DOCUMENT TITLE:

HEAT AND MATERIAL BALANCE
FOR
SWS UNIT

DOCUMENT NO: 108-GP-E-411833

TOTAL PAGES: 8

Rev.	Date	Purpose of Issue	Issue Code	Owner's Action	Prepared by	Checked by	Approved by
B0	2021.DEC.22	Approved for BEDP			ARY	AAD	BGO
2	2021.JUN.28	For Approval	IFA		ARY	AAD	BGO
1	2021.APR.05	For Approval	IFA		ARY	AAD	BGO
0	2021.FEB.09	For Comment	IFC		ARY	AAD	BGO

شرکت پالایش نفت بندرعباس BANDAR ABBAS OIL REFINING COMPANY شماره پروژه:1668	BANDAR ABBAS OIL REFINERY HEAVY PRODUCTS QUALITY UPGRADING PROJECT BASED ON USING DELAYED COKER	PHASE: EB		
		PROJ. NO.1668	UNIT/ITM: 108	
MC:HEIDCO Research Institute of Petroleum Industry	HEAT AND MATERIAL BALANCE FOR SWS UNIT	SPEC. NO: 108-GP-E-411833	SH/OF: 1 / 8	
		REV. 0 1 2 B0		

Sheet No.	Internal Issue	CHANGE INDEX DURING FORMAL ISSUES					Sheet No.	Internal Issue	CHANGE INDEX DURING FORMAL ISSUES				
		First Issue	Second Issue	Third Issue	Fourth Issue				First Issue	Second Issue	Third Issue	Fourth Issue	
NO.	REV. A	REV.0	REV.1	REV.2	REV.B0		NO.	REV. A	REV.0	REV.1	REV.2	REV.B0	
1		√	√	√	√		51						
2		√	√	√			52						
3		√	√	√			53						
4		√	√	√			54						
5		√	√	√			55						
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	شرکت پالایش نفت بندرعباس BANDAR ABBAS OIL REFINING COMPANY شماره پروژه:1668		BANDAR ABBAS OIL REFINERY HEAVY PRODUCTS QUALITY UPGRADING PROJECT BASED ON USING DELAYED COKER			PHASE: EB					
						PROJ. NO.1668			UNIT/ITM: 108		
MC:HEIDCO			HEAT AND MATERIAL BALANCE FOR SWS UNIT			SPEC. NO: 108-GP-E-411833			SH/OF: 2 / 8		
						REV.	0	1	2	B0	

