**ACTIVITY : Plant no 5 classifier operation, maintenance, electrical start up.**

**Objective**                 :-   Safe operation and maintenance of plant no 5 classifier and accessories for optimum performance

**Scope**                   :-     Plant no 5- classifier

**Ref**                       :-    Instruction Manual M/s The Eimco K.C.P Ltd

**Responsibility**        :- Engineer In Charge & workmen at job

**PPE”s to be used :** Helmet, Safety shoes, Dust masks, Hand gloves and goggles.

**.Work No 1:** Classifier operation

**Work No 2:** Start up of classifier after long duration

**Work No 3** : General Maintenance

**Work no 4**: Classifier liner replacement

**Aspect-impact**

Scrap Generation

Resource depletion

**Hazards identified**

**Physical Hazard :** Fall of oil in eyes, mouth, ear.

Temperature

Inhalation of dust

Fire in the power pack

**Mechanical hazard**   :       Slip of person/equipment/material

Fall of person/material/equipment from height

Entanglement between crane/hydra swing arm/counter weight

Hitting of crane hook

Entanglement of motor and classifier screw, between motor / classifier body and platform / other fixed members

Failure of D shackle, sling & crane

Burn injury during gas cutting and welding

Trapping of person /equipment

Failure of crane rope and hook

Fall of material from height due to improper slinging

Fall of material on crane cabin

Failure of lifting hook

Fall of object on person

Trapping of person in between classifier body, parts and structure.

Back Pain due to sudden or heavy load like gear boxes, drums & motors

**Electrical**Hazard      :      Electrical shock from switches, motor, welding etc

**Human behavior aspect of operator**: Operator nature, alcoholism, casual approach, back pain, Horse play & non usage of PPE?s

**Work No 1: Classifier operation**

1. Ensure that the guards of all drives in position and interlocks are in operation before starting the system
2. Ensure that nobody stands close to any of the moving equipment before starting the plant.
3. Chute carrying fines and water below screen are connected to classifier & should be in open condition (diverter plate to be placed accordingly)
4. First start the fines conveyor belt by switching ON the **classifier fine belt** from the push button given outside panel room.
5. Switch ON the **classifier main drive** to start the classifier in rotating condition (3 RPM to 5 RPM maximum).
6. Start wet screening pump and water flow to be ensured to classifier inlet tank.
7. Start belt 3 and belt 2
8. Start vibrating screen, belt no. 1 and Vibrofeeder to give the feed.
9. In order to increase/decrease the RPM of classifier, PUSH the speed increase/speed decrease button and it should be pressed continuously to increase/decrease the RPM of the classifier. On the switch board it is marked as **speed increase/speed decrease.**
10. In an **emergency situation**, if classifier has to be stopped, pull the cord which is at the side of the classifier fines conveyer belt or can be stopped at local push buttons provided outside panel room.
11. To stop the classifier under normal condition follow the above procedure in reverse order
12. For shutdown of classifier for a longer duration, drain out all the muddy water with fines and ensure that the fine belt and classifier trough is empty.

**Work No 2:** Start-up of classifier after long duration:

1. Switch ON the button of **hydraulic motor** to lift the classifier from the tail end. Limit switches are installed to cut supply at extreme positions.
2. After lifting the classifier from the tail end, switch ON the classifier. Operate solenoid **valve** from operating panel button to lower the classifier. This is done to overcome the extra torque which may come on motor during start-up.(due to jamming of fines in classifier flights)
3. Classifier cannot be lifted when it is running. Interlock is put to stop the classifier when it is to be lifted. But can be lowered in running condition.

**Work No 3 : General Maintenance:**

1. Maintenance can be “routine or unscheduled” ie it should be carried out in safety conditions.
2. Routine maintenance: - the operator is responsible for routine maintenance and must carry out the following activities.
3. After a brief operating period of about 100 hours, change the oil in the gear unit.
4. Check that there are no metallic parts with unusual dimensions in the magnetic plug of the gear unit.
5. Change the oil in the gear unit while it is hot so that it is easier to drain.
6. Wash the interior of the gear unit with a suitable liquid that is recommended by the lubricant manufacturer.
7. Subsequent oil changes will be made every 2000-2500 hours of operation or, in any case, each year.
8. Do not mix different types of oil. Recommended oil is Parthan 320 or equivalent
9. Periodically check the levels (about once a month) and top up if necessary.

