QUALITY CONSTRUCTION EQUIPMENT

AMMANN APOLLO INDIA PVT. LTD.

OPERATION AND MAINTENANCE MANUAL

for

ASPHALT DRUM MIX PLANT
DM 35

SO No. 51022-eProc2 / 05 X HMP 20/30 TPH /SO-23/GS 2015-16/DGBR/E3ES dt. 10.11.2015

Quality Construction Equipment

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OPERATING INSTRUCTION MANUAL

FOR

ASPHALT DRUM MIX PLANT
DM35

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One Source, Unlimited Possibilities...

Ammann Apollo

Quality Construction Equipment

Quality Policy

Ammann Apollo India Pvt. Limited (AAIPL) is committed to delighting the customer by catering Quality Construction Equipment and Services.

AAIPL aims to implement this Quality Policy through

- Continuation improvement and up gradation of product, Processes and People.
- Nation wide presence
- Dedicated and trained employees
- Shortest lead time in the industry
- Active vendor participation

Dear Customer,

We thank you for choosing an Ammann Apollo Product. Our objective is to achieve "customer delight". We are confident that our product and services shall meet with your expectations.

This operating instructions & parts manual is a guide to successful operation and maintenance. This document is to be carefully read and followed by the operator and supervisor alike to ensure an efficient and trouble-free operation of the equipment.

The manual is required to be carefully preserved for all time. The manual is to be referred to whenever it is necessary to carryout overhaul operations; the recommended procedures are to be followed. The performance of the equipment depends highly on the use of correct and genuine parts. Ammann Apollo offers genuine spare parts at affordable prices. Therefore, we request you to source your spare parts requirement only from us.

The manual shall be of great help as a reference for operational pre-requisites and regular maintenance. We strongly recommend that the maintenance schedule is strictly adhered to, for a high uptime of the equipment. Adherence to this schedule is vital for the performance of the equipment and should never be overlooked.

An efficient spares and service organization is at your disposal. The following page gives the address and telephone numbers of our offices located in India. We request you to contact the office nearest to you to avail the services.

Warranty

The equipment supplied is covered by the manufacturer's standard warranty for 6 calendar months from the date of despatch. This warranty does not cover electrical items like bulb, switches, etc. rubber items including pneumatic tyres, conveyor belts etc and other items of normal wear. The warranty does not cover defects arising out of repairs done without our approval and/or improper use. We do not accept any responsibility for consequential damages or cost for alternatives and repairs

During this warranty period we shall replace or make good, free of charge, any defect in the goods supplied arising out of manufacturing defect. We request you to notify us of such defects immediately to enable us depute our Service Engineer to check the complaint. Where a replacement is to be made by us, the defective part has to be returned to us for effecting the replacement.

We give no other guarantee and this general guarantee is deemed to take the place of any guarantee or other liability in either expressed or implied.

Receiving the Equipment

Your **AMMANN APOLLO** equipment has been thoroughly tested, carefully inspected, and properly loaded at the factory. The entire shipment including loose parts was thoroughly checked before it was released to the transportation company.

Upon receipt of the machine, before unloading, carefully inspect for any loss or damage that may have occurred during transportation. Do refer to the packing list to determine short supplies if any. If any loss or damage is discovered, please notify the transporting company as well as the insurance company.

Our Customer Care Department shall be pleased to assist in the Erection & Commissioning of the equipment. We shall appreciate a few days advance notice of your plans to an Apollo Office nearest to you, which will help us in planning.

Safety First

Most accidents are caused by someone's failure to follow simple and fundamental safety rules or precautions.

Regardless of the care used in the design and construction of the equipment, complete safeguard is possible only with careful and efficient operation. A careful operator is the best insurance against an accident.

The complete observance of one simple rule would prevent many a serious accident. That rules is:

Never attempt to clean, oil, or adjust any part in the machine while it is in operation.

We wish you years of safe and trouble free operation with Ammann Apollo equipment.

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GENERAL DESCRIPTION

For a modern industrialized country, road and highways network is a most now-a-days because a natural earth track can neither support modern wheel loads nor provide an adequate riding surface. It has now become a standard practice to use bitumen bound-material in the contraction of heavy duty streets, roads and airports etc.

HOT MIX PLANT

To prepare hot asphalt mix for the base and surface courses, both aggregate and the bitumen are heated and then along with filler material they are mixed thoroughly in the hot mix plant. It's functions are:

1. Rough proportioning of the aggregate
2. Heating & drying the aggregate
3. Heating the bitumen
4. Mixing the proportioned aggregates, bitumen to produce homogenous mix

Hot Mix Plant mainly consists of

1. Dryer unit complete with blower exhauster, burner
2. Load out conveyor with discharge hopper/silo & elevator
3. Slinger conveyor with load cell
4. 3 bin feeder/4 bin feeder
5. AC, DC control panel wiring diagram operating instructions manual
6. Bitumen tank with automatic burner

Optional Consists of

1. Wet Dust Collector
2. Vibrating screen
3. Mineral Filler
4. Hot Oil Tank
5. Fuel Tank

DM Plant is a highly portable, continuous mix plants. The system consists of a total proportional controlled feed system, which feeds on to a slinger type charring conveyor. The asphalt proportion enters the drum mixer simultaneously with aggregate.

Aggregate is fed to the slinger conveyor by the feeder. The slinger conveyor feeds the aggregate into the charging chute of the Drum Mixer where it is sprayed with asphalt from the asphalt system.

MIXER DRUM

The parallel flow drum mixer is a large rotating cylinder that is supported by two steel tires bolted to the outside of the drum. The drum is driven from the main gear box by the drum chain to a large sprocket bolted to the outside of the drum.

As the aggregate discharges from the slinger conveyor into the drum mixer charging chute the asphalt is introduced. The asphalt cools very fast and balls up with the fine aggregates and dust.

The first section of flights are spirals that prevent material from moving backwards to the end of the drum. This prevent spillage. The second set of flights are angles that gently roll the material with a minimum amount of exposure to the direct flame. The final set of flights are cupped shaped. These are carrying flights that lifts the material from the bottom to the top of the drum, discharging it in a veil through the hot gases. It is at this point that the softened asphalt will foam and quickly spread over the aggregate.

COMBUSTION CHAMBER

It consists of a refractory fire brick lined steel cylinder mounted at the charging end of the mixer. The function of the cone is to obtain complete combustion of the fuel. After a few minutes operation, the combustion chamber becomes very hot. In the case of oil, the atomized spray of fuel from the burner, passing trough the chamber, comes in contact with the intense heat, which converts the atomized spray to a gas. Once in a gaseous form, the fuel burns instantly.

