opens the discharge chute.

(e) Paddle Mixer. The double shaft paddle mixer can easily handle a batch of 300 lbs (3 cubic feet). The paddle shaft is spring loaded to allow them to rise when the stone become jammed between the paddle tips and the liners. Renewable, abrasive resisting liners and renewable tips are fitted in the paddle mixer. A heating jacket received hot gases from the heating chamber of the bitumen kettle. The Paddle mixer is at a convenient height for discharging mixed material into wheel barrows or front end dumpers etc.

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(f) The Tar or Bitumen Kettle. This equipment comprises an oil fired bitumen kettle of 100/120 gallons capacity, slung between the chassis beneath the drying cylinder. Pitch or harder penetration bitumen may be fed in lump form into the bitumen kettle. Hot bitumen is circulated through a piping system by pump and can be drawn off into

the bitumen measuring trough placed above the mixer. The oil burner for heating the bitumen is of the self sustaining type with its own fuel tank fitted with a hand pump.

(g) Controls. All controls are conveniently grouped adjacent to the paddle mixer. A dial type thermometer indicate the temperature of the aggregate in the to the bitumen kettle.

(h) Specification. Please see Appendix "A".

3. Trial Running. Before the plant is put under trial running the plant should be positioned such that it is supported by the two forward "swing-down" bottle jacks and the two rear stabilizers. A check should be made to ensure that the chassis is fairly horizontal both along and across by using the spirit level provided in the tool kit.

(a) Lubrication. Check that all lubrication requirements have been attended to as per the chart at Appendix 'B'.

(b) Engine. Check fuel, oil and water as per maintenance Instruction No.40.

The Pressure Blower Oil tank must be filled.

The feeder head shaft, reduction gear box must be filled.

The dryer cylinder burner tank must be filled.

(c) Check before starting up. The following checks should be made before starting the engine:-

(i) Feeder control knob in forward position (disengaged clutch).

(ii) Bitumen pump driving belt on loose pulley.

(iii) Both fuel control valves closed.

(iv) Air control valve closed.

The dryer cylinder burner and the bitumen kettle heater should not be operated during the trial.

(d) Applying the load. With the engine running a gradual outward movement of the clutch control lever will bring into operation the following sections :-

(i) The rotary cylinder unit.

(ii) The Mixer.

(iii) The feeder.

(iv) The pressure blower.

Immediately check that the oil flow on the pressure blower is correctly regulated to pass 4 drops per minute.

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Check the dryer cylinder burner and fuel pump.

Burner fuel and air supply pressures should now read. Air 12 lbs. P.s.i. approx fuel-15 lbs. P.s.i approx. If these are not so adjustments are to be made.

(e) Stopping the plant. Stop the feeder by disengaging the feeder control clutch, allow the dryer cylinder and storage ring to empty and gradually disengage the engine clutch and stop the engine.

4. Productive Operation.

(a) Load a barrel of cut back bitumen into the barrel warming chamber, tap and allow the contents to drain into the kettle without the heater being lighted. If the pitch, or harder penetration blk bitumen is to be used, break this into small pieces, and lay the pieces over the floor of kettle. Fill the heater fuel tank and pump up the pressure to 20 lbs. Heat the coil and light the heater. Control the flame to low until a layer of bitumen has formed on the floor of the kettle. This precaution is necessary to avoid kettle floor distortion. When the layer has formed the heater may be turned up to fill and the kettle stocked with bitumen.

(b) Order of operation. With the bitumen kettle well stocked and nearing working temperature proceed as follows :-

- (i) Check fuel, oil and water (engine)
- (ii) Check blower oil tank contents and top up of necessary.
- (iii) Check drying cylinder burner fuel tank contents.
- (iv) Lubricate plant in accordance with the chart.
- (v) Check the air filter oil cup content.
- (vi) Pump up pressure in the kettle heater fuel tank.

(c) Starting up for production. After attending to the engine and general lubrication check that :

- (i) The feeder clutch is disengaged.
- (ii) The bitumen pump is on the loose pulley.
- (iii) Fuel control valves 1 and 2 are closed.
- (iv) Air control valve is closed.