The lubrication oil for the multi-disc brakes is the same one that lubricates all gears in the gear unit, therefore the brake fluid is automatically replaced when the gear unit oil is replaced.

**Oil Change:**

1. In Wheel Gear Units there are 2 oil plugs located at 180 deg.

**Oil change with 2 oil plugs at 180**°**:**

1. Turn the gear unit until the drain plug in pos. **“A”** is at the lowest point as shown in figure no. 2 below.
2. Unscrew the drain plug in pos. **“A”** and the one in pos. **“B”** to make it easier for the oil to drain from the gear unit. Once the oil has been drained, replace the drain plug in pos. **“A“**.
3. Wash the interior of the gear unit with a suitable cleaning liquid that is recommended by the lubricant manufacturer.
4. Put liquid into the gear unit and then replace the filler plug; run the gear unit for a few minutes at a high speed, then drain the cleaning liquid from the gear unit & fill new oil (08 ltrs with gear box in Horizontal position..



**III ELECTCIAL OPERTAING PROCEDURE FOR PLANT 5 CLASSIFIER:**

1. Classifier unit includes the following drives.

* Classifier main drive
* Classifier fine belt (Belt-5)
* Hydraulic power pack
* Lubrication motor

1. Classifier main drive can be run between 9-15 rpm by using speed variations through variable frequency drive. Speed increase/decrease push buttons have been provided on the VFD panel for varying the classifier speed. Classier RPM can be seen on a RPM indicator provided on classier panel. In case user wants to run the classifier at full rpm, it is preferred to run it in DOL instead of VFD, to avoid VFD energy losses. On classifier panel, selector switch has been provided for the selection of VFD or Bypass (DOL).
2. Before starting the classifier after stopping the classifier for long periods, it has to be kept in fully lifted position (by switching ON the hydraulic pump), which is ensured through limit switch interlock. Once the classifier is started, it can be lowered by pressing solenoid coil on push button provided at site. Hydraulic pump will get switched off by sensing limit switch signal when it is fully lifted.
3. For the lubrication of classifier unit, lubrication pump has been provided for the purpose. Lubrication pump starts in auto when the classifier is in operation. The lubrication pump will run for 10 minutes in every 12 hrs. If lubrication pump fails to start as per the predefined time, classifier will trip giving an indication saying lubrication not taking place
4. When the Grease reservoir tank level is gone down, level limit switch will sense the low level to give indication of Grease level low and will give the trip command to lubrication pump to stop.
5. The following interlocking sequence is in place as a part of process interlock.

Classifier fines belt- classifier main drive- VS (in addition to the existing interlock of main belt.

1. If the classifier is not available for operation due to any reason, plant 5 can be run independently as earlier by bypassing the classifier ( VF can be started without the classifier by switching on bypass toggle switch provided on VF feeder)

**IV Following precaution to be taken during Startup of Classifier.**

**This is to be implemented when the Classifier to be taken line after long shutdown.**

**ACCESS TO CLASSIFIER:**

1. A walk way parallel with the slope of the classifier should be provided.
2. If a hydraulic lifting device is installed the walk way should be replaced on the side on which the pump is located.
3. Elevated access must be provided at the over flow end of the machine for lubrication of the submerged lower bearing.
4. This platform of ladder may also be used to observe the spiral when lowering or raising the same.
5. In the case of motorised hydraulic lifting devices, the Lift button and an extended “bypass” valve may be placed on this platform for better operations.

**CHECKS BEFORE STARTING**

**Tank**

* Check slope of tank tighten the anchor bolts. Remove shipping bracing, this is painted red for easy recognition. Tighten the feed and overflow launder.

