1.0 DESIGN PHILOSOPHY:

The treatment shall be designed to minimize the formation of scale and build up of micro – organisms, and prevent fouling, and corrosion of the turbine condenser and other heat exchanger.

To inhibit scale formation in the CW system it is proposed to dose Sulphuric acid to convert calcium and magnesium bicarbonates into sulphates, which have higher solubility in water. synthetic polymer based Scale Inhibitor along with Corrosion inhibitor, Biocide and H2SO4 dosing Systems have been designed to dose required quantity of chemical to maintain CW quality at CW fore bay.

2.0 TANK AND PUMP CAPACITY SELECTION:

Acid Dosing (98% H_2SO_4)

1

Acid dosage rate = [Make-up M-Alkalinity-(Desired M-Alkalinity in Make-up water/COC)] X Make-up water X 24/1000
= [144-150/5] X 1800 X 24/1000
= 4924.8 kg/day
= 205.2 kg/hr (Approx)
= 209.38 kg/hr (98% H_2SO_4)
Specific Gravity = 1.84
Acid dosage rate = 209.38 /1.84 LPH.
= 113.79 LPH.

Acid Dosing Pumps = 250 LPH (selected).

Capacity of H2SO4 Day Tank = 113.79X24 = 2731.14 liters.
= 3000 Liters (selected)

Capacity of H_2SO_4 Bulk Storage tank = 113.79 X 24X15 Liter.
= 40967.2 Liter (2 numbers tank each of approx 23 M3).

Scale Inhibitor /corrosion inhibitor /biocide:

Scale inhibitor and corrosion inhibitor are a proprietary chemicals and level of its dosage in CW & ACW depends upon the the recommendations of chemical manufacturer and based upon plant operation. However, the Plant will be designed for 10-ppm dosage of either scale inhibitor or corrosion inhibitor, & for biocide dosing rate is maximum 3 ppm.

Scale inhibitor /corrosion inhibitor dosing rate = Make-up water (m3/hr) X dosage (ppm) /1000
= 1800 X 10/1000
= 18 kg/hr of 100% solution.
Specific gravity = 1 (approx).
Chemical dosage rate = 18/1 LPH (Approx).
= 18 LPH.

Chemical Dosing Pump Considered = 50 LPH (Selected).

Biocide dosing rate = Total CW+ACW flow (m3/hr) X dosage (ppm) /1000
= 92136 X 3/1000
= 276.4 kg/hr of 100% solution.

Specific gravity = 1 (approx).
Chemical dosage rate = 276.4 /1 LPH (Approx).
= 276.4 LPH.
Chemical dosage rate Considered. = 276.4 LPH (Approx).
Chemical Dosing Pump = 500 LPH (Selected).

3.0 CONTROL & INSTRUMENTATION

The operation of the Circulating Water Treatment System (including Scale Inhibitor Injection System, Corrosion Inhibitor Injection System, Biocide Injection System & Sulphuric Acid Injection System) shall be from DDCMIS located in CW Pump house.

The OWS shall have 24" colour TFT monitor, keyboard, mouse etc.

All the dosing/injection Pumps shall be operated from OWS. Local operation (start/stop) is also provided through LPBS. Normally one (1) no. pump will be in service and one (1) no. will be as stand-by pump selection through OWS.

1 Sulphuric acid will be unloaded from road tankers by Sulphuric Acid Transfer Pumps into over ground Sulphuric Acid Storage Tanks kept at suitable elevation to enable transfer of acid from Acid Storage tank to Acid Day Tank. The starting & stopping of Pump Shall be from OWS in Auto/Manual mode. Local Push Button provided near to the pumps for Emergency Stop. The Acid Storage tank is equipped with the instruments such as level indicator and the level Transmitter which will generate Low level alarm & High level alarm for low level & high level indication respectively. The high level inter lock in the Storage tank shall be used for tripping of Sulphuric Acid Unloading Pump to prevent tank Overflow.

1 The Sulphuric Acid Injection Pumps shall be operated from OWS in Auto/Manual mode. Local operation (start/stop) is also provided through LPBS. In the auto mode, the stroke shall be adjusted by sensing pH of Circulating Water. During normal operation, Sulphuric Acid Injection Pumps will operate in the auto-mode and inject sulphuric acid to maintain the pH of circulating water at a desired level to control scale deposition or corrosion. Adjustment of stroke shall be possible from remote as well as local manually.

Normally one (1) no. pump will be in service and one (1) no. will be as stand-by pump selection through OWS.

1 All effluents from Sulphuric Acid storage tank and Injection area will pass through a Lime/Neutralization Pit for neutralization before discharge into nearest Plant Drain.

The operation of Scale Inhibitor Injection Pumps shall be automatic as well as local manual.

Normally one (1) no. pump will be in service and one (1) no. will be as stand-by pump selection through OWS.

The operation of Corrosion Inhibitor Injection Pumps shall be automatic as well as local manual.

Normally one (1) no. pump will be in service and one (1) no. will be as stand-by pump selection through OWS.

Monitoring equipment with reference to scale formation, corrosion and biological growth need to be provided to supervise the performance of the treatment systems.

1 ON/OFF/TRIP status of all pumps, agitators and drive motors as required shall be displayed in OWS.
All pumps shall be tripped at Low Low level in respective tank. Acid unloading pumps shall be tripped at high level of bulk acid storage tank. High Level alarm shall be provided in each tank.

All drive motors shall be provided with arrangement of local starting and stopping (through LPBS). Local starting shall be possible through remote/local selector switch in MCC. Tripping of drive motors locally shall be permissible irrespective of position of remote/local selector switch. Provision for locking the local stop push buttons after tripping the motor from local push button shall be there.
Annunciation showing tripping of different motors, level alarms from level switches/transmitters shall be located in the Operating Station.

Hard wired annunciation system shall also be provided for critical alarm in CW Pump House.

1 The measurement of all Instruments(except gauges) and operation of Motor driven Drives & Auto Valves shall be through OES/OS in DDCMIS, placed in CWPH.

The ON/OFF/module disturbance status of drive Motors for all Pumps will be provided in DDCMIS by BHEL.