ERECTION

The important factors to be considered for the selection of plant site are:

1. Size of the plant site
2. Stability of the ground
3. The plant site should be such that an adequate drainage can be provided
4. Location of truck loading drive way

After selecting the suitable site for plant erection the following procedure should be adopted to erect the plant.

1. Level off the area of ground over which plant is to be erected.

2. Tow the different units of plant into exact position since it is very difficult to change their position once they are jacked up.

3. After towing the different units into position set the two jack legs near the towing side such that the units stand on those two jacklegs and tyres, the chassis slightly inclined towards the towing side. Place a hydraulic or mechanical jack of suitable capacity at the other end of the units. Place the jack on a piece of heavy timer to prevent the base of jack being forced into the ground perform jacking operation till the rail end of the units are raised through a height of about 10cm. hold the units in this position by lowering the jack legs near the tail end. Now perform the jacking operation near towing end till the chassis becomes horizontal. Repeat this operation till the different units are lifted to their working heights. In case of the units, which are to be lowered, i.e. the working height of the unit is less that its towing height.

Proceed as follows

Jack up the unit slightly as explained above so as to relieves the tyres of the weight of the unit. Remove the tyres alongwith wheel rim to store them indoor safely. Place a hydraulic or mechanical jack of suitable capacity at one end of the unit and perform jacking operation to raise that end by 5cm. so that jack legs nearer to the jack are reliever of load. Raise these jack legs and lower this end of the unit gradually by about 10cm. by operating jack. Hold the unit in this position by lowering the jack legs. Perform the jacking operation at the other end till the chassis becomes horizontal. Repeat this operation till the units are lowered to their working height.

To establish an absolutely rigid contact between units and the ground, preventing them from swaying while in operation, the different units should be supported in a raised position by building a timber cribbing from the ground upto the chassis of the units.

With the aid of the foundation drawings of different units, the foundation work should be down very precisely for each unit.

To ensure that the chassis of each units be horizontal perfectly both cross wise and lengthwise, check them by means of a accurate spirit level.

MAINTENANCE AND ADJUSTMENTS

TRUNNION ROLLERS

The function of the trunnion rollers is to support the revolving mixer drum and when properly adjusted, to neutralize the down hill thrust of the drum. The natural tendency of the drum, while rotating is to work down hill.

By skewing the trunnion assemblies a counteracting thrust is developed as a result of friction between the trunnion rollers and the drum tires.

NOTE : In order to maintain this friction, the drum tires and trunnion roller surface must never be greased or oiled.

When the trunnions are properly adjusted, the drum tire should contact either thrust roller only, slightly causing them to turn intermittently.

If the thrust roller bearings should overheat, excessive thrust against that roller is indicated and the trunnion should be adjusted immediately to reliever this condition.

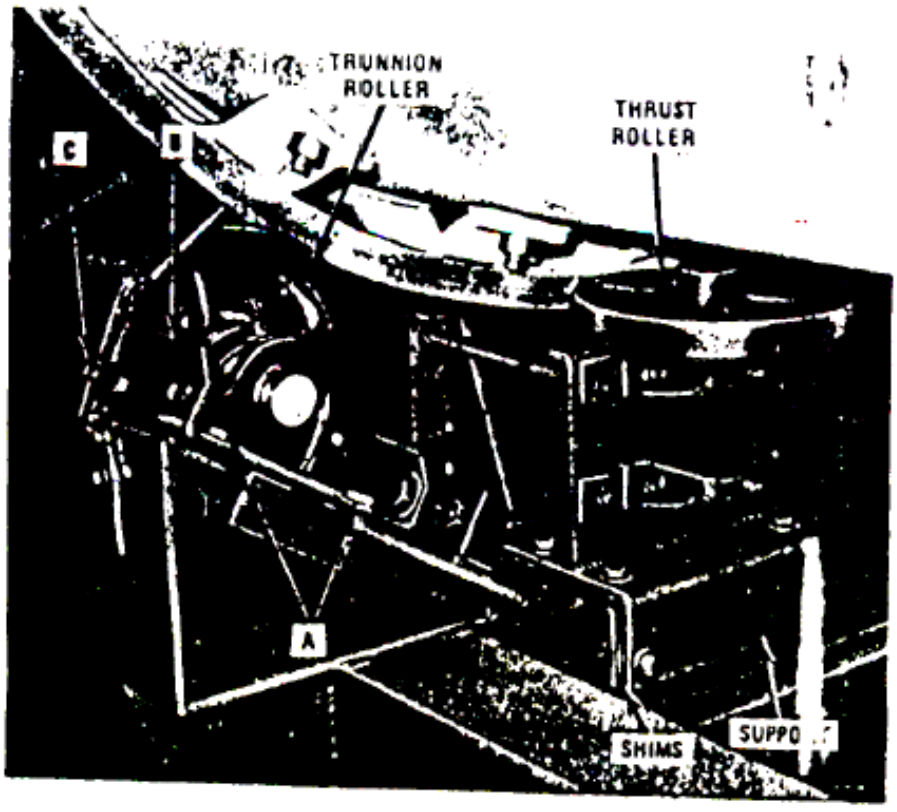

FIGURE G-1 – Trunnion Rollers and Thrust Rollers

In order to simplify the adjustment of each trunnion, a brass instruction plate (Figure G-1) is attached to each trunnion support frame. This plate shows which way to skew the trunnion to shift the drum, either up-hill or down-hill, and has a scale to show the distance that the trunniion assembly has been skewed. The scale has a zero point which denotes no skew. On either side of the zero point the scale is calibrated in eighth and sixteenths of a inch. The eighths are numbered 1,2,3 and 4. The sixteenths marks are not numbered. A chisel mark in the trunnion pivot frame, directly above the instruction plate, serves as an indicator to show the amount of skew.

Adjustment of the trunnion should be made with the mixer fully loaded and in operation.

1. Assume that the drum is riding downhill with the forward drum tire riding hard against the lower thrust roller.

2. With the mixer operating, skew on front (charging end) trunniion, not to exceed 1/16 in and observe the results. If this is sufficient to cause the drum to shift uphill to the proper position, then this trunnion should be returned ½ the distance moved the same amount, giving the same amount of skew to each trunnion.

   CAUTION: The trunnions must be adjusted in pairs. The distance between the trunnion shaft centers A and B should be the same as shaft centers C and D (figures G-2).