**Drive**

* Alignment of motor and reduction gearbox sheaves—tightens V Belt. Tighten holding down bolts. Check for sufficient lubricants on gears.
* Check oil level in reduction gearbox. See that gear and belt guards are in position. See that grease fitting on main bearing has not been damaged in transit.

**LIFTING DEVICE**

**Motorized hydraulic lifting type**

* Operate motor and by pass valve. See that motor turns in right direction by observing rising of spiral.

**LOWER BEARING**

* Before bearing is submerged, apply grease gun and charge grease till grease escapes near pipe/ shaft flange. If no grease appears and relief valve operates, the bearing must be inspected. Three to four strokes of grease gun should be applied at least once in every 8 hours shift.

**TRUSS, FLIGHT, SHOES**

* Check all bolts for tightness

**STARTING AFTER SHUTDOWN FOR LONG TIME**

* To start machine, start motor and then turn in the feed. No alarm need be felt if at first the sand load seems excessive.
* Due to lack of pool density this is sometimes more apparent when starting the machine, than is the case when a balanced operation condition is established.

**OPERATION DURING FIRST TIME RUNNING AFTER LONG SHUTDOWN**

* Overflow particle size is controlled through adjusting the pool density by changing the amount of dilution water, or by changing the poor area and volume by adjusting the height of the overflow weir. In extreme cases the slope of the classifier may be changed.
* For finer overflow, and more water or raise weir height.
* For courser overflow particle size do the reverse.
* Change in spiral speed has little or no effect on overflow particle size.

**MAINTENENCE OF CLASSIFIER**

* Being submerged in a highly abrasive liquid, this bearing requires regular lubrication.
* Three or four strokes of the grease gun should be applied at least once every 8 hours shift.
* Whenever the bearing is raised above water level, the grease gun should be applied to check if grease passes through bearing and exist near shaft flange.
* If regularly lubricated the bearing requires internal inspection only every 12 to 18 months, when all the old grease should be washed off and new grease packed in.
* The spiral packing fits LOOSELY into its cavity and must be only moderately compressed by the springs and set screws.
* The spiral packing serves as a throttling labyrinth for the passage of **grease not as a seal.**
* **Complete sealing may cause grit to enter and destruction of the bearing will result.**
* All work involving opening up of bearing must be carried out in clean surrounding.
* Before starting any work involving opening up the lower bearing, arrangement drawing of the bearing should be studied.
* A definite sequence must be observed when removing the spiral packing.
* First release spring tension by means of setscrews.
* Second release set screws holding spring retaining block.
* Third remove the spiral packing the retainer block is first firmly anchored by means of the set screws in the housing.
* Then the springs and hex head screws are replaced in position and moderately tightened.

**Main bearing:**

* This bearing is packed with grease in the factory and requires no attention beyond being lubricated about twice a year, by means of the grease fitting provided.

**Work no 4**: Classifier liner replacement

1. Take clearance from RMHS in charge and take electrical shutdown of classifier after positioning of screw keeping worn out liner portion on top side.
2. Gas cut the liner bolts if not getting opened by spanners and replace the liner.
3. Tighten the bolts of liners replaced.
4. To replace liners at bottom portion rotate the classifier after clearing shutdown, all workmen, material, scrap from trough of classifier and get the bottom portion on top. Take electrical shutdown again and carry out the activity.
5. Clear the shutdown & take trial
6. Carry out housekeeping as per instruction WI/MAINT/91

Do’s

Take electrical shutdown before start of any activity.

Release the pressure of hydraulic system before working on it.

Clear the spilled oil from floor and platforms after work.

Do Not

Work on hydraulic system while in operation



**Amendement Record**

|  |  |  |  |
| --- | --- | --- | --- |
| **Date** | **Manual Section Ref. & Para** | **Brief details of Revision** | **New Rev.** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

|  |  |  |
| --- | --- | --- |
| **Prepared By:**  Area Engineer | **Reviewed & Issued By:**  Management Representative | **Approved By:**  Mechanical Head |
| **Signature** | **Signature:** | **Signature:** |
| **Review Date: 12.12.22** | **Review Date: 12.12.22** | **Review Date: 12.12.22** |