**ACTIVITY: STANDARD OPERATING & MAINTENANCE PROCEDURE FOR SIDE**

**STREAM FILTER FOR BF COOLING TOWER**

**Objective:** Filtering inlet water of BF cooling tower

**Scope:** Operation of side stream filter

**Responsibility:** Operation/production engineer/maintenance technicians on the job

**PPE –s to be used:**

 safety Helmet, Safety shoes, hand gloves and safety goggle, dust mask

**Work No 1:** Working/maintenance of side stream filter

**Aspect – Impact**

Scrap generation Resource Depletion

Oil Spillage Land contamination

Oil traced waste generation Land contamination & Resource Depletion

Draining of water resource depletion

**Hazards identified**

**Physical hazard -**

Impact of pressurized water/air

Temperature

Dust inhalation

Congestion

Drowning of a person in cooling tower basin

Flood due to Side stream filter vessel damage

Suffocation of a person inside vessel while carrying out maintenance of the side stream filter vessel

**Mechanical hazard -**

Trapping of finger/leg while operating/handling valve/pump/filter etc.

Entanglement in between moving parts, guard, coupling

Falling of material/tools such as hammer, bolts,spanners, slinged items on person.

Falling of person from platform/height

Injury from slip of pump component while assembly / dismantling

Impingement of fingers, hand while fitting assembly of pump, bearing fixing, impeller fixing, flange bolts tightening with spanners.

Trapping between the moving parts

Slip and fall due to slippery surface/ stairs.

Cut injuries from sharp edges of items

Failure of sling, chain pulley block

1. **Electrical**

**- Electric** Shock due to welding, machine, cable or while carrying out PLC maintenance or Pneumatic valve maintenance

**Chemical hazard -** Fire

Contact with chemically treated water

**Biological Hazard** - Bee sting

**Human Behavior aspect of operators**:

Operator nature, alcoholism, casual approach, horse play, use of mobile at workplace, back pain & non usage of PPE?s



**Side filter in service mode:**

1. Open the pump suction valve of the cooling tower cell to be taken in line
2. Start the pump
3. To fill the filter, open the inlet valve (V1) and open the air release valve (V6)
4. Close air release valve (V6) after water is seen flowing from it
5. Open discharge valve (V2) to cooling tower
6. Check the flow physically and differential pressure gauge and note down the reading

7. Ensure followings valves, backwash inlet V3, backwash outlet V4, raise outlet drain V5 are kept close during filtration process.

1. Incase of changeover of cell first open the suction valve of the pump to be taken on line and then close the suction valve of the cell which was in line
2. Cell to be changed every 8 hrs

**Back wash procedure if differential pressure is more than 0.8kg/cm2 or every 24 hrs whichever is earlier:**

1. Ensure cooling tower level should be full.
2. Close the filter inlet (V1) and outlet (V2) valves.
3. Open inlet (V3) and outlet (V4) valves of the filter.

4. Run the system for 10 minutes

1. Check for clear water.
2. Reverse the process from top to bottom.
3. Take filter in service.

**The side stream filter will work in total Auto mode and any deviation will be indicated in the BF II control room.**

**Technical details**

1) Service operation: Discharge flow rate: 100 m3/hr. time of operation: 24 hr

2) Drain down operation: flow rate: nil time: 5 min.

* 1. Backwash operation: flow rate: 100 m3/hr. time: 10 min. to be in line when differential pressure – 0.8 kg/cm2 or after 24 hrs. Whichever is first or once in each shift, depending upon the inlet/outlet TSS.
  2. Rinse operation: flow rate: 100 m3/hr time: 5 min after back wash.
  3. Vessel fill operation: Flow rate: 100 m3/hr time: 2 min.

**SAFETY, PRECAUTIONS AND DO AND DO NOT’s GUIDE LINES:**

**DOs:**

· To operate the plant strictly as per the basic guidelines provided for necessary process inputs.

· To operate the plant by the trained and experienced persons only. · To follow the safety guide lines provided for the Mechanical, Electrical equipments and handling of filter media.

· To always ensure the system vessels are full of water and free of air, during the plant operation.

· To record the plant parameters during regular operation for review and evaluate the performance of the system components and equipments.

