

# MAINTENANCE: 6

## MAINTENANCE SCHEDULE

### DAILY

#### 1. STATIC GENERATOR

- a) Ensure that the water conductivity is below 20mS. If it exceeds this level then change the DM water.
- b) Check the functioning of earth leakage circuit.
- c) Check the function of Emergency push button.
- d) Check and correct the float flow switch by 2 to 3 times ON/OFF of DM water.
- e) Check their individual interlocking by closing the respective valve.
- f) Check the water temperature interlocking by reducing the temperature range.

#### 2. CRUCIBLE

- a) Check the hardness of the soft water (Coil Water).
- b) Check for water leakage in crucible and flow switches.
- c) Check the emergency tank water level, flow emergency waken once for 5 minute  
Before start of Daily operation
- d) Check the inlet and outlet temperature and pressure of cooling water of heat exchanger  
in close loop system.
- e) Check the interlocking of furnace water flow switch individually and check their interlocking  
of water temperature. (by reducing temperature range.)

#### 3. OTHER SYSTEM: HYDRAULIC COOLING TOWER & PUMPS.

- a) Check the pressure of the hydraulic oil and level in the tank.
- b) Clean the hydraulic power pack from outside and bottom of the crucible where DRV valve and Hosepipe are fitted.
- c) Check the level of water in the storage tank underground tank or else fill the tank up  
2/3 high level.
- d) Check the smooth functioning of motors in the pump house. (This can be judged by the  
Sound of the pump.)

- e) Check that the gate valve is in fully open condition and the smooth operation of the check Valve.
- f) Check the condition of Jets & flow of water through is Jet type cooling tower and check the Freely movement of splinker and outlet of water droplets.

### WEEKLY

#### 1) STATIC GENERATOR:

- a) Clean the Static frequency converter with electric blower. Do not use compressed air.
- b) Check the working of flow switches. There should not be any bubbling in the magnetic Float. Check whether any switch has been bypassed. Check the interlocking of each flow switch and cleaning.
- c) If the water conductivity exceeds the specified limit, flow then replace the DM water  
Do not add fresh DM water but replace the water fully in the tank.
- d) Clean the contacts of the change over switch with a solvent like CTC and brush. Never use emery or sand paper for cleaning the contacts.
- e) Check the fill up oil in oil pocket of water temperature thermostat if necessary.
- f) Ensure that the furnace trips or OFF when EL trip condition occurs.
- g) Tighten all the nuts and bolts of the busbars, change the blackned fastners.
- h) Check & clean the contact of main MCCB at input of the static generator by CTC.

#### 2) CRUCIBLE:

- a) Tighten all nuts and bolt of water-cooled busbars and water-cooled cable.

- b) Tighten all clamps of water carrying rubber hoses.
- c) Check for any insulation damage of the coil on account of sparking.
- d) Clean and check the working of flow switches.
- e) Check the setting of the furnace water temperature sensor and its position.  
Fill up oil in oil well if necessary.
- f) Tighten all lamination packets in case of a steel frame furnace. Replace the Mica or Asbestos insulation between the coil and lamination packet if required.
- g) Check the blackned fastners.
- h) Tighten fastners of furnace body and coil support plates.

3) OTHER SYSTEMS:

A) COOLING TOWER

- 1) Clean nozzle of the header.
- 2) Check the tightness of the belt in case of a belt driven fan.
- 3) Clean the return line filter of hydraulic power pack with oil.
- 4) Check the working of valves & levers.

MONTHLY

1. STATIC GENREATER:

- a) Clean the contacts of incoming isolators by a solvent like CTC.
- b) Tighten all Nuts and Bolts of the busbar in Penal. Check the pressure on Thyristors  
by ensuring the free rotation of pressure check washer of pressure plate assembly.
- c) Tighten all clamps of PVC braided pipe.
- d) Check loose connection of the control wiring and mounting of PCB cards.
- e) Clean the cabinet thoroughly.

2. CRUCIBLE:

- a) Put proper insulation where insulation is damaged and varnished.
- b) If the scaling is noticed, check the hardness of water. Take necessary action to  
reduce hardness if necessary.
- c) Apply grease at point of hinge box of the crucible.

3. OTHER SYSTEMS:

a) HYDRAULIC: Check the makeup oil in the hydraulic power pack. Check the oil Viscosity and if required change the complete oil in the tank. Tighten all joints Of the entire system.

b) PUMP HOUSE:

1. Check the tightness of the foundation bolts of all motors.
2. Tighten the flanges of suction pipe to stop leakage of water.
3. Check any loose connection of cable at starters and the motor terminals.
4. Clean all motor starter contacts by CTC.
5. Check relay setting of the motor starter.

c) TRANSFORMER:

1. Check the oil level in the conservator and top up with dry oil if required.
2. Check the alarm and trip contact of Bucholz relay winding temp. Sensor oil Level indicator sensor and transformer oil temp. Indicators sensor.
3. Check for the leakage of oil.
4. Check color or silica gel and dry it if turns to pink color.

