

DATA SHEET - SHELL AND TUBE HEAT EXCHANGER

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1 Customer	THAI OIL PUBLIC COMPANY LIMITED	Equipment Tag No.	F-10703
2 Plant Location	SRIRACHA, THAILAND		
3 Service of Unit	VACUUM TOWER FEED FURNACE		

4 **NOTES (CONTINUED):**

5 33. TUBE SIDE HEATING CURVE FOR VR HOS BOTTOMS FEED @ 0.3 BAR (A):

Temp °C	Pressure Bar (a)	Enthalpies				Crit Temp - TC		Crit Press - PC	
		Vapor MW	Liquid MW	Water MW	Total MW	Vapor K	Liquid K	Vapor Bar (a)	Liquid Bar (a)
354	0.3	16.35	79.76	0.00	0.00	866	970	15.7	13.4
357	0.3	17.72	79.53	0.00	1.14	867	972	15.6	13.3
359	0.3	19.22	79.19	0.00	2.31	868	974	15.6	13.3
362	0.3	20.84	78.76	0.00	3.49	870	975	15.5	13.2
365	0.3	22.58	78.22	0.00	4.69	871	977	15.5	13.2
368	0.3	24.45	77.57	0.00	5.92	872	980	15.4	13.1
370	0.3	26.45	76.82	0.00	7.16	874	982	15.4	13.1
373	0.3	28.59	75.94	0.00	8.42	875	985	15.3	13.0
376	0.3	30.83	74.98	0.00	9.70	877	988	15.3	12.9
378	0.3	33.16	73.93	0.00	10.99	878	991	15.3	12.9

Temp °C	Pressure Bar (a)	Vap Flow kg/h	Vapor Mol. Wt	Vapor Wt Fraction	Liq Flow kg/h	Liquid Mol. Wt	Water Flow kg/h	Surf. Ten. dyne/cm	Latent Heat kJ/kg
354	0.3	52354	184.4	0.13	363309	525.3	0	16.7	206.9
357	0.3	56803	191.9	0.14	358859	528.1	0	16.6	206.1
359	0.3	61675	199.5	0.15	353988	531.3	0	16.6	205.3
362	0.3	66846	206.9	0.16	348812	534.7	0	16.5	204.5
365	0.3	72393	214.2	0.17	343269	538.5	0	16.4	203.7
368	0.3	78322	221.4	0.19	337336	542.7	0	16.3	202.9
370	0.3	84586	228.4	0.20	331077	547.2	0	16.3	202.1
373	0.3	91267	235.3	0.22	324395	552.2	0	16.2	201.3
376	0.3	98157	241.8	0.24	317505	557.5	0	16.2	200.4
378	0.3	105525	248.1	0.25	310136	563.3	0	16.1	199.6

Temp °C	Pressure Bar (a)	Densities		Specific Heats		Thermal Conductivities		Viscosities	
		Vapor kg/m³	Liquid kg/m³	Vapor kJ/kg·°C	Liquid kJ/kg·°C	Vapor W/m·°C	Liquid W/m·°C	Vapor cP	Liquid cP
354	0.3	0.95	809.4	2.579	2.871	0.035	0.064	0.012	0.649
357	0.3	0.98	808.8	2.588	2.877	0.035	0.063	0.012	0.643
359	0.3	1.01	808.3	2.598	2.883	0.034	0.063	0.012	0.638
362	0.3	1.04	807.8	2.607	2.890	0.034	0.063	0.011	0.634
365	0.3	1.07	807.5	2.616	2.896	0.034	0.062	0.011	0.630
368	0.3	1.11	807.3	2.625	2.902	0.034	0.062	0.011	0.628
370	0.3	1.14	807.3	2.633	2.908	0.034	0.062	0.011	0.627
373	0.3	1.17	807.3	2.642	2.914	0.034	0.062	0.011	0.626
376	0.3	1.20	807.7	2.651	2.919	0.034	0.061	0.011	0.627
378	0.3	1.22	808.0	2.659	2.925	0.034	0.061	0.011	0.629

53 Rev	0	1	2	3	4	5
54 Date/ By	29-Jan-2016 PJ	25-MAR-2016 PJ				
55 Chkd/Appr	PS WPB	PS WPB				

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CHEVRON LUMMUS GLOBAL



DATA SHEET - SHELL AND TUBE HEAT EXCHANGER

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1 Customer	Thai Oil Public Company Limited	Equipment Tag No.	F-10703
2 Plant Location	Sriracha, Thailand		
3 Service of Unit	VACUUM TOWER FEED FURNACE		

NOTES (CONTINUED):

TUBE SIDE HEATING CURVE FOR VR HOS BOTTOMS FEED @ 0.057 BAR (A):