· To record replacements of spares for equipments and to maintain individual history cards for each equipment.

· To always use original spares to safe guard the overall integrity and reliability of the system against loss of performance.

· To implement preventive maintenance schedule for equipments to prevent unexpected break down of equipments and the system.

· To ensure that the system is operated within the capacity designed and to request for guidance whenever required especially if there is any major deviations in the raw water quality.

· Any maintenance activity shall be carried out only after electrical shut down of the system.

· Only authorized personnel shall open the PLC panel

· In case of any alarm sounded from PLC panel emergency stop on the PLC panel to be operated and Instrumentation shift technician to be informed.

· If the cooling tower cell level goes down, side stream filter to be stopped by operating Emergency stop from PLC panel and Instrumentation shift technician to be informed.

**DON’Ts**

· Do not operate the system when the feed water limiting factors are not as per stated recommended specifications

· Do not use sub standard and duplicate spares for equipments.

· Never isolate cooling tower cell in line without opening valve of new cell to be taken in line

· Never touch any pneumatic valve while the Side stream filter is in operation ·

Never operate pneumatic valves manually without instrumentation engineer’s advice while the filter is in running

· For maintenance of filter: Never open the man hole of side stream filter without electrical shut down and after ensuring that the filter has been drained completely

*Entering into SSF is a confined Space Activity. Below mentioned procedure to be followed*

**FOR MORE DETAILS REFER CENTRALISED CONFINED SPACE ENTRY SOP-VL/IMS/VAB/SP44 Y**

*Confined Space Checks before job start up:*

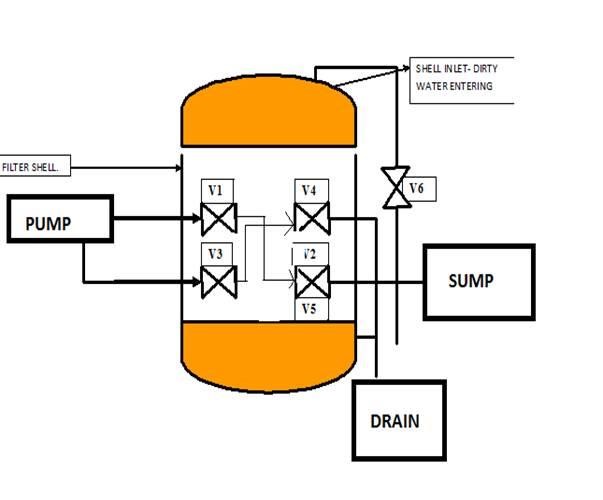
1. *Before Entering in Confined Space ensure –*
2. *inside temperature should be less than 40 degree Celsius.*
3. *CO Level should be 0 ppm*
4. *Attendant must ensure proper illumination, if illumination not found ok, he must inform concern electrical person to provide hand lamp or halogen.*
5. *Take the work permit from production-in-charge, Safety, electrical, mechanical for entering Confined Space.*
6. *The workmen (Entrant) who is trained and certified by SBU Head and having valid confined space gate pass should perform the activity and he can be replaced(in emergency) only by certified entrant .*
7. *A standby (attendant) who is trained and certified by SBU Head and having valid confined space gate pass should perform the activity and he can be replaced(in emergency) only by certified attendant .*
8. *Standby person who shall be positioned outside the confined space , must have no other duties other than monitoring people and conditions inside the confined space and coordinating with rescue personnel (he must have contact number of rescue team members) if required.*
9. *Standby (Attendant) person has to log down the In/Out entry of all entrants and ensure that entrant should be come out after 30  minutes from confined space for normal jobs.*
10. *In some cases In/Out time may be relaxed /extended based on the risk involved in the particular confined space.*
11. *Check Internal atmosphere of the space for sufficient oxygen content (19.5% to 23.5 %) flammable gases and vapours, and the potential for toxic air contaminants by the use of multi gas detector, if required use pump with extension before entering. If there is any deviation, do not enter into confined space.*
12. *Check for the presence of Chemical asphyxiates such as Carbon monoxide (CO gas detector).It should be 0 PPM*
13. *Check inside temperature and it should be is in the tolerable range (25 deg C to 45 Deg C). If the temperature is not within limits then appropriate ventilation to be used to normalize the temp.*
14. *Check for suitability of equipment that is used at the confined space.*
15. *Check any dust due to which visibility is reduced or respiratory tract is irritated.*
16. *The sign-in and sign-out of all persons entering into confined Space should be recorded.*
17. *Use 24V DC supply illumination to avoid electrocution/electric shock.*
18. *Cutting or welding jobs inside the confined space should be carried out after checking for any explosive environment (LEL should be <10%) and by providing localized suction or heavy duty exhaust systems to prevent accumulation of gases inside the space.*
19. *Isolation of related equipment of respective confined space with personal LOTO lock to be Ensured.*

