

Review of Sulphuric Acid Plant Waste Heat Boiler System

Client: Technip Energies, Chennai

Project: IFFCO, Paradeep, Odisha

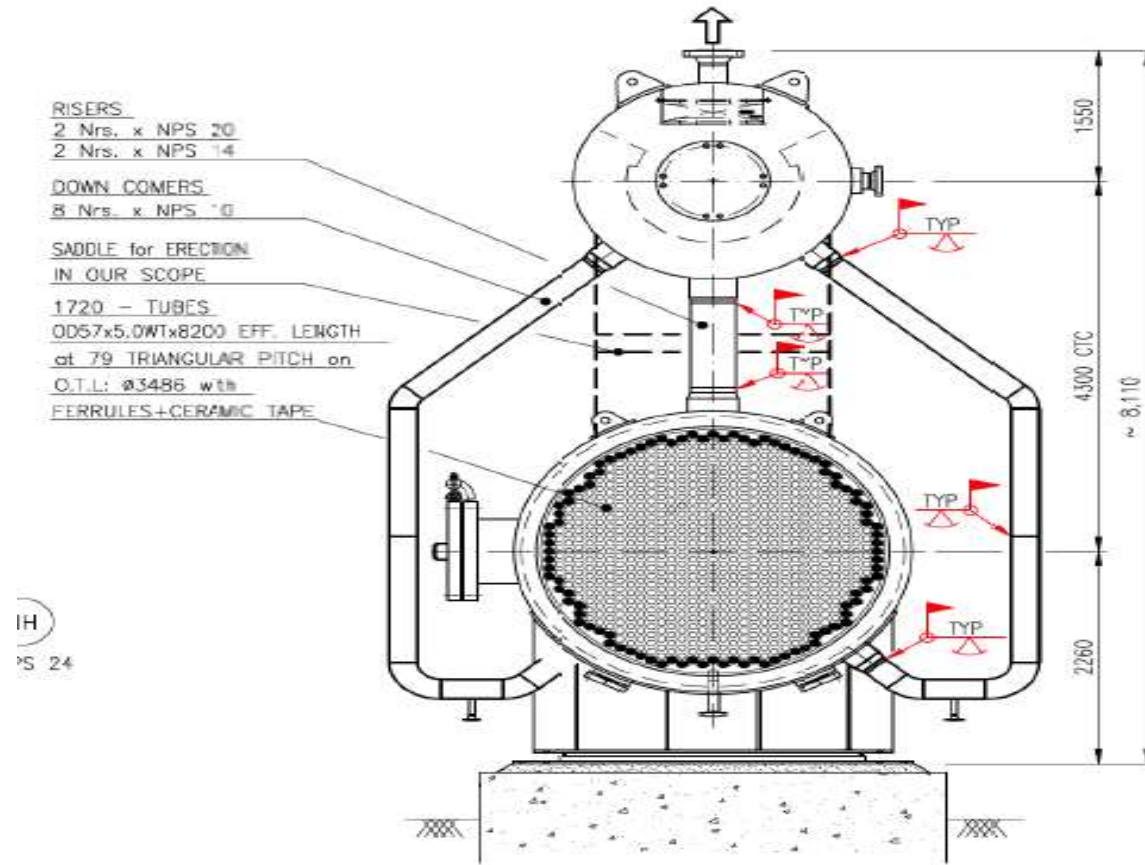
Scope Of Work:

- i) Technical Bid evaluation**
- ii) Thermal design verification**
- iii) Mechanical design verification**
- iv) Weight estimation of Pressure parts and non-pressure parts**
- v) Bill of material of Pressure parts and non-pressure parts**
- vi) Estimated cost and predicted price range**

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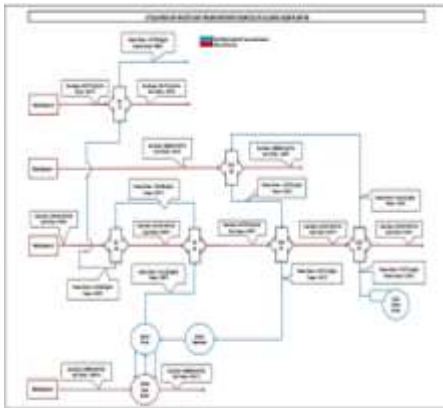
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ADVANCED ENGINEERING SERVICES			
WEIGHT COMPARISON SHEET			
Sl.No.	Description	AES Estimated Fabrication Weight in MT	TSPL provided Empty Weight in MT
1	WHB	280	280
2	Steam drum	81	85
3	Riser DC piping	6	5
4	Steam Separator	10	10
5	SUPERHEATER, 1C		
	Top Vestibule	4	4.5
	Top Tube bank	38	35
	Bottom Tube bank	43	40
	Bottom Vestibule	8	8
6	SUPERHEATER, 4B		
	Top Vestibule	4	3.5
	Tube bank	29	24
	Bottom Vestibule	5	20
7	SUPERHEATER, 5A		
	Top Vestibule	8	3.5
	Tube bank	21	28
	Bottom Vestibule	5	20
8	ECO 5C		
	Tube bank	61	60
9	ECO 5A		
	Tube bank	79	93
10	ECO 3B		
	Top Vestibule	4	3.5
	Top Tube bank	81	51
	Bottom Tube bank	29	71
	Bottom Vestibule	6	20