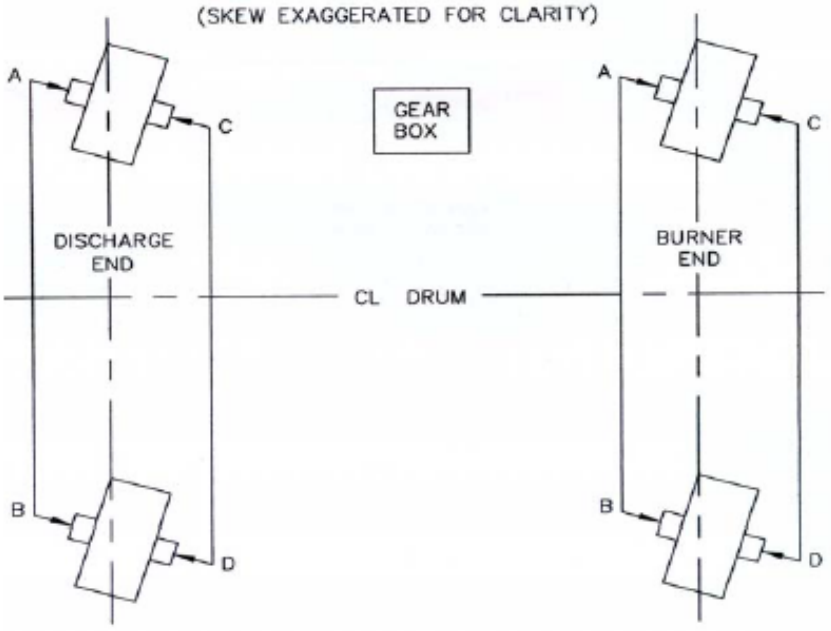

FIGURE G–2 –Skew Trunnions as shown to obtain Forward Thrust, to move Mixer Drum Uphill

3. Should the 1/16" in. skew mentioned above not be sufficient, than skew the opposite trunnion, not to exceed 1/16" in. or until the drum rides between the thrust roller properly.

4. If, after the front (charging end) trunnions have been skewed 3/8 of an inch, the drum still does not maintain its correct position, skew the rear trunnions as necessary. Do not skew any trunnions more than 3/8 of an inch off center.

5. Final adjustment of trunnions should be made only when the Mixer is operating at full capacity. If the drum is riding uphill against the front thrust roller, then reverse the above procedure.

   IMPORTANT: Extreme caution should be exercised when making trunnions adjustments to prevent with moving parts of the machine and possible injury.

To Adjust Trunnions Rollers

1. Loosen the four nuts (A) (Fig.G-1), which secure the trunnion frame to the support frame (B).

   CAUTION: Do not confuse these nuts with the bolts that secure the trunion bearing to the pivot frame.

2. Slack off the nut on the adjusting bolt (C) on the end of the trunnion that will be pulled away from the drum while adjusting.

3. Take up on the opposite adjusting bolt until the trunnion has been skewed not more than 1/16" of inch. Remember that as the nuts on one adjusting screw are taken up, the nuts on the opposite adjusting screw must be slacked off.

4. Tighten nuts and the adjusting bolts.

5. Tighten mounting nuts (A) securing pivot frame.

THRUST ROLLERS: (Refer to Figure G-1)

The thrust roller support are shimmed out away from the mixer main frame to provide a definite clearance between the rollers and the drum tire.

The position of these rollers will not require changing unless, through wear, the clearance becomes greater than 1/2" inch. when this condition exists remove sufficient shims to reduce clearance to between 1/4 inch and 3/8 inch.

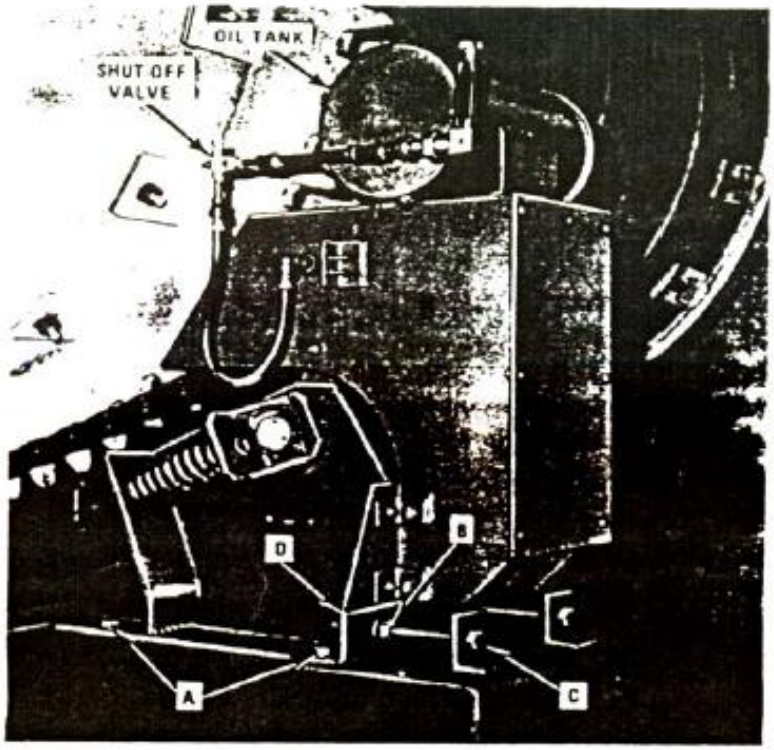

FIGURE G-3 – Drum Drive Chain Adjustment 27655

DRUM DRIVE CHAIN (Refer to Figure G-3)

Proper adjustment of the drum drive chain is maintained by a spring-loaded idler sprocket.

To check for proper adjustment, the chain should be observed while the mixer is in operation. When in operation there should be no slack at any point in the chain.

To Tighten Chain

1. Loosen mounting plate hold down bolts (A)
2. Loosen lock nuts (B) on take-up bolts (C)

3. Tighten adjusting nuts (D) until slack is removed (Take up the same amount on each bolt to maintain proper alignment)
4. Tighten lock nuts (B) and hold down bolts (A)

At the end of each season's operation, the drum drive chain should be removed from the machine and thoroughly washed & cleaned with a solvent.

Re-oil the chain after cleaning with a light motor oil, making sure the oil penetrated the chain bushings.

DRUM DRIVE CHAIN OILER: (Refer to Figure G-3)

A drip type oil lubricator is provided to keep the drive chain rollers lubricated.

The lubricator should be kept filled with a No. 30 SAE engine oil and the drippers adjusted to drip approximately 2 drops per minute, to provide adequate lubrication to the rollers of the drive chain.