### QUARTERLY

1. Clean heat exchange of furnace as well as Static generator.
2. Change the worn out couplings and bearings of all pumps.
3. Clean and check functionally all the flow switches of the Static generator.
4. Apply grease to all the motors, pumps etc.
5. Check oil seals of Hydraulic Cylinder and replace if necessary.
6. Clean and service the cooling tower PVC fill by forced water or cleaning agent.

7. Inspect insulation deformation of the furnace coil, reinsulated and reform if required.
8. Inspect the top and bottom castable. Replace or repair if required.
9. Examine any crack, dirt deposit or oil leakage in the bushings of the transformer.
10. Check the color of silica gel in the breather of the transformer. If it has changed to  
Pink, reactivate by heating it.
11. Check the setting and operation of protection relays in the H.T. side.

### ANNUALLY

1. Check the transformer oil for dielectric strength, acidity and sludge.
2. Check the Oil Circuit Breaker oil for dielectric strength, Acidity and sludge.
3. Check the moving and fixed contacts of the Oil Circuit Breaker.
4. Re-insulate and reform the Coil of the crucible if required.
5. Check the all cable conditions, contacts and clean, if properly.
6. Check the heat exchanger plates, underground tank, overheat tank.
7. Check the scalling in water pipes, if required place.
8. Change the deformed fins of cooling tower.

## MAINTENANCE OF DIFFRENET ASSEMBLIES OF FURNACE

Following are procedures for maintenance of different assy. Used in melting furnace.

### THYRISTORS REPLACEMENT

To replace faulty thyristors first switch off the main & control supply. Disconnect the gate & cathode wires. Without touching the stack pressure bolt, loosen the stack assembly bolts.

Lift all the coolers and busbars from topside of the particular thyristors, which is to be replaced

For detail see attached thyristor assembly sketch for easy understanding.

Remove the faulty thyristor. Take care of snubber wires while removing and replacing the thyristor clean the contact area of cooler and thyristor by CTC and insert the new thyristor

With thin layer of heat sink compound applied on the both side. To match the center of

Thyristor and cooler a Dowell Pin is placed in the locating hole. ENSURE THAT THYRISTOR IS

PLACED IN THE CENTER. If the pin is not placed properly then there could be a gap between

Thyristor and cooler. Poor contact would affect the heat transfer between cooler and thyristor

and might damage the thyristor.

After replacement of thyristors put the top cooler with all assembly in sequence and check the

Alignment till top pressure plate. This will ensure alignment of complete stack and even pressure distribution on the thyristors. Tighten the stack nut such that check wheel of pressure

Plate assembly start moving freely. Connect gate-cathode wire of thyristors & check the looseness of wires if any.



Check the gate cathode pulses of all the thyristor. After switching ON the furnace measure the sharing of voltage between series connected thyristor of each arm. The difference between peak voltage and TOT of series connected thyristor of a particular arm should be within 5%.

#### CLEANING PROCEDURE FOR WATER COOLED CABLE

The only maintenance that is necessary as far as water cooled power cables are connected is

Periodical cleaning of the cable core with a suitable solvent or detergent to remove deposits

Building by the cooling water. As soft water is used for cooling cables less frequent cleaning

is required. The necessity of this operation is entirely dependent on the cleanliness of the

Cooling water that is circulated through the cables.

However it is recommended to clean it at an interval of 6 months. Depending on quality of the

Water and after two to three cleanup operation the frequency of cleaning should be decided.

The procedure that should be adopted for this cleaning is as follows.

\* Take Diluted solution of the ratio of 10:1 of water and any good quality descaling compound

Or agent or caustic soda in approximately 25 liter tank. Confirm that this descaling compound

Is especially for Non-ferrous tube or section.

\* Disconnect both inlet & outlet water connection of water cooled cable. To be cleaned take

Any one small pump of approximately 50 liters/ minute flow.

\* Connect delivery of this pump to one end of cable and suction to the tank filled with descaling

Compound solution. Put second end of water cooled cable in to the solution tank.

\* Run the pump for 1 hour to 3 hour depending up or scaling.

\* Empty out and wash the tank with clean water when all the activity of descaling is over

Repeat the above procedure twice to remove any type of acid the cable within.

\* Connect cable again in the circuit.

## MAINTENANCE OF HYDRAULIC UNIT

A correctly installed pressure assembly filled with good quality of fluid meeting specification

Should be used to provide efficient and trouble free operation with timely maintenance. With

The fluid itself serving as a lubricant and built in overload protection, a hydraulic system is highly

Dependable on oil. Fluid contamination tends to reduce its efficiency and shorten its life.

1) Keep the installation clean. Serious damage can result due to foreign material in the  
System.