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Proceed to start up the engine and :-

- (i) Apply the load, gradually engaging the engine and take off clutch with a firm but steady movement.
- (ii) When bitumen is at the required temperature, move the bitumen kettle outlet/drainage valve to the working position.
- (iii) Move the belt striker slowly over onto the pump driving pulley to bring the bitumen into circulation.

(iv) Light the dryer cylinder burner.

(v) Commence feeding and when sufficient material is in the batch storage ring.

5. Precautionary measures.

(a) Cleaning the bitumen handling equipment. The first and most important job on closing down the plant is to drain off the bitumen remaining in the bitumen circuit and to clean the bitumen pipes. With the plant running light i.e dryer cylinder empty and the feed stopped, transfer the pump driving belt from the driving pulley onto the loose pulley by means of the belt shifter unit. Then disengage the clutch lever and stop the engine.

(b) The bitumen supply circuit must be drained whenever the plant stops production for any considerable period, particularly so in extremely cold climates. This certainly minimizes the possibility of blockage in the piping due to emergency stops. Keep the bitumen to bucket diversion cock properly lubricated.

(c) Do not over stock the kettle with cold block bitumen. This leads to overflowing at the kettle mouth and may impair the efficiency of the plant and may also lead to fire hazard.

(d) Do not attempt to bring the bitumen pump into operation prematurely as this can result into a broken driving shaft particularly when the bitumen has not properly melted.

(e) Most cleaning fluids are highly inflammable to operator and is therefore, warned that care must be exercised in handling of such fluids.

6. Kettle heater failure causes. Failure to ignite is due to one of the following causes :-

(a) Insufficient heating of the coil. 4-5 minutes is an approximate period and in severe weather condition it may take a little longer.

(b) Insufficient pressure in the fuel supply. This should be between 15-20 lbs per sq. inch.

(c) Dust or carbon formation at the burner nozzle.

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7. Order of lighting the dryer cylinder burner. The position of valves before starting up the plant should be as follows :-

(a) No. 1 and 2 oil control valves closed.

(b) Air control valve closed.

(c) Damper in exhaust chimney three quarters open. With the valves set as above, the plant operating light proceed as follows :-

(d) Fully open No.1 fuel control valve.

- (e) fully open the air control valve.
- (f) Move to No.2 fuel control valve position.
- (g) Prepare and light the torch and apply to the burner nozzle at the same time slowly open No.2 fuel control valve.
- (h) Do not withdraw the torch but gradually increase the fuel supply until the popping noises ceases and the burner is operating efficiently.
- (j) Operate No.1 fuel control valve and air control valve to moderate the flame to low.
- (k) When control from No.1 control valve has thus been established No. 2 fuel control valve can be fully opened so that all controlling during operation is effected from the main valve.

8. Burner Behaviour Interpretations.

- (a) Red flame. A deep red flame indicates that too much oil, or insufficient air is passing to the the burner resulting in excessive black smoke coming from the eshaust. Either increase the air supply or decrease the fuel.
- (b) Whit flame. A white flame indicates that too much air or insufficient fuel oil is passing to the burner, resulting in white smoke from the exhaust. Either increase fuel oil or decrease the air supply.
- (c) Correct flame. The correct balance of air and fuel is indicated by a yellowish flame with very little or no smoke from the exhaust. If the flame extinguishes during operation, shut off the fuel supply valve and wait until the vapour inside the cylinder clears.

9. Possible causes of burner failures.

- (a) Incorrect balance of fuel and air to the buarner.
- (b) Dirt in the burner nozzle.
- (c) In correct setting of the damper in the exhaust chimney.

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- (d) Incorrect operating pressures of air and fuel.

10. Shutting down the burners.The order of shutting down should be as follows :-

- (a) No.2 fuel control valve.
- (b) No.1 fuel control valve.
- (c) Air control valve.

11. Summary of Do's and Don'ts in connection with the dryer cylinder burner system.

- (a) Keep the burner nozzle clean. It is advisable to release the burner from its block and wash the nozzle in paraffin oil daily before starting up.
- (b) Control valves. Keep all gland unions tight. Leakage at the valve is evidence of loose glands.
- (c) Flexible Pipes. Never twist flexible pipes close up to the couplings.
- (d) fuel filter. The fuel filter requires emptying at the end of each day.
- (e) Fuel pump. It should be never allowed to run If for any reason the plant must be run when there no fuel in the tank, it is advisable to remove the pump driving belt.
- (f) Pressure blower. Keep the pressure blower oil tank topped up daily and the oil flow regulated to about 4 drops per minute.
- (g) Burner box. Inspect the burner box lining periodically for evidence of cracking or crumbling and renew.