Temp °C	Pressure Bar (a)	Enthalpies				Crit Temp - TC		Crit Press - PC	
		Vapor MW	Liquid MW	Water MW	Total MW	Vapor K	Liquid K	Vapor Bar (a)	Liquid Bar (a)
354	0.057	56.32	47.94	0.00	0.00	891	1047	14.9	11.7
357	0.057	58.37	47.07	0.00	1.18	892	1052	14.8	11.7
359	0.057	60.37	46.24	0.00	2.34	893	1057	14.8	11.6
362	0.057	62.29	45.45	0.00	3.49	894	1062	14.8	11.5
365	0.057	64.16	44.71	0.00	4.62	895	1067	14.7	11.4
367	0.057	65.98	44.01	0.00	5.73	896	1072	14.7	11.3
370	0.057	67.74	43.36	0.00	6.83	897	1077	14.7	11.2
373	0.057	69.45	42.73	0.00	7.92	898	1082	14.7	11.1
375	0.057	71.11	42.15	0.00	9.00	899	1087	14.7	11.0
378	0.057	72.73	41.60	0.00	10.06	899	1092	14.6	11.0

Temp °C	Pressure Bar (a)	Vap Flow kg/h	Vapor Mol. Wt	Vapor Wt Fraction	Liq Flow kg/h	Liquid Mol. Wt	Water Flow kg/h	Surf. Ten. dyne/cm	Latent Heat kJ/kg
354	0.057	194015	300.0	0.4668	221644	674.4	0	19.5	206.7
357	0.057	199944	302.7	0.4810	215715	685.2	0	19.5	205.8
359	0.057	205582	305.2	0.4946	210082	696.1	0	19.6	205.0
362	0.057	210921	307.5	0.5074	204738	707.2	0	19.6	204.1
365	0.057	215983	309.7	0.5196	199681	718.2	0	19.6	203.3
367	0.057	220782	311.7	0.5312	194882	729.3	0	19.6	202.5
370	0.057	225327	313.6	0.5421	190337	740.4	0	19.6	201.8
373	0.057	229640	315.5	0.5525	186023	751.6	0	19.7	201.1
375	0.057	233727	317.2	0.5623	181936	762.7	0	19.7	200.4
378	0.057	237606	318.8	0.5716	178058	773.7	0	19.7	199.7

Temp °C	Pressure Bar (a)	Densities		Specific Heats		Thermal Conductivities		Viscosities	
		Vapor kg/m³	Liquid kg/m³	Vapor kJ/kg·°C	Liquid kJ/kg·°C	Vapor W/m·°C	Liquid W/m·°C	Vapor cP	Liquid cP
354	0.057	0.33639	858.26940	2.595	2.845	0.030	0.063	0.010	1.356
357	0.057	0.33639	859.55088	2.602	2.851	0.030	0.063	0.010	1.392
359	0.057	0.33639	860.99254	2.610	2.856	0.030	0.062	0.010	1.430
362	0.057	0.33639	862.27402	2.617	2.862	0.030	0.062	0.010	1.469
365	0.057	0.33639	863.55550	2.624	2.867	0.030	0.062	0.010	1.509
367	0.057	0.33639	864.83698	2.631	2.873	0.031	0.062	0.010	1.550
370	0.057	0.33639	866.11845	2.639	2.878	0.031	0.061	0.010	1.592
373	0.057	0.33639	867.23974	2.646	2.884	0.031	0.061	0.010	1.634
375	0.057	0.33639	868.36104	2.653	2.889	0.031	0.061	0.010	1.677
378	0.057	0.33639	869.32215	2.660	2.895	0.031	0.061	0.010	1.720

53 Rev	0	1	2	3	4	5
54 Date/ By	26-FEB-2019	RDL				
55 Chkd/Appr	PS	WPB				

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1 Customer	Thai Oil Public Company Limited	Equipment Tag No.	F-10703
2 Plant Location	Sriracha, Thailand		
3 Service of Unit	VACUUM TOWER FEED FURNACE		

**NOTES (CONTINUED):**

TUBE SIDE HEATING CURVE FOR VR HOS BOTTOMS FEED @ 0.03 BAR (A):

