

CONTRO PHILOSOPHY AND SYSTEM DESIGN FOR PROPOSED CPP

Vikash Metal & Power Ltd. is operating a Sponge Iron Plant at Santuri in Purulia ,Dist.,West Bengal . We are presently two numbers 100 TPD Sponge Iron Plant and working both of in its 80% of utilization of their own capacity , we are expanding now two more 100TPD Sponge Iron Plant which are under construction in the said premises and which scheduled to be commissioned by end September,2005. We are also taken into action to install three numbers 8 Tons Induction Furnaces along with 4/7 meter radius caster in our Billet casting plant to produce Ingot and Billet in the same premises. Further to the above , our next phase enhancing projects simultaneously in the same area will come in stage wise one for three strand Hot Rolling Mills to produce TMT bars and after we are going to install 9 MW Arc Furnace & its auxiliaries for Ferro Alloy Plant .

In order to meet the enhanced power demand of the entire complex rather than existing power given from DVC , we proposed to construct 10 MW Captive Power Plant utilizing the waste heat of flue gas from the plant . This will achieve the dual purpose of the energy saving and reduce environmental pollution . Meeting the above said requirement of our plant philosophy , the proposed captive plant is based on four Waste Heat Recovery Boilers and One Fluidised Bed Boiler operating on Coal and Char , with One considering Steam Turbine ,generating the required power for the plant as per the specifications and scope detailed out in our proposed technical main equipment parameters which attached hereunder in separate sheets .

The system is so designed that in even if one of the Kiln is stopped for maintenance the FBC boiler along with the other waste heat boilers will help in generating the 10 MW power. For this the plant layout shall be finalized during detailed Engineering stage keeping in view the functional and maintenance requirements , economy of piping and cables connections and optimal use of infrastructure facilities .

Systems Design Philosophy :

The proposed plant shall be configured with four nos. Waste Heat Recovery Boiler(**WHRB**) of capacity 10 TPH each operating at 66 Kg/cm² and 485 ± 5 °C .

The steam for generating the rated power will be generated by one number Fluidised bed boiler using Coal and Coal Char (**FBC**) used as stand by of capacity 15.0 TPH operating at 66 Kg/Cm² and 485 ± 5 °C .

The proposed one number **10 MW Steam Turbine** shall have one uncontrolled extraction connected to one constant pressure deaerator normally working at 125 °C feed water temperature.

The steam generated in the four boilers would be sufficient to generate 9.399 MW of power.

The feed water system of boilers is sized to support the installed capacity of boilers to enable 10.0 MW power generation .

One induced draft FRP counter flow **Cooling Tower** with three cells of adequate capacity to meet the design operating point of the proposed CPP is envisaged .

5 m³/hr. rated flow capacity single steam fully manual operated outdoor type **DM Plant** is envisaged for the proposed CPP. More over the final capacity of DM tank will be decided after finalization of plant layout drawings and other related equipment.

All **Electrical** equipment will confirm to relevant IS/IEC standards and recommendations of IEEE standards .

One centralized **Control System** is envisaged for the operation of major equipment (Boiler,STG, CW System) in the plant and other auxiliary systems (Compressors and DM Plant) shall be operated from their relay based local control panels / station .

The steam at required parameters to STG would be provided through a main steam header . All boilers will be connected to this main steam header .

The fuel handling system shall be provided with one number conveyor for coal fines and coal char . The crushed and coal / char shall be fed to the ground hopper from the existing storage yard . The coal char will be generated in the process of sponge iron manufacturing and treated as waste . So we will be using the same as fuel in FBC Boiler .

Therefore we are using waste gas and waste char as fuel for steam generation and utilizing for the power fully. Therefore this project is more viable and Eco-friendly.

The ash handling system shall be provided for handling bed ash and fly ash generated from the FBC Boiler only . No additions shall be made to the existing ash handling arrangement provided for the Sponge Iron Kilns .

The source of raw water required for the plant is to be drawn from Damodar river . This is the basis of the selection of Multi grade filter / Ultra Filtration / RO / DM water treatment plant . For this which one is mostly suitable for taking in our account will depends the characteristics of raw water analysis report to be taken after finalization of this projects. In that case we will provide the water analysis report for the basis of that report the designer will accommodated the selection of water treatment equipments .

CONTROL PHILOSOPHY FOR SELECTION OF 10 MW CAPTIVE POWER PLANT (CPP).

To recover the sensible heat contained in waste gases from sponge iron exhaust, Waste Heat Recovery Boiler is incorporated on waste heat steam. The boiler unit generates high pressure, high temperature steam which shall be fed to the steam turbine to generate electric power.

WHRB BOILER STEAM GENERATION FROM 1X 100 TPD SPONGE:

Flue Gas Quantity generated from 100TPD Kiln	24,000Nm ³ /hr
Outlet Gas Enthalpy from 100 TPD Kiln @ 950°C	261.92 Kcal/Kg
Outlet Gas Enthalpy at WHR Boiler @ 170°C	39.15 Kcal/Kg
Density of Gas	1.3118 Kg/m ³
Actual Gas Flow (Flue Gas Quantity × Density of Gas)	31483.2 Kg/hr
Heat Available {Actual Gas Flow ×(Inlet Gas Enthalpy –Outlet Gas Enthalpy)}	7013512 Kcal/hr
Radiation Heat Loss 1% (Heat Available × 1/100)	70135.12 Kcal/Hr
Blow down Loss 1.1% (Heat Available × 1.1/100)	77148.64 Kcal/hr
Actual Heat Available {Heat Available – (Radiation Heat Loss + Blowdown Loss)}	6866229 Kcal/hr
Steam Enthalpy or Total Heat at 66 Ksc(g), 490°C	810.08 Kcal/Kg
Feed Water Enthalpy at 126°C	127.38 Kcal /Kg
Generated Steam at 67 Ksc(g), 485°C {Actual Heat Available /(Steam Enthalpy – Feed Water Enthalpy)}	10,057.46 Kg/hr
	-10.057 TPH

Through the waste gas generated from 1×100 TPD Kiln, We can generate 10,057 Kg/hr of steam by incorporating the 1×10TPH WHR Boiler.

Further if one WHR is not in operation it means that one DRI kiln is not running which means one induction furnace is not working (feed stock for this furnace is from DRI kiln), hence it is to be understood that this FBC boiler are not installed to operate 10 MW all the time this is just to compensate the fluctuations in the steam supply of WHR boilers. So if one WHR is not in operation then the power output will be only 7.5 MW not 10 MW.