NOTE: Flush drive chain once a week with one gallon No. 30 SAE engine oil. Rotate drum 10 minutes after flushing.

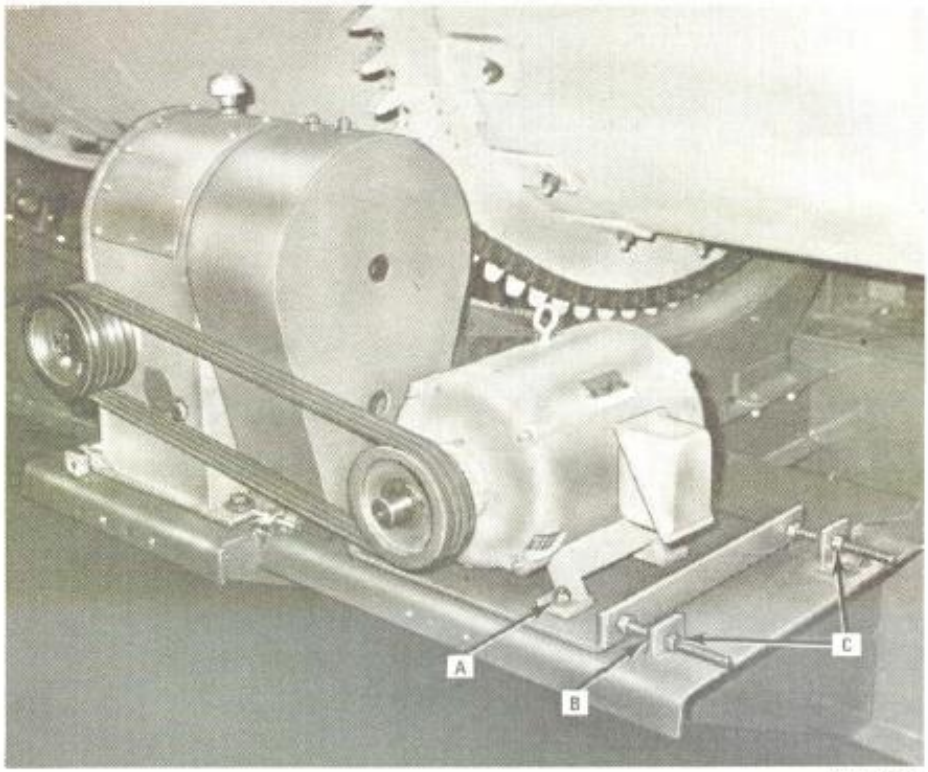

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FIGURE G-4 – Main Drive V-Belt Adjustment

MAIN DRIVE BELTS: (Refer Figure G-4)

The mixer is belt driven as shown in Figure G-4

To Adjust Belts:

1. Loosen the 4 mounting plate bolts (A)
2. Loosen lock nuts (B)
3. Take up evenly on nuts (C)
4. Tighten nuts (A) and (B)

MIXER DRUM

Check drum for excessive warping which will came charging end to whip around the rub.

Examine sprocket teeth for wear, which is a normal result of operation. Check hold down bolts for fitness

Examine flights for general good condition. Make sure hold-down bolts are tight when flights are installed.

DISCHARGE CHUTE

Inspect the discharge chute liner plates for excessive wear and replace when worn thin before outer chute is exposed to wear.

Some types of aggregate have a more rapid wear rate on these lines than other aggregates. A periodic inspection should be made to establish the rate of wear and the interval when new lines should be installed. New liners plates should be kept on hand, available when needed.

TIRES AND WHEELS

When towing mixer, check tires and keep inflated to proper pressure, 70 lbs, keep wheel retainer lug nuts tight.

If the mixer is to be set up on a job over a period of 3 to 4 months it is advisable to remove the tire and wheel assemblies and store them indoors.

BELT CONVEYOR

INSTALLATION:

1. Take care in selection for components with proper erection marking.
2. Check that the conveyor structure is perfectly straight and correctly leveled.
3. Check that the head, tail, take up bend and snub pulleys are all correctly mounted such that they are level and with their axis perpendicular to the center line of the conveyor belt.
4. Ensure that all troughing and return idler sets are correctly mounted with their axis perpendicular to the center line of the conveyor and that all rollers are rotating freely, arrow on outer bracket of troughed idler indicates running direction of belt.
5. Ensure that all self-aligning idler sets, when fitted are pivoting freely.
6. In the case of gravity or other forms of automatic take-up ensure that take-up assembly is square and free to move.
7. In the case if manually operated screw take-up gears ensure that these are adjusted initially to remove undue slack from the belt and that equal tension is applied on each side, such that the pulley is correctly perpendicular to the line of the belt.
8. Where skirt plates are involved, check that the seal strips are correctly fitted and adjusted.
9. Ensure that all parts of the conveyor is greased and/or oiled where necessary.
10. Check along the length of the conveyor and ensure that there are no items, lying above which could obstruct and cause damage to moving equipments.
11. See that belt is not creased, folded or strained any where along the conveyor and vulcanize joint is made correct without horizontal bends.
12. Check drive machinery for alignment on assembly and before starting the conveyor check motor insulation resistance.

OPERATION

1. After confirming no load operation feed material on the conveyor belt uniformly and carefully.

2. Quantity of material feed should be controlled. If the material is feed in excess, the motor of the conveyor will be overloaded in addition the material on the belt is apt to spill.

3. Proper belt tension should be maintained by the take up.

    a) To ensure that the minimum tension in the belt is sufficient to prevent undue sag between idlers.
    b) To transmit load.

4. When the conveyor is to be stopped, it is preferable that there is no material left on the belt.

5. Before starting the conveyor, ensure that the conveyor structure is firm enough to prevent vibrations. Power transmission machinery should be checked for proper alignment assembly.

6. Check that the feed on to the conveyor is central and that the belt at the feed point is running centrally and straight, if not, establish the cause of the non-central feed and rectify as necessary.

7. Inspect the skirt plate seal strips and ensure that these are adjusted close enough to the belt to prevent spillage or material jamming between the seals and the belt, but at the same time not bearing hard on the belt.

8. Check that the belt generally is running centrally and straight on both the loaded and return strands.

9. Inspect the condition of the conveyor belt regularly and arrange for the earliest possible repair of any damage which may have occurred as this can make a worthwhile extension to the useful life of the belt.

10. Check that there is no evidence of belt slip at the drive pulley which is detrimental to the back cover of the belt and for undue sag between idlers, in other words symptoms that the belt is not sufficiently tensioned. Adjust take up gear if necessary.

