



Sugar Mill Calculations

Resource for Sugar Mill Calculations.....

Crushing Capacity, TCD	10560.00
Working Hour ~ Hrs	24.00
Crush, TCH	440.00
Milk of Lime, (V/V)	2.00
Filterate Juice % Cane	16.00
Filter Cake % Cane	2.70
Pol % Filtercake	1.80
Evaporator Supply Juice, MT/Hr	538.42
Evaporator Supply Juice Temperature, C	111.00
Evaporator Supply Juice Brix (Calculated)	11.36
Evaporator Outlet Syrup Brix (Calculated)	60.74
Evaporator Outlet Syrup Brix (Required)	60.00
% Evaporation (Required)	81.06
Water Evaporated (Required), MT/Hr	436.45
Syrup Quantity (Required), MT/Hr	101.98
Syrup Quantity (Calculated), MT/Hr	100.74

Juice, Syrup, Melt Heaters	Brix	Brix	Pol	Pol	Purity	Purity	Flow	Flow	% Rise
	In	Out	In	Out	In	Out	% Cane In	% Cane Out	
Raw Juice Heater	12.22		9.53		78.00		115.00		
Sulphited / Defecated Juice Heater	12.22		9.53		78.00		133.00		
Clear Juice Heater	11.75	11.36	9.16	9.16	77.99	80.64	119.08	122.37	3.28
Melt Heater	60.00								
Syrup Heater	60.00						23.18		
Filterate Heating	10.95								
Melt Concentrator	60	72							

Juice, Syrup, Melt Heaters	Flow	Flow	Specific Heat of Juice / Syrup / Melt				Water
	MT/Hr	MT/Hr					Added in DC Heater
	In	Out					
Raw Juice Heater	506.00	506.0			0.93		0.00
Sulphited / Defecated Juice Heater	585.20	586.7			0.93		1.47
Clear Juice Heater	523.97	538.4			0.93		14.45
Melt Heater	0.00	0.0			0.64		0.00
Syrup Heater	101.98	104.5			0.64		2.48
Filterate Heating	70.40				0.93		
Melt Concentrator	0.00						

Evaporator Conditions	Units	Exhaust	# 1	# 1	# 2	# 2
		In	In	Out	In	Out
delta T eff	C		7.50		8.90	
Vent T/Hr	MT/Hr		1.80		1.00	
Heat loss %	%		1.50		1.50	
Steam / Vapour temperature, C	C	120.20	120.20	112.70	112.70	103.80
Latent heat of evaporation	Kcal/Kg	525.89	525.89	530.87	530.87	536.65
Hugot design velocity, m/s	m/sec.	34.00	34.00	34.70	34.70	35.60
Specific volume	m3/kg	0.88	0.88	1.11	1.11	1.45
Water enthalpy	Kcal/Kg	120.45	120.45	112.85	112.85	103.86
Saturated vapour enthalpy	Kcal/Kg	646.34	646.34	643.73	643.73	640.51
Vapour Density	kg/m3	1.13	1.13	0.90	0.90	0.69

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Evaporator Conditions	Units	# 3		# 4		# 5	
		In	Out	In	Out	In	Out
delta T eff	C	7.20		12.80		28.80	
Vent T/Hr	MT/Hr	0.30		0.10		0.10	
Heat loss %	%	1.50		1.50		1.50	
Steam / Vapour temperature, C	C	103.80	96.60	96.60	83.80	83.80	55.00
Latent heat of evaporation	Kcal/Kg	536.65	541.22	541.22	549.16	549.16	566.30
Hugot design velocity, m/s	m/sec.	35.60	36.38	36.38	37.92	37.92	42.49
Specific volume	m3/kg	1.45	0.92	0.92	1.44	1.44	2.40
Water enthalpy	Kcal/Kg	103.86	96.61	96.61	83.76	83.76	54.95
Saturated vapour enthalpy	Kcal/Kg	640.51	637.84	637.84	632.92	632.92	621.25
Vapour Density	kg/m3	0.69	1.08	1.08	0.70	0.70	0.42

Bleeding required	Exhaust			# 1			# 2		
	Deg C	Deg C	DC=0	Deg C	Deg C	DC=0	Deg C	Deg C	DC=0
JUICE HEATING	In	Out	TUB =1	In	Out	TUB =1	In	Out	TUB =1
Raw Juice Heater									
Sulphited / Defecated Juice Heater				99.7	102	1	91.4	99.7	1
Clear Juice Heater				101	111	0	95	101	0
Melt Heater				60	90	1			
Syrup Heater									
Filterate Heating									
Melt Concentrator							60	72	

Bleeding required	# 3			# 4			# 5		
	Deg C	Deg C	DC=0	Deg C	Deg C	DC=0	Deg C	Deg C	DC=0
JUICE HEATING	In	Out	TUB =1	In	Out	TUB =1	In	Out	TUB =1
Raw Juice Heater				60.8	72	1	30	48.3	1
Sulphited / Defecated Juice Heater	76.2	89.9	1						
Clear Juice Heater									
Melt Heater									
Syrup Heater				57.9	80	0			
Filterate Heating				63.2	75	0			
Melt Concentrator									

Heaters	Condensate Heater			Clarifier flash Heater					
	Deg C	Deg C	DC=0	Deg C	Deg C	DC=0			
	In	Out	TUB =1	In	Out	TUB =1			
Mixed juice	48.3	60.8	1						
Sulphited juice	71.2	76.2	1	89.9	91.4	0			
Clear juice									
Melt heating									
Syrup heating									
Filterate juice heating									
Condensate heater	5								