1	Stream Number		01	02	03	04	05				
2 3	Stream Name		SOUR WATER TO SURGE DRUM	OFF GAS FROM SURGE DRUM	RECOVERED OIL TO PUMP (Note 1)	RECOVERED OIL TO SLOPS TANK (Note 1)	SOUR WATER FROM SURGE DRUM				
4	Stream Description	**Unit**									
5	Vapor Mass Percent	wt%	0.01	100.00	0.00	0.00	0.00				
6	Temperature	°C	54	53	54	54	54				
7	Pressure	bar (g)	2.2	1.1	(Note 3)	5.4	(Note 3)				
8	Total Mass Flow	kg/h	99264.7	17.3	(Note 1)	113.8	99133.7				
9	Total Mol Flow	kmol/h	5458.4	0.6	(Note 1)	1.4	5456.4				
10	Total Heat Flow	MW	-423.71	0.0	(Note 1)	-0.1	-423.63				
11	Total Molecular Weight	kg/kmol	18.19	29.64	81.77	81.77	18.17				
12	Total Flowing Density	kg/m³	917.4	2.3	632.6	632.9	955.8				
13											
14	**Liquid Phase**										
15	Mass Flow Rate	kg/h	99250.3		(Note 1)	113.8	99133.7				
16	Molar Flow Rate	kmol/h	5457.9		(Note 1)	1.4	5456.4				
17	Flow Rate @ op. cond.	m³/h	103.9		(Note 1)	0.2	103.7				
18	Standard Volume Flow Rate	m³/h	102.6		(Note 1)	0.2	102.5				
19	Molecular Weight	kg/kmol	18.18		81.77	81.77	18.17				
20	Flowing Density	kg/m³	955.3		632.6	632.9	955.8				
21	Specific Gravity @ 15/15 °C	-	0.9679		0.6675	0.6675	0.9685				
22	Viscosity	cP	0.4602		0.2265	0.2260	0.4590				
23	Surface Tension	dyne/cm	46.05		14.96	14.93	45.95				
24	Mass Enthalpy	kJ/kg	-15368.7		-2331.4	-2330.5	-15384.1				
25	Mass Heat Capacity	kJ/(kg.°C)	3.9505		2.3445	2.3440	3.9524				
26	Thermal Conductivity	W/(m.K)	0.6123		0.1096	0.1095	0.6138				
27											
28	**Vapor Phase**										
29	Mass Flow Rate	kg/h	14.5	17.3							
30	Molar Flow Rate	kmol/h	0.5	0.6							
31	Flow Rate @ op. cond.	m³/h	4.3	7.4							
32	Molecular Weight	kg/kmol	28.06	29.64							
33	Flowing Density	kg/m³	3.3616	2.3319							
34	Viscosity	cP	0.0115	0.0114							
35	Compressibility Factor	-	0.9862	0.9896							
36	CP/Cv Ratio	-	1.1887	1.1798							
37	Mass Enthalpy	kJ/kg	-1733.1	-1744.2							
38	Mass Heat Capacity	kJ/(kg.°C)	1.9805	1.9224							
39	Thermal Conductivity	W/(m.K)	0.0533	0.0496							
40											
41	Stream Composition		mol %	wt %	mol %	wt %	mol %	wt %	mol %	wt %	mol %	wt %
42	N2		0.00	0.00	0.89	0.84	0.00	0.00	0.00	0.00	0.00	0.00
43	H2		0.01	0.00	44.33	3.01	0.10	0.00	0.10	0.00	0.00	0.00
44	C2		0.00	0.00	0.59	0.60	0.04	0.01	0.04	0.01	0.00	0.00
45	C3		0.00	0.00	0.42	0.63	0.08	0.04	0.08	0.04	0.00	0.00
46	C4		0.00	0.00	0.32	0.62	0.17	0.12	0.17	0.12	0.00	0.00
47	C5+		0.03	0.14	20.26	58.91	92.76	97.75	92.76	97.75	0.00	0.02
48	CO2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49	H2S		1.00	1.87	28.07	32.27	2.82	1.18	2.82	1.18	0.99	1.87
50	NH3		0.96	0.90	0.08	0.05	0.01	0.00	0.01	0.00	0.96	0.90
3	Water		98.01	97.09	5.04	3.06	4.02	0.88	4.02	0.88	98.04	97.21
4	SUM		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	شرکت پالایش نفت بندرعباس BANDAR ABBAS OIL REFINING COMPANY شماره پروژه:1668		BANDAR ABBAS OIL REFINERY HEAVY PRODUCTS QUALITY UPGRADING PROJECT BASED ON USING DELAYED COKER				PHASE: EB				
							PROJ. NO.1668		UNIT/ITM: 108		
MC:HEIDCO	Research Institute of Petroleum Industry		HEAT AND MATERIAL BALANCE FOR SWS UNIT				SPEC. NO: 108-GP-E-411833		SH/OF: 3 / 8		
							REV.	0 1	2	B0	

