

Sugar Mill Calculations

Resource for Sugar Mill Calculations.....

	Exhaust	#1	#2	#3	#4	#5
Kgcm ² Vapour in		2.04	1.60	1.18	0.92	0.56
Kgcm ² Vapour out	2.04	1.60	1.18	0.92	0.56	0.16
Kgcm ² g Vapour out	1.02	0.58	0.16	-0.11	-0.46	-0.86
Vapour pressure, mmHg				79.26	338.25	634.23
Vapour pressure kPaa	199.88	156.84	115.97	89.73	55.21	15.76
Delta P, kPaa		43.0	40.9	26.2	34.5	39.5
Vapour temperature C	120.20	112.70	103.80	96.60	83.80	55.00
Juice inlet Brix		11.36	16.88	30.05	37.63	46.73
Water evaporated Kg/hr		1,75,957.74	1,58,859.88	41,022.52	31,660.71	30,183.87
Juice outlet Brix		16.88	30.05	37.63	46.73	60.74
Juice outlet Kg/hr	5,38,424.86	3,62,467.12	2,03,607.24	1,62,584.72	1,30,924.02	1,00,740.15
Avg. Brix		14.12	23.47	33.84	42.18	53.74
Purity of fluid		77.99	77.99	77.99	77.99	77.99
Juice level in tubes, m		0.60	0.60	0.60	0.60	0.60
Height of juice, ft		1.97	1.97	1.97	1.97	1.97
Density of juice (at avg Brix)		1.00	1.05	1.10	1.15	1.23
Hydrostatic head Psig		0.85	0.89	0.94	0.98	1.05
Hydrostatic head in half level (z/2), Kgcm ²		0.03	0.03	0.03	0.03	0.04
Hydrostatic head in half level (z/2), kPa		2.94	3.08	3.23	3.38	3.61
Total abs. pressure at bottom		1.63	1.21	0.95	0.60	0.20
Water boiling temp. at bottm, C		113.40	104.69	97.70	85.40	59.37
HUGOT, BPE-Hydrostatic head		0.70	0.89	1.10	1.60	4.37
Solberg, BPE-Hydrostatic head		0.73	0.93	1.16	1.69	4.54
Hugot, BPE-Bx		0.33	0.61	1.02	1.46	2.32
Solberg, BPE-Bx		0.31	0.70	1.26	1.77	2.52
PGW BPE-Bx		0.25	0.57	1.01	1.42	2.01
HUGOT, Avg. juice boiling temp.C		113.73	105.30	98.72	86.86	61.69
Solberg, Avg. juice boiling temp.C		113.74	105.43	99.02	87.26	62.06
HUGOT, Difference (Vapour temp & avg juice temp)		6.61	7.54	5.21	9.86	22.20
Solberg, Difference (Vapour temp & avg juice temp)		6.60	7.41	4.91	9.46	21.83
Dessin factor		0.0009	0.0009	0.0009	0.0008	0.0007
HUGOT, Heat transfer coefficient(Kg/m ² /hr/C)		4.96	3.70	2.80	1.82	0.82
Evaporation rate		32.81	27.92	14.59	17.95	18.23
Heating surface, m ²		5,363.09	5,690.30	2,811.20	1,763.79	1,655.31
Heating surface calculated using Solberg's BPE						
HUGOT, Heat transfer coefficient(Kg/m ² /hr/C)		4.96	3.70	2.80	1.82	0.82
Evaporation rate		32.75	27.46	13.77	17.22	17.93
Heating surface, m ²		5,372.50	5,785.76	2,979.08	1,838.56	1,683.20
Heat in Kcal		1,75,216	1,39,038	43,214	30,809	24,334

Latent heat of evap, J/Kg

	2201786.61	2222655.71	2246843.40	2265992.45	2299218.35
Evaporation rate, Kg/s	48.88	44.13	11.40	8.79	8.38
delta T eff	6.46	7.27	4.78	9.34	21.74

