**WORK INSTRUCTIONS FOR SAMPLING OF PROCESS WATER, ADDITION OF CHEMICAL AND WATER ANALYSIS.**

**Sampling of Process water:**

**Hazards identified**

1. Fall of person while sampling
2. Contact with chemicals placed near cooling tower
3. Contact with hot water
4. Fire
5. Health hazards (inhalation, ingestion)
6. Human Behavior -Nonuse of PPE
7. Human behavior-Improper house keeping
8. Inadequate local lighting
9. Getting affected by CO gas
10. Human behavior- Not carrying CO detector
11. Lone working

**Significant Aspect**

Water usage

**Procedure**

On daily basis 8 water samples need to be collected, viz: inlet to cooling tower, make up water sample, outlet from cooling tower, outlet from thickener, side stream filter discharge water, PCM tank discharge, two pond inlets from furnace 1 & 2 separately. During the collection of these water samples it is mandatory to wear all the PPE’s, viz: Safety shoes, safety helmet, hand gloves, and safety spectacle. Use of CO monitor is mandatory.

In addition to the above mentioned, extra water samples are to be collected as per the necessary requirement.

**Addition of chemical:**

**Hazards identified**

1. Fall of person causing injury
2. Contact with chemicals causing burns
3. Fire
4. Health hazards
5. Nonuse of PPE
6. Improper house keeping
7. Inadequate local lighting
8. Smelling of chemical
9. Unnecessary mixing of two different chemicals

**Significant Aspect**

Chemical spillage

**Procedure**

Unauthorized operation or repair of any equipment is an offense.

Unauthorized usage or handling of chemicals (full as well as empty cans) is prohibited.

Job to be carried out by trained and authorized person only.

MSDS to be followed during the activity.

During chemical addition it is mandatory to wear all the PPE’s, viz: Safety shoes, safety helmet, acid proof hand gloves, and safety spectacle.

**Procedure for Chemical addition to cooling tower sump:**

Direct addition of chemical in cooling tower sump should be done using measuring cylinder and bucket provided for chemical whose dosing quantity is below 3 liter for dosing chemicals (20-25 liter dosage). Addition is also done by filling in a barrel of 20 Litres and added drop by drop in the cooling tower basin. This is controlled by a valve.

Quantity of each chemical to be added on daily basis

1. Corrosion inhibitors- MS 6201MS 6209 = 1.6 Kgs & MS 6201 = 0.6 Kgs Dosage is 3.7 Kgs

2. Dispersant BL 5323, BL 5301 = 2.3 Kgs 4.62 Kgs

3. Copper corrosion inhibitor AZ 8100= 0.3 Kgs 0.59Kgs

4. Sodium hypochlorite (Biocide) = 25 Kgs (quantity/dosage for two days added alternate day)

5. Boicide Biocide (Anti mollase control) NX 1100 CT1300= 20 Kgs 8 Kgs consumed per month (To be added once in 15 days) (Dosage 2Kgs each time added

Parameters of cooling water and makeup to be maintained within the following limits

PH=7-8, Conductivity< 6000mhos <600 mhos , T-alkalinity < 50PPM, M-alk <50PPM, Chlorides <100PPM, TSS<30 PPM, TDS< 500PPM, Ca hardness= 10-25PPM

Phosphate=6-8 PPM 7 to 9 ppm, Iron<3PPM, FRC= 0.2-0.4 0.3PPM, Bacteria<102

**Procedure for floculant addition to thickener/PCM floculant tank:**

First, fill the flocculent tank with water. Switch the stirrer on.

For flocculent addition to thickener Add 4 Kg flocculent slowly to the flocculent tank. Make sure the stirrer is continuously running. Set the valve so as to maintain desired flow.

This activity is to be done twice a day. The quantity of flocculent used the second time the tank is filled should be 2 Kg.

For flocculent addition to PCM flocculent tank the quantity 4 kg per day (4kg in the morning and 2 kg in the evening). The flocculent needs to run on continuous basis for 24 hrs. Daily.