1	Stream No.		06	07	08	09		10			
2 3	Stream Name		SOUR WATER TO FILTER COALESCER	PREHEATED SOUR WATER TO STRIPPER	SOUR WATER TO STRIPPER	ACID GAS FROM STRIPPER		COOLED ACID GAS TO REFLUX DRUM			
4	Stream Description	**Unit**									
5	Vapor Mass Percent	wt%	0.00	0.00	0.09	100.00		35.78			
6	Temperature	°C	54	85	85	116		90			
7	Pressure	bar (g)	7.1	5.7	1.6	1.5		1.3			
8	Total Mass Flow	kg/h	99133.7	99133.7	99133.7	9613.1		9613.1			
9	Total Mol Flow	kmol/h	5456.4	5456.4	5456.4	477.8		477.8			
10	Total Heat Flow	MW	-423.61	-420.13	-420.13	-22.86		-26.54			
11	Total Molecular Weight	kg/kmol	18.17	18.17	18.17	20.12		20.12			
12	Total Flowing Density	kg/m³	956.0	939.2	735.6	1.6		5.1			
13											
14	**Liquid Phase**										
15	Mass Flow Rate	kg/h	99133.7	99133.7	99047.8			6173.4			
16	Molar Flow Rate	kmol/h	5456.4	5456.4	5453.8			333.2			
17	Flow Rate @ op. cond.	m³/h	103.7	105.5	105.4			6.9			
18	Standard Volume Flow Rate	m³/h	102.5	102.5	102.3			6.5			
19	Molecular Weight	kg/kmol	18.17	18.17	18.16			18.53			
20	Flowing Density	kg/m³	956.0	939.2	939.8			889.1			
21	Specific Gravity @ 15/15 °C	-	0.9685	0.9685	0.9690			0.9553			
22	Viscosity	cP	0.4585	0.2975	0.2986			0.2587			
23	Surface Tension	dyne/cm	45.93	36.44	42.96			53.15			
24	Mass Enthalpy	kJ/kg	-15383.4	-15257.0	-15268.2			-13480.3			
25	Mass Heat Capacity	kJ/(kg.°C)	3.9522	4.2138	4.2152			4.2898			
26	Thermal Conductivity	W/(m.K)	0.6138	0.5613	0.5722			0.5944			
27											
28	**Vapor Phase**										
29	Mass Flow Rate	kg/h			85.9	9613.1		3439.7			
30	Molar Flow Rate	kmol/h			2.6	477.8		144.6			
31	Flow Rate @ op. cond.	m³/h			29.4	6053.6		1860.8			
32	Molecular Weight	kg/kmol			32.99	20.12		23.79			
33	Flowing Density	kg/m³			2.9233	1.5880		1.8485			
34	Viscosity	cP			0.0142	0.0106		0.0113			
35	Compressibility Factor	-			0.9830	0.9833		0.9860			
36	CP/Cv Ratio	-			1.2474	1.3279		1.3175			
37	Mass Enthalpy	kJ/kg			-2344.8	-8560.5		-3584.0			
38	Mass Heat Capacity	kJ/(kg.°C)			1.3505	1.7756		1.5264			
39	Thermal Conductivity	W/(m.K)			0.0220	0.0273		0.0259			
40											

41	Stream Composition		mol %	wt %	mol %	wt %	mol %	wt %	mol %	wt %	mol %	wt %
42	N2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
43	H2		0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02	0.00
44	C2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45	C3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46	C4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
47	C5+		0.00	0.02	0.00	0.02	0.00	0.02	0.05	0.21	0.05	0.21
48	CO2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49	H2S		0.99	1.87	0.99	1.87	0.99	1.87	14.02	23.75	14.02	23.75
50	NH3		0.96	0.90	0.96	0.90	0.96	0.90	18.05	15.27	18.05	15.27
3	Water		98.04	97.21	98.04	97.21	98.04	97.21	67.86	60.76	67.86	60.76
4	SUM		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

شرکت پالایش نفت بندرعباس BANDAR ABBAS OIL REFINING COMPANY شماره پروژه:1668	BANDAR ABBAS OIL REFINERY HEAVY PRODUCTS QUALITY UPGRADING PROJECT BASED ON USING DELAYED COKER				PHASE: EB		
					PROJ. NO.1668		UNIT/ITM: 108
MC:HEIDCO Research Institute of Petroleum Industry	HEAT AND MATERIAL BALANCE FOR SWS UNIT				SPEC. NO: 108-GP-E-411833		SH/OF: 4 / 8
					REV. 0 1	2 B0	