11. Inspect the gravity take up if fitted and ensure that there is sufficient take-up if movement available to cater for the start-up condition in order that the gear does not "bottom" before adequate starting tension is applied as this can result in server damage to the belt. Should this situation is likely to arise, make appropriate adjustments at the permanent take-up gear if incorporated or alternatively arrange for the belt to be shortened as necessary and respliced.

12. Check regularly that all idler rollers and non-driving pulleys are rotating freely and that all self aligning idlers are pivoting freely, if not rectify or replace as necessary to avoid belt tracking problems and unnecessary belt wear. Inspect all rollers and pulleys regularly and arrange for any damaged ones to be replaced at the earliest opportunity.

13. Check that the belt cleaning equipment is functioning correctly and efficiently. In the case of scrapers ensure that they are pivoting freely and are not chocked with a build-up of material. Also check that the blades are not bearing on the belt any more than is necessary and that any blades which are unevenly worn or in a condition likely to cause damage to the belt are replaced immediately. Where brushes are involved, ensure that these are correctly adjusted relative to the belt, that they are not operating in a chocked condition and that any badly or unevenly worn brushes are replaced immediately.

14. Grease or oil bearings and moving parts requiring lubrication at regular intervals. Bearings should be stripped, cleaned and re-packed with grease at intervals as recommended by Apollo. It is important to bear in mind that a bearing should not be cover greased as this can cause over heating and consequent damage.

15. In the case of gear boxes, check the oil level every day or two, replenish when necessary and drain and refill with clean oil as recommended by Apollo.

16. Inspect the driving gear regularly following the manufacturers maintenance instructions for the various parts involved. Ensure that any brakes involved are correctly adjusted to avoid snatching when running or slipping when at rest and that linings are renewed immediately it becomes necessary.

17. If possible keep regular record of motor amps as this will give an indication of any overloading which occurs and may be of assistance in tracing faults as the system.

18. In the interests of efficient operation and in obtaining the maximum life from equipment, it is important that operating condition should be kept as clean as possible. Any spillage which occurs should be cleaned up as regularly as possible and not be allowed to build-up on decking plates and on floors or in any other location to the point where it is obstructing running equipment, chutes should be inspected at regular intervals and any build-up of material which is accumulating should be removed in order to minimize the likelihood of eventual chute blockage.

19. It is important to ensure that should any item of plant require repair or replacement it should be dealt with as soon as possible to avoid the possibility of a chain reaction of damage. Also, if in the course of inspection any abnormality in operation should be seen for which there is no obvious reason, this should be noted and expert advice sought.

MAINTENANCE:

In order to keep a conveyor in good working order and to prevent minor faults developing into major problems with consequently length and expensive shutdowns, it is essential that it is to be effectively maintained preferably in a properly organized routing basis.

Due regard should be paid to this requirement during the design stages, to ensure that adequate access is provided to all working parts which are likely to require inspection and attention, and that the simpler forms of maintenance such as routing lubrication, adjustment to take-up gear etc. can be carried out without having to remove guards.

During any major inspection cleaning or adjustment operations which would involve personnel being exposed to contact with normally moving equipment, it is essential that the conveyor should be stationary and rendered in-operative to eliminate the possibility of accidents due to unauthorized or inadvertent starting.

While not necessarily covering all possible contingencies, as general guidance to good maintenance the following points should be inspected regularly and action taken as necessary.

a) Check that the feed onto the conveyor is central and that the belt at the feed point is running centrally and straight. If not establish the cause of the non-central feed and rectify as necessary.

b) Inspect the skirt plate seal strips and ensure that they are adjusted close enough to the belt to prevent spillage or material jamming between the seals and the belt, but at the same time not bearing hard on the belt.

c) Check that the belt generally is running centrally and straight on the loaded and return strands. If not refer to clause "Belt Training" and proceed as recommended.

d) Inspect the condition of the conveyor belt regularly and arrange for the earliest possible repair of any damage which may have occurred as this can make a worthwhile extension to the useful life of the belt.

e) Check that there is no-evidence of the belt slip at the drive pulley which is detrimental to the back cover of the belt and for undue sag between idler, in other words symptoms that the belt is not sufficiently tensioned. Adjust take up gear if necessary.

f) Inspect the gravity take up if fitted and ensure that there is sufficient take up movement available to cater for the start-up conditions in order that the gear does not "bottom" before adequate starting tension is applied as this can result in severe damage to the belt.

Should this situation be likely to arise make appropriate adjustments at the permanent take up gear if incorporated or alternatively arrange for the belt to be shortened as necessary and respliced.

g) Check regularly that all idlers rollers and non-driving pulleys are rotating freely and that all self-aligning idlers are pivoting freely. If not, rectify or replace as necessary to avoid belt tracking problems and unnecessary belt wear. Inspect all rollers and pulleys regularly and arrange for any damaged ones to be replaced at the earliest opportunity.

h) Check that the belt cleaning equipment is functioning correctly and efficiently. In the case of scrapers ensure that they are pivoting freely and are not checked with a build-up of material. Also check that the blades are not bearing on the belt any more than is necessary and that any blades which are un-evenly worn or in a condition likely to cause damage to the belt are replaced immediately. Where brushes are involved ensure that these are correctly adjusted relative to the belt that they are not operating in a choked condition and that any badly or un-evenly worn brushes are replaced immediately.

i) Grease or oil all bearings and moving parts requiring lubrication at regular intervals, bearings should be stripped, cleaned and re-packed with grease at intervals as recommended by the makers. It is important to bear in mind that a bearing should not be over greased as this can cause overheating and consequent damage.

j) In the case of gear boxes, check the oil level every day or two replenish when necessary and drain and refill with clean oil as recommended by the manufacturers.

k) Inspect the driving gear regularly following the manufacturers maintenance instructions for the various parts involved. Ensure that any brakes involved are correctly adjusted to avoid snatching when running or slipping when at rest and that linings are renewed immediately it becomes necessary.

l) If possible keep regular record of motor amps as this will give an indication of any over loading which occurs and may be of assistance in tracing faults in the system.

m) Where ancillary devices are involved, such as traveling trippers, these should be inspected regularly and maintained on the same general lines as set out above, making sure that brakes and drive/reversing gear are functioning correctly. Devices such as weighing machines, magnetic separators and samplers etc. should be inspected and maintained in accordance with the manufacturers instruction.

n) In the interests of efficient operation and in obtaining the maximum life from equipment, it is important that operating conditions should be kept as clean as possible. Any spillage which occurs should be cleaned up as regularly as possible and not be allowed to build up on decking plates and on floors or in any other locations to the point where it is accumulating should be removed in order to minimize the like hood of eventually chute blockage.

o) It is important to ensure that should any item of plant require repair or replacement it should be dealt with as soon as possible to avoid the possibility of a chain reaction of damage. Also if in the course of inspection any abnormality in operating should be seen for which there is no obvious reason, this should be not and expert advice sought.