Project: IFFCO

Date: 08.12.2021



PROJECT NAME: IFFCO
BOILER PARAMETERS: 1 x 121 TPA @ 400 + 8 Deg C

SHELL THICKNESS CALCULATION - SA 191 GR. 1B

WASTE HEAT BOILER SHELL

Sl.No.	Description	Units	Value
1	Design pressure, MPa	MPa	15.1
2	Maximum Working Temperature, T1	°C	394
3	Water Temperature, T2 = T1 + 10 (Outside the Drum)	°C	394
4	WHD Shell (T)	mm	307
PROPOSED WORKING STRESS (σ) = 81.13			
5	σ = Allowable stress at 300 deg C	MPa	138
6	σ = Allowable stress at 250 deg C	MPa	138
7	σ = Allowable stress at rated temperature	MPa	138.33
8	σ = Allowable Stress at Water temperature (From ASME Section II)	MPa	138.33
9	Thickness of WHB Shell, T1	mm	138
10	Permissible Working Stress (σ)	MPa	138.33
CORROSION EFFICIENCY (CORROSIONAL CORRECTION OF BULK TUBES)			
11	(C) (Longitudinal) = (2 - 0.1) x		1.000
MINIMUM THICKNESS			
12	Corrosion Allowance	mm	0.8
13	Rolling Allowance	mm	0.8
14	Corrosion Allowance	mm	0.8
15	Total Required thickness	mm	111.30
16	Thickness Provided, T2	mm	110
17	Allowance = T2 - T1	mm	-1.308

ADVANCED ENGINEERING SERVICES				
THERMAL DESIGN CHECK COMPARISON				
Sl.No.	Description	Unit(s)	TSPL Provided Data	AES Output
1	WASTE HEAT BOILER SHELL			
	GAS VOLUME (includes gas bypass)	Nm ³ /hr	198984	198984
	GAS VOLUME (95% FLOW)	Nm ³ /hr	-	189034
	GAS DENSITY	kg/Nm ³	-	1.4454
	GAS FLOW (95% FLOW)	kg/hr	-	273236
	GAS INLET TEMPERATURE	°C	3094	3094
	GAS EXIT TEMPERATURE at WHB	°C	-	382
	GAS DUTY	Mkcal/hr	51.4	54.9
	BYPASS GAS FLOW (5% FLOW)	kg/hr	-	14362
	MIXED GAS TEMPERATURE	°C	405	407
	STEAM FLOW	kg/hr	121238	121238
	SATURATED STEAM INLET TEMP	°C	284	284
	SURFACE AREA	m ²	2526	2526
2	SUPER HEATER 1C			
	GAS FLOW	kg/hr	287990	287990
	GAS INLET TEMPERATURE	°C	611	611
	GAS EXIT TEMPERATURE	°C	435	435
	GAS DUTY	Mkcal/hr	12.9	12.7
	STEAM FLOW	kg/hr	121238	121238
	STEAM INLET TEMP	°C	320	320
	STEAM EXIT TEMPERATURE	°C	480	480
	STEAM DUTY	Mkcal/hr	12.9	12.7
	SURFACE AREA	m ²	2645	2637
3	SUPER HEATER 4B			
	GAS FLOW	kg/hr	212152	212152
	GAS INLET TEMPERATURE	°C	443	443
	GAS EXIT TEMPERATURE	°C	395	399
	GAS DUTY	Mkcal/hr	2.6	2.5
	STEAM FLOW	kg/hr	121238	121238
	STEAM INLET TEMP	°C	297	297
	STEAM EXIT TEMPERATURE	°C	320	318
	STEAM DUTY	Mkcal/hr	2.6	2.5
	SURFACE AREA	m ²	798	796
4	SUPER HEATER 5A			
	GAS FLOW	kg/hr	212147	212147
	GAS INLET TEMPERATURE	°C	395	395
	GAS EXIT TEMPERATURE	°C	356	359