1	Stream No.		11		12		13		14		15
2 3	Stream Name		ACID GAS FROM REFLUX DRUM		ACID GAS TO HEADER		ACID GAS TO SRU		REFLUX TO PUMP		REFLUX FROM PUMP
4	Stream Description	**Unit**									
5	Vapor Mass Percent	wt%	100.00		100.00		100.00		0.00		0.00
6	Temperature	°C	90		90		89		90		90
7	Pressure	bar (g)	1.3		1.1		1.1		(Note 3)		6.0
8	Total Mass Flow	kg/h	3439.7		3439.7		3456.9		6173.4		6173.4
9	Total Mol Flow	kmol/h	144.6		144.6		145.1		333.2		333.2
10	Total Heat Flow	MW	-3.43		-3.43		-3.44		-23.12		-23.11
11	Total Molecular Weight	kg/kmol	23.79		23.79		23.82		18.53		18.53
12	Total Flowing Density	kg/m³	1.8		1.7		1.7		889.1		888.9
13											
14	**Liquid Phase**										
15	Mass Flow Rate	kg/h							6173.4		6173.4
16	Molar Flow Rate	kmol/h							333.2		333.2
17	Actual Volume Flow Rate	m³/h							6.9		6.9
18	Standard Volume Flow Rate	m³/h							6.5		6.5
19	Molecular Weight	kg/kmol							18.53		18.53
20	Flowing Density	kg/m³							889.1		888.9
21	Specific Gravity @ 15/15 °C	-							0.9553		0.9553
22	Viscosity	cP							0.2587		0.2580
23	Surface Tension	dyne/cm							53.15		53.11
24	Mass Enthalpy	kJ/kg							-13480.3		-13479.0
25	Mass Heat Capacity	kJ/(kg.°C)							4.2898		4.2892
26	Thermal Conductivity	W/(m.K)							0.5944		0.5944
27											
28	**Vapor Phase**										
29	Mass Flow Rate	kg/h	3439.7		3439.7		3456.9				
30	Molar Flow Rate	kmol/h	144.6		144.6		145.2				
31	Flow Rate @ op. cond.	m³/h	1860.6		2037.6		2044.5				
32	Molecular Weight	kg/kmol	23.79		23.79		23.82				
33	Flowing Density	kg/m³	1.8486		1.6881		1.6908				
34	Viscosity	cP	0.0142		0.0142		0.0142				
35	Compressibility Factor	-	0.9860		0.9872		0.9872				
36	CP/Cv Ratio	-	1.3160		1.3148		1.3137				
37	Mass Enthalpy	kJ/kg	-3594.0		-3594.0		-3584.8				
38	Mass Heat Capacity	kJ/(kg.°C)	1.5304		1.5284		1.5307				
39	Thermal Conductivity	W/(m.K)	0.0247		0.0247		0.0248				
40											

41	Stream Composition	mol %	wt %	mol %	wt %	mol %	wt %	mol %	wt %	mol %	wt %
42	N2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
43	H2	0.07	0.01	0.07	0.01	0.25	0.02	0.00	0.00	0.00	0.00
44	C2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45	C3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46	C4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
47	C5+	0.16	0.59	0.16	0.59	0.24	0.88	0.00	0.00	0.00	0.00
48	CO2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49	H2S	37.55	53.78	37.55	53.78	37.51	53.67	3.82	7.02	3.82	7.02
50	NH3	36.13	25.86	36.13	25.86	35.99	25.73	10.20	9.37	10.20	9.37
3	Water	26.09	19.75	26.09	19.75	26.00	19.67	85.98	83.61	85.98	83.61
4	SUM	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	شرکت پالایش نفت بندرعباس BANDAR ABBAS OIL REFINING COMPANY شماره پروژه:1668		BANDAR ABBAS OIL REFINERY HEAVY PRODUCTS QUALITY UPGRADING PROJECT BASED ON USING DELAYED COKER				PHASE: EB				
							PROJ. NO.1668		UNIT/ITM: 108		
MC:HEIDCO			HEAT AND MATERIAL BALANCE FOR SWS UNIT				SPEC. NO: 108-GP-E-411833		SH/OF: 5 / 8		
							REV.	0 1	2	B0	