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PREVENTIVE INSTRUCTIONS:

A. The reliable operation and life of the machine is strongly influenced by the standard of maintenance of the electrical mechanical equipment.

B. It is imperative that regular checks are carried out in respect of lubrication, operating efficiency and wear and replace damaged or worn parts.

The painting should be subjected to routing checks and where necessary to touched up in an efficient manner.

The frequency of such checks and associated maintenance works is dependent on the length of operation and possible wear on machine parts.

Contamination caused by spillage or other accumulation of dirt should be constantly cleaned off. This also applied to the cleaning up of machinery as well as for steel structure protection devices and walkways.

Rotating machine parts must only be cleaned when they are at a stand still where by the respective safety and accident preventative regulations must be observed.

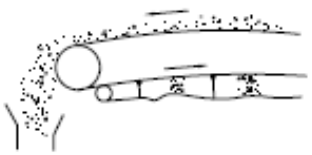
C. Damage to walkways and railings which, for instance can be caused by falling material must be repaired immediately or at the latest during the following repair shift when temporary repairs make to walkways, stairways or railways adequate safety precautions must be taken.

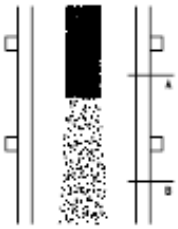
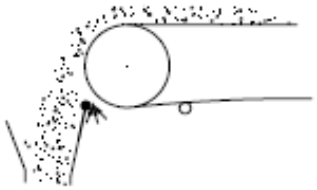
Damage to load-bearing steel structure loose rivet bolts or screws as also the pealing off point, which point to over stressing, respectively to the supervising personnel.

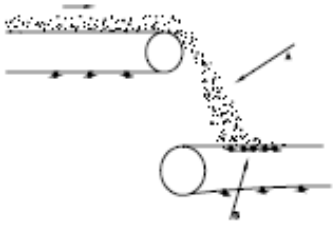
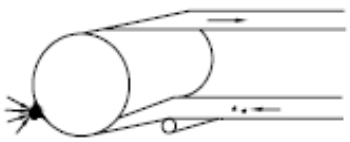
The secret to longer belt life

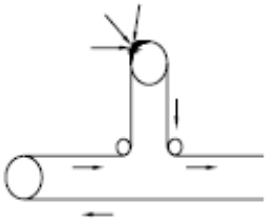
	Symptoms	Caused	Cures
I.	**Belt Edges**	Rubbing due to	
	Edges worn or frayed	a. Defective joint	a. Rectify joint
		b. Misaligned running	b. Check conveyor alignment and re-align belt.
			
		c. Off-center loading	c. Re-position loading chute to feed load centrally.
	Off center loading	d. Defective self aligning	d. Rectify of replace faulty idler
		e. Inadequate edge clearance	e. Minimum recommended clearance between belt edge and structure is 75mm.
	A belt which does not trough adequately will cause misaligned running, resulting in severe belt edge wear and material spillage.	f. Belt too stiff for adequate troughing	f. Install a laterally more flexible belt. Repair or paint edges

ACROSS THE BELT WIDTH

II.	**Top Cover**		
	Excessive uniform wear	a. Cover under specified or incorrect quality	a. Specify thicker covers of correct grade depending on loading cycle and material carried
		b. Worn or seized return idlers	b. Install cleaning devices of rubber disc idlers. Check periodically if all idlers rotate freely seized idlers with new ones

	Return run of belt rubbing against spilled material	c.	Spilled material under tail pulley setting up abrasion	c. Increase clearance between tail pulley and floor, fit decking to avoid spillage
		d.	Return run of belt rubbing against spilled material along the conveyor	d. Prevent spillage along the run of the conveyor check return idler spacing and belt tension. Ensure all spilled material to be removed immediately.
1.			Narrow Central Section	
	 A. Excessive cover wear. B. "Thin" load, speed may be high.		Speed is too high thereby belt carries a "thin" load.	Redesign drive at a reduced speed, check chutes and skirt boards to ensure that the load is fed on to the belt uniformly across its effective width. At the commencement skirt boards may be placed about two-thirds of the belt width apart and B. they should widen out in direction of travel to ensure uniform load distribution across the width.
2.	Cuts or stripping of cover, or groovey or patchy wear beneath the skirt board	a.	Material jamming between belt and skirt.	a. Adjust skirt board rubber to provide minimum clearance, and install cushion idlers to hold belt against skirt.
		b.	Skirt board rubber too hard and stiff or use of old belting pieces.	b. Use only plain rubber strips of correct hardness.
	Entrapment of material between tip of chute and belt	c.	Skirt board incorrectly set.	c. Skirt board should flare up slightly (say 1 in 42) in direction of running of belt to prevent wedging of material between belt and skirt. The metal or wooden skirt board should under no circumstances come in contact with the belt.

		d. Jamming of material in chute	d. Redesign and widen chute. In case the jamming is at the loading chute, reduce rate of loading or increase belt speed.
		e. Worn or seized return idler roll.	e. Replace all unserviceable idlers with new idlers.
		f. Handling of wet sharp material through tripper before belt pulleys in the absence of proper belt cleaning facilities.	f. Install proper cleaning facilities wraps the second tripper pulley.
3.	Cover gouging	Impact of Heavy Lumps	
		a. Face rubber cover of inadequate thickness	a. Redesign cover and grade based on loading cycle and size of material carried. Incorporate breaker, if necessary
		b. No cushion idlers at impact section on height of fall too great.	b. Use impact idlers at loading point and install "Grizzly Screen" to ensure that
		c. Roll back of material on inclines.	c. Reduce speed, ensure loading on horizontal, avoid if possible, loading large lumps without small material accompanying them.
III.	**Back Cover**		
	Severe cover wear and peeling off cover	a. Slippage of drive pulley, sand thrown between belt and drive pulley.	a. Adjust tension, lag the drive pulley, increase arc of contact.
		b. Carrying idlers seized	b. Lubricate idlers regularly, replace seized idlers.
		c. Excessive forward tilt of carrying idler	c. Adjust to not more than 2' from vertical