12. General hints on the care of drives.

- (a) Keep all driver properly lubricated.
- (b) Maintain correct tension on all chains and ropers.
- (c) Protective sleeves are fitted over the flexible couplings on the No.2 countershaft and on the drive to the feeder head drum.
- (d) Couplings should be properly lubricated and the protection sleeves should be replaced immediately.
- (e) Occasionally observe and check driver alignment.

SPECIFICATION : PARKER "SPOT MIX"

- Approximate Weight : Complete 5 Tons cwts (Std. Type TU.3M/C)
Plant 6 Tons 5 cwts (Mk.M.M/c)
- Power Unit : 8 h.p diesel engine with double reduction gear and clutch. Radiator cooling. Electric motor drive supplied as an alternative.
- Dryer Cylinder Burner : Single burner. Low pressure air and fuel oil atomiser. Fuel consumption according to conditions as follows :-
- Favorable conditions : Approx 1 imperial gall per ton of material produced.
- Medium conditions : Approx 1.5 imperial galls per ton of material produced.
- Unfavorable conditions : Approx 2 imperial galls per ton of material produced.
- Type of Burner : SFF.3. Operating on an air pressure of 10 lbs per sq. in. Fuel pressure of 10/12 lbs per sq.in.
- Air supply : By SV.4 Rotary Vane type Pressure Blower. Oil tank capacity. 5 pints.
- Burner fuel Tank : Capacity 27 imperial gallons.
- Drying Cylinder : Length 9 ft 0. ins
Dia : 2 ft 6 ins
- Paddle Mixer : Capacity -300 lbs (3 cu.ft)
- Aggregate size : From Sand up to 1½ ins. Stone.
- Bitumen kettle : Capacity : 100/120 imperial galls (20 gallon allowance for volumetric increase on heating).
Heating time : Solid to working – 1 to 2 hours according to penetration of bitumen.
Bitumen heater fuel consumption average.
3 galls per hours approx.
- Tyres : Standard TU.3 Models. Towing size : Recommended maximum is 20 mph.
10,00 x 20 x16 ply. Speed Pressure : 90 lbs per sq inch. This can be exceeded with safety up to 30 mph over short distance though no liability can be accepted by this company for accidents arising from such speeds.
Mk. M.M/cs
Size : 14,00 x 20 x 18 ply.
Pressure : 90 lbs. Per sq. inch

Bitumen Circuit : Piping Diameter : 1 ½ inches.

Approximate output in tons per hours

Feed aggregate containing 3% moisture. Temperature of aggregate at mixer 230⁰F

Medium conditions		
Long Tons	Short Tons	Cubic Metres
6 ½	7 ¼	3.9

S/ No	Assembly	(-) 10 deg F to 30 deg F	SAE Grade	30 deg F to 60 deg F	SAE Grade	60 deg F and above	SAE Grade
No.4 : D80-A8, D-80-A12, D120-A18							
a)	Engine	Servo Super 10	SAE 10 W	Servo Super 20	SAE 20	Servo Super 30	SAE 30
b)	Hydraulic system Dozer group	_____	All Temperature servo ultra 10 _____				
c)	Main clutch case transmission case steering clutch case & coil spring case	Servo Ultra 10	SAE 10 W	Servo Ultra 10	SAE 10 W	Servo Ultra 10	SAE 10 W
d)	PCU gear case	(-) 4 deg F to 90 deg F above 90 deg F	-	Servo gear HP 90 Servo gear HP 140			

No.5 : KOMATSU GD-37 MOTOR GRADER							
a)	Engine	Servo Ultra 10	SAE low	Servo Ultra 30	SAE 30	Servo Ultra 40	SAE 40
b)	Gear Box	Servo Gear HP 80	SAE 80	Servo Gear HP 90	SAE 90	Servo Gear HP 140	SAE 140
c)	Hydraulic Oil	Servo Ultra 5	SAE 5W	Servo Ultra 10	SAE 10W	Servo Ultra 20	SAE 20
d)	Grease	-----	All Temperature Servo Grease MP _____				