1	Stream No.		16	17	18	19		20			
2 3	Stream Name		REFLUX TO STRIPPER	STRIPPER TO REBOILER	REBOILER VAPORS TO STRIPPER	STRIPPED WATER TO STRIPPER BOTTOM		STRIPPED WATER FROM STRIPPER			
4	Stream Description	**Unit**									
5	Vapor Mass Percent	wt%	0.00	0.00	100.00	0.00		0.00			
6	Temperature	°C	90	133	133	133		133			
7	Pressure	bar (g)	5.1	2.1	2.0	2.0		2.2			
8	Total Mass Flow	kg/h	6173.4	112520.6	16826.6	95694.0		95694.0			
9	Total Mol Flow	kmol/h	333.2	6245.9	934.0	5311.9		5311.9			
10	Total Heat Flow	MW	-23.11	-481.78	-61.83	-409.74		-409.74			
11	Total Molecular Weight	kg/kmol	18.53	18.02	18.02	18.02		18.02			
12	Total Flowing Density	kg/m³	888.8	919.1	1.6	919.1		919.1			
13											
14	**Liquid Phase**										
15	Mass Flow Rate	kg/h	6173.4	112520.6		95694.0		95694.0			
16	Molar Flow Rate	kmol/h	333.2	6245.9		5311.9		5311.9			
17	Actual Volume Flow Rate	m³/h	6.9	122.4		104.1		104.1			
18	Standard Volume Flow Rate	m³/h	6.5	110.9		94.3		94.3			
19	Molecular Weight	kg/kmol	18.53	18.02		18.02		18.02			
20	Flowing Density	kg/m³	888.8	919.1		919.1		919.1			
21	Specific Gravity @ 15/15 °C	-	0.9553	1.0157		1.0157		1.0157			
22	Viscosity	cP	0.2579	0.2056		0.2056		0.2056			
23	Surface Tension	dyne/cm	53.11	52.12		52.12		52.12			
24	Mass Enthalpy	kJ/kg	-13479.0	-15414.2		-15414.4		-15414.4			
25	Mass Heat Capacity	kJ/(kg.°C)	4.2895	4.4997		4.4998		4.4998			
26	Thermal Conductivity	W/(m.K)	0.5944	0.6879		0.6879		0.6879			
27											
28	**Vapor Phase**										
29	Mass Flow Rate	kg/h			16826.6						
30	Molar Flow Rate	kmol/h			934.0						
31	Flow Rate @ op. cond.	m³/h			10398.3						
32	Molecular Weight	kg/kmol			18.02						
33	Flowing Density	kg/m³			1.6182						
34	Viscosity	cP			0.0133						
35	Compressibility Factor	-			0.9796						
36	CP/Cv Ratio	-			1.3408						
37	Mass Enthalpy	kJ/kg			-13227.8						
38	Mass Heat Capacity	kJ/(kg.°C)			1.9456						
39	Thermal Conductivity	W/(m.K)			0.0272						
40											

41	Stream Composition	mol %	wt %	mol %	wt %	mol %	wt %	mol %	wt %	mol %	wt %
42	N2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
43	H2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
44	C2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45	C3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46	C4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
47	C5+	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48	CO2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49	H2S	3.82	7.02	0.00	0.00	0.00	0.00	0.00	< 7 ppmw	0.00	< 7 ppmw
50	NH3	10.20	9.37	0.00	0.00	0.01	0.01	0.00	< 23 ppmw	0.00	< 23 ppmw
3	Water	85.98	83.61	100.00	100.00	99.99	99.99	100.00	100.00	100.00	100.00
4	SUM	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	شرکت پالایش نفت بندرعباس BANDAR ABBAS OIL REFINING COMPANY شماره پروژه:1668		BANDAR ABBAS OIL REFINERY HEAVY PRODUCTS QUALITY UPGRADING PROJECT BASED ON USING DELAYED COKER				PHASE: EB				
							PROJ. NO.1668		UNIT/ITM: 108		
MC:HEIDCO	Research Institute of Petroleum Industry		HEAT AND MATERIAL BALANCE FOR SWS UNIT				SPEC. NO: 108-GP-E-411833		SH/OF: 6 / 8		
							REV.	0 1	2	B0	