	Material spillage on to return of belt	d. Material spillage on to return run of belt which is ground between belt and pulley	d. Install decking plates or use endless belt. Use scrapers at tail and section. Proper rubber strips and not old
		e. Bolt head in the case of lagged drums protruding	e. Tighten bolts, replace worn lagging.
IV.	**General Cover problems:**		
	1. Surface cracks	Exposure to sunlight or ozone for long periods	Protect belt suitably, particularly in storage and when idle on the conveyor for long periods.
	2. Cover softening and bulging	Oil contamination	Avoid oil or grease contamination.
	3. Cover hardening and cracking prematurely.	Material carried too hot	Quench material carried or use better heat resistant grade belting.
	4. Bulging of cover at places and the same extending along belt length.	Fine material working into cuts or punctures in the rubber cover.	Immediate repair of cuts and punctures to prevent ingress of find dust, etc.
V.	**Belt Carcass**		
	1. Breaks in the carcass 	a. Impact of large heavy material	a. Use cushion idlers, keep height of all to a minimum and load in line with the belt at a speed equal to belt speed
	Entrapment of material at take-up pulley	b. Material build up on pulley	c. Use belt cleaning device and install scrapper on pulley
	2. Transverse breaks at edge	a. Belt edges folding up due to misaligned running	a. Use limit switches to stop excessive running out and investigate reasons for running out.

		b. Incorrect positioning of idler next to head pulley-too close or too high	b. Relocate or readjust idler or pulley position
3.	Lengthwise carcass break with covers intact	a. Belt running off-center and folding over	a. Use limit switches and determine reasons for running out.
		b. Incorrect size of fastener or improper joining	b. Use correct fasteners.
4.	Fastener pull out or transverse carcass breaks.	a. Too much tension.	a. Reduce tension
		b. Incorrect size of fastener or improper joining	b. Use correct fasteners.
		c. Direct-on-line starting.	c. Use graduated starting
5.	Transverse breaks immediately behind fasteners.	a. Fastener plates too long for pulley diameter	a. Change to shorter fasteners or increase diameter of pulley
6.	Longitudinal rip partially or through entire belt thickness	a. Belt running off and snagging on structure	a. Ensure true running of belt.
		b. Tramp iron jamming in structure and ripping belt apart	b. Redesign chute to prevent jamming.
		c. Fasteners working loose jamming in structure and ripping belt apart	c. Use correct fastener and periodically examine joint rectification
		d. belt lifting off at vertical concave cruve, particularly at starting, and becoming damaged by intervening skirt boards, chutes, etc.	d. Use heavier belt and if problem remains, calculate and rectify structure for safe vertical cruve radius
7.	Ply separation	a. Mildew or dust penetration into carcass.	a. Prevent cuts etc. arrange for immediate repairs.
		b. Pulley diameters too small	b. Increase pulley diameter or install synthetic duck belting.
		c. Oil contamination	c. Remove source of contamination.

d.	Too many reverse bends.	d. Use more flexible belt.
e.	Edge wear due to rubbing and penetration of moisture and grit.	e. Correct misalignment or remove obstruction.

VI General Operating Problems:

Belt wanders at random	Too stiff, does not conform to contour idlers	Use belt with more transverse flexibility.
Belt runs off-center at certain times.	Wind pressures and effect of sun on conveyor frame	Use covers and wind deflectors and self-aligning idlers.
Belt stretches excessively	Excessive starting and operating tensions.	Increase speed keeping tonnage same or reduce tonnage keeping the speed same, there by tensions will be reduced lag drive pulley or increase arc of contact. Use minimum counter-weight in take-up. Replace with lower elongation or higher strength belt.

IDLERS

The rollers are made from E.R.W. steel tube providing a high factor of safety and resistance or wear. Roller ends are machined and machined cast iron housings are pressed in the tube ends. The idler frame is made form angel and mild steel plates having robust construction. The spindles are securely held in the slotted brackets.

MAINTENANCE OF IDLERS

The maintenance of idler is required for proper functioning of idler during running condition. If conveyor is running with over load capacity, the spillage will occur due to which material will be jamming on side brackets. Hence the side brackets shall be cleaned. This may damage edge of outer roller. The outer roller can be interchanged because of its edge damaged and should be replaced by other new roller of same type. The tilting angle of roller in direction of belt should be maintained. The welding of brackets with base frame should be checked. The idler alignment should be checked. It not, it should be corrected by changing the idler position so that horizontal roll or the idler is at slight horizontal angle to the center line of the belt. The brackets which support the idler roller assembly have slotted hole so that such movements of idler is possible.

Idler maintenance is minimized because of following reasons:-

1. Each bearing is properly lubricated through grease nipple
2. One piece brackets are used and jig welded to inverted angle base
3. Most of the parts and rollers are interchangeable within the type

LUBRICATION OF IDLER BEARINGS

All idlers are grease backed. All bearings are lubricated with grease Veedol AP Grease-2 at our factory.

PULLEYS

Pulleys are of welded steel construction & statically balanced hubs and solid and disc are designed in such a way that give max. strength and minimum rim over hang. All the driving pulleys are having crowned face to encourage centering of the belt.

BEARING

Locking unit to the shaft:

Ball and roller bearing must be secured radially, tangentially and axially on the shaft. For locking the ball bearing units to the shaft, the shaft is spot-drilled to accommodate the grub screws which allow inausive misalignment in any direction.

The extended inner race ring incorporated in all "self lube" bearing is bored for sliding fit over the shaft. The ring is easily and securely locked to the shaft by means of two knurled cup point.

1. The complete unit is bolted into position after which the shaft etc. is fitted
2. The knurled point grub screw are tightened as finally in the assembly.
3. The remove the bearing from the housing first stacken the grub screw, then tilt the bearing 90 deg. with the aid of tool handle or pieces of tube if necessary. So that it lines up with the slot in the housing.
4. When in this position the bearing can be withdrawn the reverse brocedure applies when replacing the bearing.

LUBRICATION OF BEARINGS

All sealed bearings are pre-lubricated with grease chosen for chemical and mechanical stability. Grease which conforms to shell Alvenia No. 2 consistency and is free of any chemical impurities like acid and free alkali or any mechanical impurities such as dust, rust or metal particles should be used for re-lubrication. The bearing should be lubricated while in operation whenever possible grease should be pumped in slowly until a slight bead forms around the seals.

The bearings of course should not be over lubricated. Over lubrication will heat up bearings. Usually one or two shots of grease gum are enough.

Whenever grease nipples are provided they should be wiped clean before greasing the bearings to ensue that no dirt is introduced into the bearings. Excess grease should be removed after greasing.

