

ERK Eckrohrkessel GmbH

2006-01-24

Date :

Lloyd Steel Sponge Iron (AVA) .

Project-No 05_0188

Drawing-No 9883_20_Arev2.dwg

Filename gmk2401C

Name Manoj Kumar Guthikonda

General boiler data

Steam flow : 10.9 t/h Steam temperature : 490.0 °C
 Drum pressure(abs) : 76.0 bar Outlet pressure (abs) : 75.0 bar
 Saturation temp : 251.4 °C Feed water temp : 140.0 °C

Conduction-Radiation loss : 1.75 %
 Blow down : 1.00 %
 Calculated efficiency : 80.49 % (25°C) related to LHV

Fuel data

Fuel : Waste Heat

Flue gas data

Mass flow 9.27 kg/s standard volume flow 25000 Nm³/hGas density (0°C, 1.013bar) : 1.3350 kg/Nm³

Flue gas pressure : 1013 mbar

Composition Volume contents Mass contents

CO ₂	17.00	25.18
H ₂ O	12.00	7.23
N ₂	67.70	63.73
O ₂	3.00	3.21
SO ₂	0.30	0.66

mean Gas- Velocity head Draft loss

	velocity [m/s]	at inlet [mbar]	[mbar]
Economizer	9.69	0.144	0.062
Superheater 2	9.40	0.145	0.170
Superheater 1	8.47	0.136	0.349
Evaporator 1	7.38	0.149	0.917
Evaporator 2	6.91	0.107	0.723
Economizer 3	9.21	0.268	1.110
Economizer 2	8.31	0.256	3.996
Economizer 1	9.06	0.324	2.657

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Temperatures after		Fouling	
		Fouling factor	$k_{fouling}$ [W/m ² K]
Temp. at Gas Entr	970.0 °C		
Economizer	916.0 °C	0.80	300
Superheater 2	840.6 °C	0.77	300
Superheater 1	686.4 °C	0.78	300
Evaporator 1	416.9 °C	0.82	300
Evaporator 2	333.5 °C	0.84	300
Economizer 3	306.6 °C	0.77	300
Economizer 2	218.9 °C	0.79	300
Economizer 1	169.3 °C	0.78	300

Transferred heat					
		Transferred heat to			
		Heating surface	Wall surface		
		[KW]	[m ²]	[KW]	[m ²]
Economizer	60.8	349.46	8.8	58.81	1.5
Superheater 2	64.8	718.67	26.3	179.41	4.6
Superheater 1	62.6	1476.72	61.3	324.60	10.7
Evaporator 1	52.7	2674.98	219.7	329.50	27.2
Evaporator 2	48.0	791.05	219.7	97.17	27.2
Economizer 3	66.1	275.86	57.5	5.72	3.4
Economizer 2	62.8	903.70	229.8	-0.00	13.4
Economizer 1	65.5	309.05	93.4		

Heating surfaces							
		Gas pass		Pitch		Tubes	
		length	width	cross	long.	per	Number
		[mm]	[mm]	[mm]	[mm]	row	of rows
Economizer		2076	2196	93	90	22.0	2
Superheater 2		2076	2169	93	90	22.0	6
Superheater 1		2076	2169	93	90	22.0	14
Evaporator 1		2076	2169	93	80	23.0	40
Evaporator 2		2076	2169	93	80	23.0	40
Economizer 3		2070	1280	80	90	16.0	18
Economizer 2		2070	1280	80	90	16.0	72
Economizer 1		2070	1045	80	90	13.0	36
							Tube arrangement

Tubes				
		Diameter	Wall thickness	Parallel
		[mm]	[mm]	Tubes
Economizer		31.75	3.66	5.0
Superheater 2		31.75	4.50	22.0
Superheater 1		31.75	4.50	22.0
Evaporator 1		38.10	3.66	*****
Evaporator 2		38.10	3.66	*****
Economizer 3		31.75	3.66	16.0
Economizer 2		31.75	3.66	16.0
Economizer 1		31.75	3.66	13.0
				Effective Length mm

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Steam data

	Steam temp. [°C]		Tube wall temp. [°C]		mean veloc. [m/s]	mean spec. w. [kg/m³]	Pressure drop [bar]
	Inlet	Outlet	Inlet	Outlet			
Superheater 2 paral. flow	398.4	490.0	424.3	512.0	14.0	24.28	0.374
Superheater 1 counterflow	291.4	448.1	468.6	306.4	11.2	28.82	0.639

Preheater

	Water temp. [°C]		Tube wall temp. [°C]		mean veloc. [m/s]	mean spec. w. [kg/m³]	Pressure drop [bar]
	Inlet	Outlet	Inlet	Outlet			
Economizer counterflow	253.0	275.8	282.7	260.7	1.7	780.11	0.215
Economizer 3 paral. flow	233.9	253.7	235.6	255.0	0.5	809.11	0.040
Economizer 2 counterflow	164.7	233.9	235.1	165.9	0.4	871.32	0.145
Economizer 1 counterflow	140.0	164.7	165.5	141.1	0.5	918.44	0.105