1	Stream No.		21	22	23	24		25			
2 3	Stream Name		STRIPPED WATER FROM PREHEATER	STRIPPED WATER PUMP TO AIR COOLER	STRIPPED WATER TO TRIM COOLER	STRIPPED WATER FROM TRIM COOLER		STRIPPED WATER HEADER (Note 2)			
4	Stream Description	**Unit**									
5	Vapor Mass Percent	wt%	0.00	0.00	0.00	0.00		0.00			
6	Temperature	°C	104	104	60	45		45			
7	Pressure	bar (g)	(Note 3)	8.2	7.5	7.3		6.3			
8	Total Mass Flow	kg/h	95694.0	95694.0	95694.0	95694.0		95694.0			
9	Total Mol Flow	kmol/h	5311.9	5311.9	5311.9	5311.9		5311.9			
10	Total Heat Flow	MW	-413.22	-413.20	-418.29	-420.01		-420.01			
11	Total Molecular Weight	kg/kmol	18.02	18.02	18.02	18.02		18.02			
12	Total Flowing Density	kg/m³	944.8	945.0	980.7	992.3		992.3			
13											
14	**Liquid Phase**										
15	Mass Flow Rate	kg/h	95694.0	95694.0	95694.0	95694.0		95694.0			
16	Molar Flow Rate	kmol/h	5311.9	5311.9	5311.9	5311.9		5311.9			
17	Actual Volume Flow Rate	m³/h	101.3	101.3	97.6	96.4		96.4			
18	Standard Volume Flow Rate	m³/h	94.3	94.3	94.3	94.3		94.3			
19	Molecular Weight	kg/kmol	18.02	18.02	18.02	18.02		18.02			
20	Flowing Density	kg/m³	944.8	945.0	980.7	992.3		992.3			
21	Specific Gravity @ 15/15 °C	-	1.0157	1.0157	1.0157	1.0157		1.0157			
22	Viscosity	cP	0.2683	0.2681	0.4631	0.5939		0.5937			
23	Surface Tension	dyne/cm	57.89	57.87	65.96	68.62		68.61			
24	Mass Enthalpy	kJ/kg	-15545.4	-15544.5	-15735.8	-15800.7		-15800.7			
25	Mass Heat Capacity	kJ/(kg.°C)	4.4066	4.4052	4.3287	4.3171		4.3173			
26	Thermal Conductivity	W/(m.K)	0.6822	0.6822	0.6535	0.6376		0.6376			
27											
28	**Vapor Phase**										
29	Mass Flow Rate	kg/h									
30	Molar Flow Rate	kmol/h									
31	Flow Rate @ op. cond.	m³/h									
32	Molecular Weight	kg/kmol									
33	Flowing Density	kg/m³									
34	Viscosity	cP									
35	Compressibility Factor	-									
36	CP/Cv Ratio	-									
37	Mass Enthalpy	kJ/kg									
38	Mass Heat Capacity	kJ/(kg.°C)									
39	Thermal Conductivity	W/(m.K)									
40											
41	Stream Composition		mol %	wt %	mol %	wt %	mol %	wt %	mol %	wt %	mol %	wt %
42	N2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
43	H2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
44	C2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45	C3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46	C4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
47	C5+		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48	CO2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49	H2S		0.00	< 7 ppmw	0.00	< 7 ppmw	0.00	< 7 ppmw	0.00	< 7 ppmw	0.00	< 7 ppmw
50	NH3		0.00	< 23 ppmw	0.00	< 23 ppmw	0.00	< 23 ppmw	0.00	< 23 ppmw	0.00	< 23 ppmw
3	Water		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
4	SUM		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

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						PROJ. NO.1668			UNIT/ITM: 108		
MC:HEIDCO			HEAT AND MATERIAL BALANCE FOR SWS UNIT			SPEC. NO: 108-GP-E-411833			SH/OF: 7 / 8		
						REV.	0	1	2	B0	