*Please note that this area is considered as Confined Space so needs to maintain the checklist of the activity. All In time and out time details of entrants, levels of gases to be logged in checklist (yellow copy) or in any alternate document and to be documented.*

***Role of Rescue Team***

***As the work is being carried out inside confined Space, in an emergency victim can be taken out by use of rescue apparatus such as stretcher. However attendant should call ambulance which is fully equipped. However rescue team members should take a charge of the situation.***

***OPERATION PROCEDURE FOR SIDE STREAM FILTER FOR BF COOLING TOWER***



**V1 - INLET**

**V2 - OUTLET**

**V3 - BACKWASH INLET**

**V4** - **BACKWASH OUTLET**

**V5 - RINSE OUTLET (drain)**

**V6 - AIR RELEASE**

**Steps for operation of the filter:**

1. To fill the vessel open Valve1 & Valve6 and close Valve2,Valve3,Valve4,Valve5.
2. For backwash cycle open Valves3 & Valves4.

Close Valve1, Valve2, Valve5, Valve6.

1. To rinse the shell open Valve1 & Valve5.

Close Valve2, Valve3, Valve4, Valve6.

1. For servicing of the system open Valve1 & Valve2.

Close Valve3,Valve4,Valve5,Valve6.

***Table for reference:***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S.No | Mode | Stages | Valves Open | Valves closed | Pump | Duration |
| 1 | Backwash Mode | Drain Down | V5 & V6 | V1, V2, V3, V4 | Off | 2 min |
| Backwash | V3 & V4 | V1,V2,V5& V6 | On | 5 min |
| Rinse | V1 &V5 | V2,V3,V4 &V6 | On | 3 min |
| Vessel filling | V1 & V6 | V2, V3, V4 &V5 | On | 1 min |
| 2 | Service Operation | Service | V1 & V2 | V3,V4,V5 &V6 | On | 8 hrs |

***BACKWASH CYCLE FOR CLEANING PROCESS:***

· A differential pressure switch is located across the inlet and outlet of the filter. On a predetermined pressure drop of 0.8 kg/cm2 the differential pressure switch through the PLC will trigger closing of inlet and outlet valves and will open the backwash inlet and backwash outlet valve.

· After a predetermined time (which will be set as per the site conditions) the backwash inlet and outlet valves will close and the unit will be put back in service mode.

**MAINTENANCE PROCEDURE FREQUENCY**

|  |  |
| --- | --- |
| INSPECT UNIT FOR LEAKS | A |
| INSPECT UNIT FOR FAILED COMPONENTS | A |
| COLLECT OPERATIONAL DATA | A |
| EXTENDED BACKWASH | B |
| OPEN BACKWASH | C |
| OBSERVATION AND MAKE UP OF FILTER MEDIA. | D |
| REPLACEMENT OF FINE FILTER MEDIA. | E |

1. - Daily
2. - Weekly or when the pressure drop across the filter exceeds 1 kg/cm2, whichever occurs first? C - Twice a year
3. - ONCE IN A YEAR,

MAKE UP LOSSED

QUANTITY DURING

BACKWASH

1. – Whenever activated carbon does not restore the media.

**ALARMS PROVIDED IN BF2 CONTROL ROOM:**

· Side Stream Filter Fault – It is a common fault which will be activated if :-

Ø System goes to Backwash mode from Service mode Ø Emergency push button is pressed

· Side Stream Filter Feed

Pump Off

**Amendement Record**

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