2) See that the inlet and return line fittings are tight so that air is not drawn onto the  
System and there is no leakage of oil. Check all oil seals.

3) Check the level of oil in the oil tank every day.

4) Check the color of the fluid and its level in the reservoir sight glass. Dirty and discolored

Oil would indicate the need of changing the filter cartridge and possibly fluid itself.

5) Check for noise or vibration of the motor and the pump.

6) Keep the record of all maintenance work and also record when fluid is added or changed

Filter cartridges replaced or strainer elements cleaned.

## MAINTENANCE OF PLATE HEAT EXCHANGER

If a common salt solution (NaCl) is used, it should be kept alkaline at a PH-value of at least

8.5 by adding sodium carbonate. Check the alkalinity regularly. (The brine should clearly

alkaloidally to phenolphthaleine or litmus paper.)

calcium chloride (CaCl<sub>2</sub>) should not be used.

Follow the stipulations for the food production industry in all applicable respects. Generally,

Deposits, particularly lime deposits, can be removed by washing as described below without

Opening the apparatus. The washing must, however, be done often enough and regularly,

So that the deposits cannot form thick layers. This applies especially when polyphosphate

and EDTA are used, which have a milder effect than nitric acid.

**A.** Only stainless plates and only when the deposits are practically free from chlorides.

1. Nitric acid with a concentration of 2% by volume (2 liter conc. HNO<sub>3</sub>, spec. gravity

1.4 to 98 liters of water) is circulated at maximum 50°C (120°F)

Maximum circula-

tion time: 30 minute daily.

2. Carefully flush out with water.

## LUBRICATION:

The carrying bars and their threaded portion should be kept clean and lubricated with

Petroleum jelly to which a rust preventive has been added. Lubricate rollers in pressure

Plates, with engine oil, painted and stainless surface should be slightly greased.

REFITTING:

Before refitting the plate heat exchanger ensure that all the gaskets are in their position. Place back the plates in their order and push them together by hand as much as you can. Push the

Pressure plate to the plate pack and tighten the nuts evenly tuning each nut of turns at a time.

The tightening bolts are to be kept greased by Molybdenum supplied or equivalent lubricant.

Rollers of the pressure plate are greased normally.

## REGASKETING:

### OLD GASKET REMOVAL

Remove the plates from the exchanger and note down the number punched on the right hand top of the plate.

Gaskets fastened with resin glue, can be removed from groove by first warming the plate carefully from the rear side with gas burner. The dried glue softens at a certain temperature.

A still usable and elastic gasket in one place can thereafter be removed at right angles to the groove by means of a pair of pliers. The propane flame gives the correct temperature when the nozzle is held 10 to 15 cms. Behind the plate and moved along the groove at a speed to be varied with the softening of glue.

Welding torch (acetylene gas) is completely unsuitable for this purpose. Higher temperature will make the rubber brittle and discolor the plate. A gasket, subject to high temperature for the longer time will break must under the packing and moved along the groove, for removing gasket out of plate.

### SURFACE PREPARATION:

Some rubber residues will inevitably remain in the groove after the gaskets have been drawn out. These should be scrapped off with a knife or screw driver, if necessary, while heating the rear side of plate.

Clean the groove with tri chloroethylene or benzene and wipe with a clean cloth. Decrease the packing groove with alkali or a wetting agent (teepal or the like) and wipe out with a clean cloth. Finally dry the groove by means of a gas burner moving it rapidly along the groove by means of a gas burners for 30 to 50 seconds.

The groove should then be washed with a solution of the cement made by dissolving one part cement with nine parts by industrial mentholated spirit and

allowed to dry. This treatments prepares the surface and gives protection against contamination.

### CEMENTING:

Place the plate on a work table with the gasketing side facing upward. Apply the gasket cement uniformly on the groove directly from the container with the help of painter brush.

Place the gasket on the groove.

The glue now is not sufficiently adhesive. The gasket must therefore be fixed by adhesive tape which should be pressed fast across the upper surface of the packing. The tape strips must be long enough (about 5 cms.) to adhere properly to the plate on either side of the packing.

### CURRING (HARDENING) OF CEMENT:

After drying of the gasket- cement for about a hout or two, at normal room temperature, suspend the plates back in the heat exchanger I the order previously. Tighten the cemented plates in normal way. Plate pack length during curing should however be about 50mm. more per 100 cemented plates than the normal pack length.

**(Note:** Normal pack length is more than PHE pack length with old packings)

Circulate hot water at 80-90<sup>0</sup> for 2-3 hours which will cure the gasket. When the heat exchanger has been cooled down nearly to room temperature, open it again examine the plates, remove tape strips and superfluous cement and tighten the exchanger to normal plate pack length.

### 13) SPARE PARTS:

1. ONE SET OF O-RINGS.
2. ONE SET OF GASKETS.