1	Stream No.		26	27	28	29					
2 3	Stream Name		STRIPPED WATER TO PROCESS UNITS	STRIPPED WATER TO WWT UNIT	STRIPPED WATER TO WWT UNIT	LS FROM B.L.					
4	Stream Description	**Unit**									
5	Vapor Mass Percent	wt%	0.00	0.00	0.00	100.00					
6	Temperature	°C	45	45	45	210					
7	Pressure	bar (g)	6.3	6.3	5.6	4.1					
8	Total Mass Flow	kg/h	45777.0	49917.0	49917.0	16318.7					
9	Total Mol Flow	kmol/h	2541.0	2770.8	2770.8	905.8					
10	Total Heat Flow	MW	-200.92	-219.09	-219.09	-59.15					
11	Total Molecular Weight	kg/kmol	18.02	18.02	18.02	18.02					
12	Total Flowing Density	kg/m³	992.3	992.3	992.3	2.4					
13											
14	**Liquid Phase**										
15	Mass Flow Rate	kg/h	45777.0	49917.0	49917.0						
16	Molar Flow Rate	kmol/h	2541.0	2770.8	2770.8						
17	Actual Volume Flow Rate	m³/h	46.1	50.3	50.3						
18	Standard Volume Flow Rate	m³/h	45.1	49.2	49.2						
19	Molecular Weight	kg/kmol	18.02	18.02	18.02						
20	Flowing Density	kg/m³	992.3	992.3	992.3						
21	Specific Gravity @ 15/15 °C	-	1.0157	1.0157	1.0157						
22	Viscosity	cP	0.5937	0.5937	0.5935						
23	Surface Tension	dyne/cm	68.61	68.61	68.61						
24	Mass Enthalpy	kJ/kg	-15800.7	-15800.7	-15800.7						
25	Mass Heat Capacity	kJ/(kg.°C)	4.3173	4.3173	4.3174						
26	Thermal Conductivity	W/(m.K)	0.6376	0.6376	0.6376						
27											
28	**Vapor Phase**										
29	Mass Flow Rate	kg/h				16318.7					
30	Molar Flow Rate	kmol/h				905.8					
31	Flow Rate @ op. cond.	m³/h				6939.7					
32	Molecular Weight	kg/kmol				18.02					
33	Flowing Density	kg/m³				2.3515					
34	Viscosity	cP				0.0164					
35	Compressibility Factor	-				0.9751					
36	CP/Cv Ratio	-				1.3396					
37	Mass Enthalpy	kJ/kg				-13048.8					
38	Mass Heat Capacity	kJ/(kg.°C)				2.1461					
39	Thermal Conductivity	W/(m.K)				0.0348					
40											
41	Stream Composition		mol %	wt %	mol %	wt %	mol %	wt %	mol %	wt %	mol %	wt %
42	N2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
43	H2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
44	C2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
45	C3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
46	C4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
47	C5+		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
48	CO2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
49	H2S		0.00	< 7 ppmw	0.00	< 7 ppmw	0.00	< 7 ppmw	0.00	0.00		
50	NH3		0.00	< 23 ppmw	0.00	< 23 ppmw	0.00	< 23 ppmw	0.00	0.00		
3	Water		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00		
4	SUM		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00		

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			PROJ. NO.1668			UNIT/ITM: 108			
MC:HEIDCO	Research Institute of Petroleum Industry	HEAT AND MATERIAL BALANCE FOR SWS UNIT	SPEC. NO: 108-GP-E-411833			SH/OF: 8 / 8			
			REV.	0	1	2	B0		

GENERAL NOTEs:

1 - NA: NOT APPLICABLE

NOTEs:

1- This stream is intermittent flow, and is averagely 113.8 kg/hr (1.4 kmol/h, 0.2 m^3/h).

Standard Volume Flow Rate: 0.2 m^3/h

Total Heat Flow: -0.07 MW

2 - Stripped water specifications are as follows:

Maximum H2S content is 7 ppmw

Maximum NH3 content is 23 ppmw

3 - Pressure is in accordance with Hydraulic Calculation.