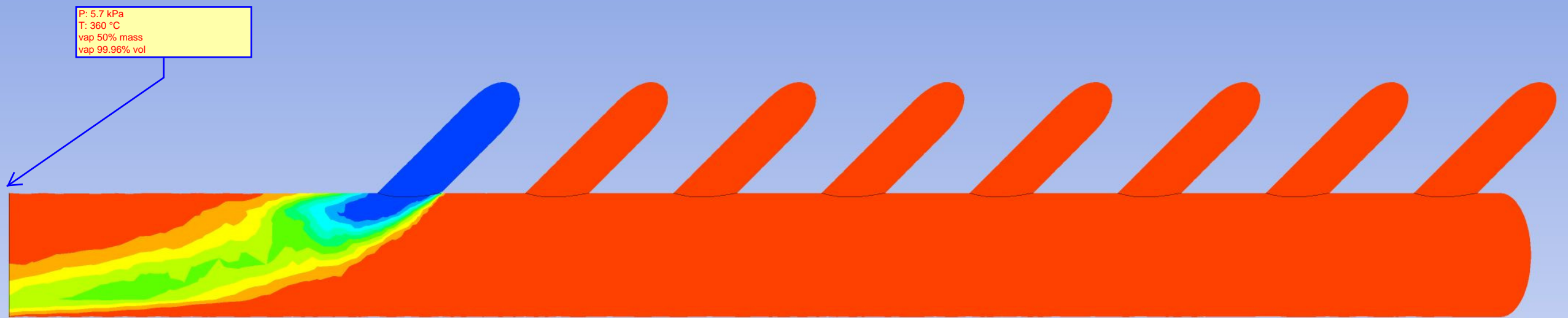
Temp °C	Pressure Bar (a)	Enthalpies				Crit Temp - TC		Crit Press - PC	
		Vapor MW	Liquid MW	Water MW	Total MW	Vapor K	Liquid K	Vapor Bar (a)	Liquid Bar (a)
354	0.03	67.32	39.18	0.00	0.00	898	1088	14.7	11.0
357	0.03	68.88	38.68	0.00	1.06	899	1093	14.7	10.9
359	0.03	70.39	38.21	0.00	2.10	900	1098	14.6	10.9
362	0.03	71.87	37.77	0.00	3.14	900	1103	14.6	10.8
365	0.03	73.31	37.36	0.00	4.16	901	1107	14.6	10.7
367	0.03	74.72	36.97	0.00	5.18	902	1112	14.6	10.6
370	0.03	76.10	36.60	0.00	6.19	903	1116	14.6	10.5
373	0.03	77.45	36.25	0.00	7.20	903	1121	14.5	10.5
375	0.03	78.78	35.92	0.00	8.20	904	1125	14.5	10.4
378	0.03	80.09	35.61	0.00	9.19	905	1129	14.5	10.3

Temp °C	Pressure Bar (a)	Vap Flow kg/h	Vapor Mol. Wt	Vapor Wt Fraction	Liq Flow kg/h	Liquid Mol. Wt	Water Flow kg/h	Surf. Ten. dyne/cm	Latent Heat kJ/kg
354	0.03	233138	316.5	0.5609	182526	764.1	0	20.9	206.8
357	0.03	237048	318.2	0.5703	178616	775.3	0	20.9	206.1
359	0.03	240758	319.7	0.5792	174901	786.4	0	20.9	205.5
362	0.03	244287	321.2	0.5877	171376	797.5	0	20.9	204.9
365	0.03	247639	322.6	0.5958	168024	808.5	0	20.9	204.3
367	0.03	250837	323.9	0.6035	164827	819.4	0	20.9	203.8
370	0.03	253890	325.2	0.6108	161769	830.3	0	20.9	203.3
373	0.03	256811	326.5	0.6178	158853	841.1	0	20.9	202.9
375	0.03	259605	327.7	0.6246	156059	851.9	0	20.9	202.4
378	0.03	262286	328.8	0.6310	153378	862.5	0	20.9	202.0

Temp °C	Pressure Bar (a)	Densities		Specific Heats		Thermal Conductivities		Viscosities	
		Vapor kg/m³	Liquid kg/m³	Vapor kJ/kg·°C	Liquid kJ/kg·°C	Vapor W/m·°C	Liquid W/m·°C	Vapor cP	Liquid cP
354	0.03	0.17620	880.21470	2.594	2.834	0.029	0.062	0.010	2.173
357	0.03	0.17620	881.33599	2.601	2.839	0.029	0.062	0.010	2.234
359	0.03	0.17620	882.29710	2.608	2.845	0.030	0.062	0.010	2.295
362	0.03	0.17620	883.09803	2.616	2.851	0.030	0.062	0.010	2.356
365	0.03	0.17620	884.05913	2.623	2.857	0.030	0.061	0.010	2.417
367	0.03	0.17620	884.86006	2.630	2.863	0.030	0.061	0.010	2.478
370	0.03	0.17620	885.50080	2.637	2.869	0.030	0.061	0.010	2.538
373	0.03	0.17620	886.14153	2.644	2.874	0.031	0.061	0.010	2.598
375	0.03	0.17620	886.78227	2.651	2.880	0.031	0.061	0.010	2.657
378	0.03	0.17620	887.42301	2.659	2.886	0.031	0.060	0.010	2.716

53 Rev	0	1	2	3	4	5
54 Date/ By	26-FEB-2019	RDL				
55 Chkd/Appr	PS	WPB				

**TEMPERATURE PROFILE @ LONGITUDINAL PLANE**



3 DIAMTERES BETWEEN 107-TICA-667A AND LAST BRANCH