The greasing interval is dependent on operating conditions. Observations of the condition of grease discharged at time of re-lubrication is the best guide to determine re-greasing interval.

BITUMEN SECTION

The efficient use of bitumen depends upon its viscosity at the time of application. Bitumen viscosity varies with its temperature and therefore in general practice, it is controlled in terms of bitumen temperature, which is easily measurable. The temperature required to maintain the appropriate viscosity of different grades of bitumen granges between 150°c to 180°c. The bitumen section of APOLLO DRUM MIX PLANT mainly consists of bitumen tank, bitumen charging arrangement, bitumen heating burner, hot oil system and bitumen pumping and metering unit.

BITUMEN TANK

This tank is fully insulated to minimize heat losses and is of adequate capacity. The bitumen inside the tank is heated by U-shaped heating tubes fitted with a automatic burner of adequate capacity. The fuel for this burner is supplied from the fuel tank on dryer chassis through the main fuel pump. A blower of adequate capacity provides the primary air for combustion. The bitumen tank is equipped with a manhole cover for inspection and charging of bitumen, bitumen outlet connections, drain plug and temperature meter. The lifting arrangement as a optional to handle packed bitumen barrels consists of a ½ ton capacity differential pulley lock with a traversing unit mounted on an I-beam with suitable supports. Ignition burner working on kerosene is provided to melt bitumen in the barrels and charge the bitumen tank with this bitumen. A bitumen pump driven by a A.C./D.C. Motor through an adequate reduction gear is provided to pump the bitumen to the drum. The bitumen flow rate is controlled by varying the pump r.p.m. by controlling the A.C./D.C. Motor speed. The several stages through which bitumen passes require heat to maintain proper operating temp. of about 150°c to 180°c. The following parts in the bitumen line are provided with hot oil jacketing (1) Bitumen pump (2) All bitumen lines to and from the tank except pipe fitting and valve.

A fully insulated tank of adequate Capacity for hot oil with its independent burner is mounted on the chassis. The primary air and fuel for that is supplied by the blower fuel pump system of the main bitumen tank burner. An independent electric motor driven pump is used for pumping the hot oil from tank to the jacketing lines. This is an optional system.

The main bitumen tank, hot oil tank, blower, hot oil pump, bitumen pump with speed reduction gear box & motors are all mounted on sturdy chassis and are provided with heavy adjustable jack legs to facilitate erection of the unit.

WET DUST COLLECTOR

OPERATING PRINCIPLES OF THE VENTURI TYPE WET DUST COLLECTORS:

The dust Laden exhaust gas is drawn from the drum mixer and into the venturi by the exhaust fan. At the venturi throat, the exhaust gas passes through a water spray introduced by a multiple nozzle spray bar. Dust particles: in the exhaust gas stream are "sorrounded" by the water spray and wetted. The extreme turbulence in the venturi promotes close, intimate, contact of water and dust particles to assure through mixing, as the exhaust gas enters the seperator, the dust Laden water is removed by centrifugal action a perforated skimmer plate. The dust fiaden water is then drained out of the seperator, in the form pf a watery sludge, into a settling pond.

LARGE NON-CLOGGING NOZZLES:

Large spray nozzles provide clog-free operation and assure minimum water make up requirements for venturi-type collectors. Wide opening nozzles water to be recirculated without a lengthy, clarification perfcod. Deflector in nozzle direct water stream into a full cone spray pattern for maximum wetting of dust particles.

EFFICIENT WETTING ACTION:

High pressure in the exhaust gas stream assure more efficient operation of the venturi type collectors with less maintenance. The exhaust gas stream mere than doubles it's rate of speed as it is forced through the venturi and this rapid acceleration creates extreme turbulence in the exhaust gas stream, causing a highly effective and efficient mixing action between the dust particles and the spray water. The completely assembled venturi has an adjustacle throat powered by a linear acturator which is controlled from the operator's console. This permits "fine tuning" to get the optimum cleaning efficiency for the plant operating conditions.

CONSTANTLY PRIMED WATER PUMPS:

Water pumps supplied with 'Apollo' wet dust collectors are frame mounted with a sealed and internally braced water tank on the inlet (pond) side of the water pump. In operation, pond water enters high in the tank and exits near the bottom. When shut down, the tank maintains a head of water on the pump for start up. This does away with trouble some inlet foot valves or having to prime the pump on start up. This system has been proven in many field insulations.

SETTING POND FOR SLUDGE DRAINAGE:

A setting pond will have to be constructed of sufficient size and water capacity depending on the model wet dust collector being used with the thermo drum. The settling pond would have a volume approximately equivalent tom the amount of water passing through the wet collector in one hour. The setting pond shown is devided into three sections by weirs. The sludge from the seperator enters section. A where much of the particulates settle out before flowing over into the next section B. By the time the water enters section C it is amply clarified for recirculation.

LUBRICATION CHART (DM35-DGBR)

Sr. no.	Location of item to be lubricated	Name of item to be lubricated	Lubrication oil to be used	Time period for the flush refill hrs.	Approx. Qty. of oil required per item in ltrs.	Approx. Qty. of oil required in ltrs.	Note
1	Four bin feeder conveyor	Gear box C:20 Fenner make	Servo mesh SP460 or 320 HP make	700	0.6	2.4	For all gear boxes, please check oil level daily.
2	Gathering conveyor	Gear box D:20 Fenner make	Servo mesh SP460 or 320 HP make	700	1.2	1.2	
3	Slinger conveyor	Gear box D:5 Fenner make	Servo mesh SP460 or 320 HP make	700	1.4	1.4	
4	Dryer unit	Gear box 6 NU Elecon make	Servo mesh SP460 or 320 HP make	700	11	11	
5	Long loadout conveyor	Gear box F:20	Servo mesh SP460 or 320 HP make	700	2.5	2.5	
6	Mineral filler	Gear box 3 NU Elecon make	Servo mesh SP460 or 320 HP make	700	2.5	2.5	
7	Bitumen tank	Gear box 4 NU Elecon make	Servo mesh SP460 or 320 HP make	700	3.5	3.5	
8	Air compressore	RH 80 Model swam make	Servo system 320	700	4.2	4.2	
9	All chain	Chain	Servo grease Molex/SEA 40	56	15	15	
10	All bearing block	Bearings reputed make	Servo gem grease No.2 or 3	Hot section daily Cold section weekly	5 Kg.	5 Kg.	
11	Power pack	Apollo make	Servo system 68	2000	80	80	
12	Hot oil tank	Apollo make	Servo therm medium	2880	600	600	It is only a thermic fluid & should not be heated more than 200° C

AMMANN

Apollo

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