STONE CRUSHERS

S/ No	Assembly	0 deg F to 30 deg F	30 deg F to 80 deg F	Above 80 deg F
No.	6 : <u>STONE CRUSHER/GRANULATORC BAXTER MARSHALL</u>			
a)	Engine lubrication (Perkins P-6)	Servo super 10	Servo super 20	Servo super 30
No.	7 : <u>PRABHAT STONE CRUSHERS</u>			
a)	Engine assy (Perkins) Lubrication	Servo super 10	Servo super 20	Servo super 30
b)	Gear Box	-----All Temperature Servo Gear 90 -----		
c)	Differential	-----All Temperature Servo Gear 90 -----		
d)	Steering Gear Box	-----All Temperature Servo Gear 90 -----		
No.	8 : <u>STONE CRUSHER AGARWAL</u>			
a)	Engine assy (Perkins) Lubrication	Servo super 10	Servo super 20	Servo super 30
No.	9 : <u>STONE CRUSHER SISCO</u>			
a)	Engine assy (Lister) Lubrication	Up to 40 ⁰ F Servo Engine oil 10	40 ⁰ F to 85 ⁰ F Servo Engine oil 20	Above 85 ⁰ F Servo Engine oil 30

AIR COMPRESSORS

No.	10 : <u>ATLAS COPCO 160 CFM AIR COMPRESSOR</u>						
a)	Engine crank case (Perkins) Lubrication	Servo super 10	SAE 10 W	Servo super 20	SAE 20 W	Servo super 30	SAE 30 W

b)	Air Compr crank case Lubrication	Servo super 10	SAE 10 W	Servo super 20	SAE 20 W	Servo super 30	SAE 30 W	
No.	11 : KIRLOSKAR BROOM MADE 120 CFM COMPRESSOR							
a)	Engine crank case (Perkins P-6) Lubrication	Servo super 10	SAE 10 W	Servo super 20	SAE 20 W	Servo super 30	SAE 30 W	
b)	Valves and bearings	-----Servo system 311 -----						
No.	12 : KIRLOSKAR BROOM MADE 210 CFM COMPRESSOR							
a)	Engine crank case (Leyland UE 350) Lubrication	Servo engine oil 20		Servo Engine oil 30		Servo engine oil 40		
b)	Valves and bearings	-----Servo system 311 -----						
No.	13 : KIRLOSKAR BROOM MADE 270 CFM COMPRESSOR							
a)	Engine crank case (P -6 354 engine) Lubrication	Servo super 10	SAE 10 W	Servo super 20	SAE 20 W	Servo super 30	SAE 30 W	
b)	Air CYL/Bearings	-----Servo system 317 -----						
No.	14 : AIR COMPRESSOR IN GERSOLRAND 365 CFM							
a)	Engine crank case (GM Service) Lubrication	Servo super 30		Servo super 20		Servo super 10		
b)	Valves and bearings Lubrication	-----Servo system 311 -----						
No.	15 : AIR COMPRESSOR IN GERSOL RAND 600 CFM							
a)	Engine crank case (GM Service) Lubrication	Servo super 30		Servo super 20		Servo super 10		
b)	Air Cylinder lubrication	-----Servo system 317 -----						

No.	16 : <u>AIR COMPRESSOR IN GERSOL RAND 250 CFM</u>								
a)	Engine crank case (GM Service) Lubrication	Servo super 30		Servo super 20			Servo super 10		
b)	Air Cylinder lubrication	-----Servo system 311 -----							
No.	17 : <u>CPT 365 CFM COMPRESSOR</u>								
a)	Engine (Leyland UE 600 engine)	Servo engine 40		Servo engine 30			Servo engine 20		
b)	Compressor	-----Servo system 317 -----							
No.	18 : <u>CPT 365 CFM RO 2 COMPRESSOR</u>								
		Above 90 deg F		20 deg F to 90 dag F			10 deg F to 20 deg F		
a)	Engine (Cumin NHC-4 B-1)	Servo engine oil 30		Servo engine 20			Servo engine 10		
b)	Compressor	-----Servo system 317 -----							
No.	19 : <u>KGK 250 CFM COMPRESSOR</u>								
		0 deg F to 30 deg		30 deg F to 80 dag F			Above 80 deg F		
a)	Engine (Perking P-6-354)	Servo super 10		Servo super 20			Servo super 30		
No.	20 : <u>KGK 365 CFM COMPRESSOR</u>								
		Above 90 deg F		60 deg F to 90 dag F			Below 60 deg F		
a)	Engine (Torpedo)	Servo super 40		Servo super 30			Servo super 20		
No.	21 : <u>MAW INDIA 160 CFM COMPRESSOR</u>								
a)	Engine (Torpedo)	Servo super 40		Servo super 30			Servo super 20		