HTC Australian, W/m ² K (Defecation)	3058.56	2289.42	1943.67	1524.14	891.56
A area , m ² Defecation	5447.09	5890.86	2753.77	1399.97	994.61
1 HTC Australian, W/m ² K (Sulphitation)	2599.77	1946.01	1652.12	1295.52	757.83
A area , m ² (Sulphitation)	6408.34	6930.42	3239.73	1647.02	1170.13
HTC dessin (W/m ² K)	2753.82	2196.78	1628.55	1227.82	697.37
A area , m ²	6049.86	6139.29	3286.61	1737.83	1271.59
2 A area , m ² (Sulphitation)	2340.75	1867.26	1384.27	1043.65	592.76
A area , m ² (Sulphitation)	7117.48	7222.69	3866.60	2044.50	1495.99

Sugar Mill Calculations

Resource for Sugar Mill Calculations.....

HTC AuTrallian typical formula, W/m2K	3058.77	2287.12	1938.21	1517.34	886.39
A area , m2	5446.71	5896.78	2761.53	1406.24	1000.42

Juice boiling Temperature, C	113.73	105.30	98.72	86.86	61.69
Average Brix	14.1	23.5	33.8	42.2	53.7
Apparent purity	77.99	77.99	77.99	77.99	77.99
Bx-DS	4.84	4.84	4.84	4.84	4.84
DS est.	10.00	18.62	29.00	37.34	48.89
Correction	-2.11	8.11	19.74	30.34	46.67
True purity	80.63	80.63	80.63	80.63	80.63
Viscosity, Pa.s	0.00034	0.00049	0.00080	0.00142	0.00489

Broadfoot and Dunn, HTC	2754.51	2464.56	1424.04	1623.66	1437.77
A area , m2 Defecation	6048.35	5472.24	3758.61	1314.16	616.76
3	2341.33	2094.87	1210.44	1380.11	1222.10
A area , m2 (Sulphitation)	7115.70	6437.94	4421.89	1546.07	725.60

PGW, Austy 08, HTC Robert conventional defecation	2599.75	2068.05	1536.78	1367.76	884.74
A area , m2 Defecation	6408.40	6521.43	3482.89	1560.03	1002.28
4	2209.78	1757.85	1306.26	1162.60	752.03
A area , m2 (Sulphitation)	7539.30	7672.27	4097.51	1835.33	1179.16

PGW, Austy 08, HTC Robert radial flow defecation	3395.59	2701.13	2007.22	1786.46	1155.58
A area , m2 Defecation	4906.43	4992.97	2666.58	1194.40	767.37
	2886.25	2295.96	1706.14	1518.49	982.24
A area , m2	5772.28	5874.08	3137.16	1405.17	902.79

		#1	#2	#3	#4	#5
HTC average of 1 to 4	85	2,400	1,900	1,400	1,200	800
A area , m2 (Sulphitation)		6941.76	7098.24	3823.16	1778.12	1108.45
Vapour Out MT/Hr		176	159	41	32	30
Evaporation Rate, Kg/m2.Hr		25	22	11	18	27
% of Total Area		33.45	34.21	18.43	8.57	5.34
		5781.01	6117.77	3093.74	1696.68	1361.85

Design HTC, W/m2K	#1	#2	#3	#4	#5
Love et al 1999 SASTA	2500	2500	2000	1500	700
	1750	1750	1400	1050	490
Watson 1985 ASSCT Robert Type Raw Sugar Factory	2800				
	1960				
PG Wright ASSCT 2003		3000			
		2100			
Honig 1963, Robert Type	2800	1800	1400		900
	1960	1260	980		630
Rein and Love 1995 ISSCT, Kestner	2900	2100			
	2030	1470			
SASTA 1995, Roussear et al , FF tubular	1200				
	840				
Installed running area, m2	7200	6800	3200	2000	1700
HTC on available area, W/m2K	2300.0	2000.0	1700.0	1100.0	500.0
Evaporation Rate, Kg/m2.Hr	24.44	23.36	12.82	15.83	17.76