Flocculent tank needs to be drained and refilled every day in morning before filling.

**Water analysis:**

**Hazards identified**

1. Fall / injury to person carrying out the job
2. Contact with chemicals
3. Fire
4. Electric shock
5. Health hazards
6. Touching hot beakers/watch glass causing burns
7. Not use of PPE
8. Not following work instructions
9. Improper house keeping
10. Inadequate local lighting
11. Smelling of chemical
12. Unnecessary mixing of two different chemicals

**Significant Aspect**

Water usage

**Procedure**

Unauthorized operation or repair of any equipment is an offense.

Water needs to be analyzed to check parameters like pH, conductivity, TDS, TSS, total hardness, calcium hardness, chlorides, phosphates, Fe, Bacteria test and corrosion test.

Procedures

1. Test for alkalinity

Add 2-3 drops of phenolphthalein indicator to 50 ml water sample in a beaker. (Only in case of pH>8.3). If color changes to pink titrate against 0.02 N H2SO4. Take burette reading. If no color change is observed add 2-3 drops of mixed indicator and titrate against 0.02 N H2SO4. Color changes from colorless to light green. Color changes from light green to pink. Take burette reading.

Calculation= Burette reading x 20 = alkalinity in PPM

1. Test for chlorides

Add 2-3 drops of potassium chromate indicator to 50 ml water sample in a beaker. Color changes from colorless to yellow. Titrate against 0.02 N AgNO3. Color changes to turbid yellow. Take burette reading.

Calculation= Burette reading x 14.18 (Factor) = chlorides in PPM

1. Test for Hardness

Add 4-5 drops of ammoniacal buffer solution + 2-3 drops of eriochrome black T indicator to 50 ml water sample in a beaker. Color changes from blue to pink. Pink indicates presence of hardness. Titrate against 0.01 M EDTA.Color changes from pink to violet blue. Take burette reading.

Calculation= Burette reading x 10 = Hardness in PPM

1. Test for Calcium hardness

Add 2 ml KOH solution + pinch of pattons indicator to 50 ml water sample in a beaker. Titrate against 0.01 M EDTA.Color changes from wine red to blue.

Calculation= Burette reading x 10 = Calcium Hardness in PPM

1. Test for TSS

Dry watman filter paper no.1 in oven for 10 mins and cool in desiccator for 30 mins. Weigh and note weight as A gm. Filter 1 liter water sample through this filter paper. Dry residue in oven for 45 mins. Cool in desiccator for 30-40 minutes. Weigh the residue and note weight as B gm.

Calculation=B – A= C gm x 1000= TSS in PPM

1. Test for corrosion indication

Weigh the corrosion coupon and note as A. Place corrosion coupon in the water loop for 1 month. After 1 month take out the coupon and wash with dilute HCl. Dry in oven for 20-30 mins. Weigh the coupon and note final weight as B.

Calculation= (B-A) x1.11 x 1000 =Corrosion in MPY

No. of Days

PH checked using pH meter

TDS is calculated using below equation

TDS = Conductivity \*0.6

Phosphate , Fe , TSS, Turbidity and Silica measurement is done by Spectrophotometer at laboratory

Maintain Cooling water COC above 2.

COC = CaH of Cooling tower/CaH of Make up Water

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| **Prepared By:**  Head – Production PID I | **Reviewed & Issued By:**  Management Representative | **Approved By:**  Head – Pig Iron Division |
| **Signature:** | **Signature:** | **Signature:** |
| **Date: 15.07.2022** | **Date: 15.07.2022** | **Date: 15.07.2022** |

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| **Amendment Record** | | | |
| **Revision date** | **Manual Section ref. and para** | **Brief details of revision** | **New Revision No.** |
| 15.07.2022 | **Procedure for Chemical addition to cooling tower sump**  **Procedure for floculant addition to thickener/PCM floculant tank** |  | 03 |
| **15.07.2022** |  | **Change in format** | **03** |
| **03.03.2023** | **Hazards** | **New Hazard identified** | **04** |