ROAD ROLLERS

No.	22 : <u>ROAD ROLLER BM</u>					
a)	Engine (Perkins P-4)	Servo super 10		Servo super 20		Servo super 30
No.	23 : <u>ROAD ROLLER AJ</u>					
a)	Engine (Perkins P-4) Air Filter	Servo super 10		Servo super 20		Servo super 30
b)	Gear Box	Above 90 deg F - - - - - Servo gear HP 140 - - - - -				
		Below 90 deg F - - - - - Servo gear HP 90 - - - - -				
No.	24 : <u>ROAD ROLLER AM</u>					
		0 deg F to 20 deg F		20 deg F to 90 deg F		Above 90 deg F
a)	Engine (Fordson)	Servo super 10		Servo super 20		Servo super 30

Appendix 'B' to GMI No. 147

S/No.	Assembly/Component to be lubricated	Type of lubricants		Periodicity
		Moderate Climates	Extreme Climates	
1.	Gear boxes	Shell Vitrea oil 72	Shell Vitrea oil 75	Monthly
			Shell Vitrea Oil 69	
2.	Hardy Spicer Couplings	Shell Alvania Grease 3	Shell Alvania Grease 3	Once every 2 days
			Shell Alvania Grease 2	
3	Chains (Oil bath)	Engine Oil	Engine Oil	Is required.
	Chains (exposed)	Shell Cardium Camp 'nd A	Shell Cardium camp'nd D	One every two days
			Shell Cardium Camp'nd A	One every two days
4.	Gears (Exposed)	Shell Cardium Camp'nd A	-do-	-do-
5.	Compressors	Shell Talpa Oil 20	Shell Talpa Oil 30	Is required
			Shell Talpa Oil 10 W	
6.	Air Filters (engine or compressor)	Shell Talpa oil 20	Shell Talpa Oil 30 Shell Talpa Oil 10 W	Check daily. Clean when dirt depth reaches ½ inch..
7.	Hydraulic lifting apparatus (Spenborough type)	Shell Tallus oil 27	Shell Tellus oil 27	
			Shell Tellus oil 27	
8.	Hydropneumatic cylinders (Lang & Co Ltd)	Shell Unedo Grease 4	Shell Unedo Grease 4 Shell Unedo Grease 4	
9.	Hydraulic Breaking system	-	-	Check & top up before traveling.
10.	Pneumatic controls (air line lubricator on control box)	Shell Tellus oil 27	Shell Tellus oil 27	Check & top up daily.
11.	Weighing gear (dash-pots in daily)	Shell Tellus oil 27	Shell Tellus oil 27	Top up every 6 months

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12.	Clutch controls (sliding or frictional parts)	Shell Alvsnia Grease 3 Shell Alvsnia Grease 3	Shell Alvsnia Grease 3 Shell Alvsnia Grease 2	Grease once weekly -
13.	Os cillex screens fitted with ring oiler main bearings)	Shell Torchus oil 37 - -	Shell Talpa oil 30 Shell Talpa oil 10 W	Drain, clean and refill once monthly.
14.	Exhaust fan	Shell Talpa oil 20	Shell Talpa oil 30 Shell Talpa oil 10 W	Check, level and top Up daily.
15.	Fitments	Shell Alvania Grease 3 -	Shell Alvania Grease 3 Shell Alvania Grease 2	Before traveling
16.	Bearings subject to excessive heat.	Shell Micro gel Grease (UK) Shell Darina Grease 2 (overseas)	Shell Micro gel Grease (UK) Shell Darina Grease 2 (Overseas)	Daily
17.	Wire ropes, adj screws, jacks leavers links etc.	Shell Talpa oil 20	Shell Talpa oil 30 Shell Talpa oil 10 W	Before & after use Daily