Particulars	Massecuite				% Steam Required
	% Cane				
PAN BOILING					
Raw / Sulphitation			# 2		
A massecuite boiling			35		0.45
B massecuite boiling			12		0.35
C massecuite boiling			8		0.45
C1 massecuite boiling			1.5		0.45
Refinery			#2		% steam
R1 Massecuite			0		0.30
R2 Massecuite			0		0.30
R3 Massecuite			0		0.30
R 4 Massecuite			0		0.30

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Juice, Syrup, Melt Heaters	Exhaust			# 1			# 2		
	Steam	Cond.	Flow	Vapour	Cond.	Flow	Vapour	Cond.	Flow
	In	Out	Out	In	Out	Out	In	Out	Out
	MT/Hr	°C	MT/Hr	MT/Hr	°C	MT/Hr	MT/Hr	°C	MT/Hr
Raw Juice Heater			506.0						
Sulphited / Defecated Juice Heater			586.7	2.36	107.96	586.7	8.41	100.50	586.7
Clear Juice Heater			538.4	9.10	0.00	538.4	5.35	0.00	529.3
Melt Heater			0.0	0.00	0.00	0.0			
Syrup Heater			104.5						
Filterate Heating			71.8						
Melt Concentrator			0.0				0.0		0.0
Total Juice / Melt Heating	0.0			11.5			13.8		

Juice, Syrup, Melt Heaters	Condensate			Clarifier flash					
	Qty	372.06	MT/Hr	Qty	1.96	MT/Hr			
	Temp.	83.01	°C	Temp.	99.66	°C			
				Lat.H	539.29				
	Cond.	Cond.	Flow	Flash	99.69	Flow			
	In	Out	Out	Used	638.98	Out			
	MT/Hr	°C	MT/Hr	MT/Hr		MT/Hr			
Mixed juice	372.06	44.27	506.0						
Sulphited juice	372.06	66.39	585.2	1.47		586.7			

Total Juice / Melt Heating

Juice, Syrup, Melt Heaters	# 3			# 4			# 5		
	Vapour	Cond.	Flow	Vapour	Cond.	Flow	Vapour	Cond.	Flow
	In	Out	Out	In	Out	Out	In	Out	Out
	MT/Hr	°C	MT/Hr	MT/Hr	°C	MT/Hr	MT/Hr	°C	MT/Hr
Raw Juice Heater				9.6	76.84	506.0	15.2	48.66	506.0
Sulphited / Defecated Juice Heater	13.73	91.18	585.2	0.0	0.00	585.2	0.0	0.00	585.2
Clear Juice Heater									
Melt Heater									
Syrup Heater				2.5	0.00	104.5			
Filterate Heating				1.4	-	71.8			
Melt Concentrator									
Total Juice / Melt Heating	13.7			13.4			15.2		

	Exhaust	# 1	# 2	# 3	# 4	# 5		Flow
								In
Vent from Heaters								MT/Hr
Mixed juice					0.01	0.02	0.1	506.00
Sulphited juice		0.002	0.008	0.014			0.1	585.20
Clear juice		0.009	0.005				0.1	523.97
Melt Heater		0.000					0.1	0.00
Syrup					0.002		0.1	101.98
Filterate Heating					0.001		0.1	70.40
Melt Concentrator			0.000				0.1	0.00
Total Vent MT/Hr	0.000	0.011	0.014	0.014	0.013	0.015		

Total Vent MT/Hr

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Molasses Conditioners	Exhaust	# 1	# 2	# 3	# 4	# 5	Live Steam
A Heavy					0.97		
B Heavy					0.55		
C Light					0.39		
C1 Heavy					0.15		
R1 Molasses					0.00		
R2 Molasses					0.00		
R3 Molasses					0.00		
Total Molasses conditioners, MT/Hr	0.00	0.00	0.00	0.00	2.05	0.00	0.00

Pan Boiling	Exhaust	# 1	# 2	# 3	# 4	# 5
A Masseccuite			69.30			
B Masseccuite			18.48			
C Masseccuite			15.84			
C1 Masseccuite			2.97			
Pan Boiling						
R1 Masseccuite			0.00			
R2 Masseccuite			0.00			
R3 Masseccuite			0.00			
R 4 Masseccuite			0.00			
Total Pan Boiling (MT/Hr)	0.00	0.00	106.59	0.00	0.00	0.00

Vent from	Exhaust	# 1	# 2	# 3	# 4	# 5	Vent %
A Masseccuite			0.69				1
B Masseccuite			0.18				1
C Masseccuite			0.16				1
C1 Masseccuite			0.03				1
Vent from							Vent %
R1 Masseccuite			0.00				1
R2 Masseccuite			0.00				1
R3 Masseccuite			0.00				1
R 4 Masseccuite			0.00				1
Total Vent from Pan Boilings	0.00	0.00	1.07	0.00	0.00	0.00	

Miscellaneous Requirements	Exhaust	# 1	# 2	# 3	# 4	# 5	Live Steam
Pan Washings	0.00	4.40					
Sugar Melting		1.86					
Sulphur Melting							
Steam Ejectors							
Magma Pumps							
Centrifugal wash water							
Total Miscellaneous MT/Hr	0.00	6.26	0.00	0.00	0.00	0.00	0.00

VAPOUR BLEEDS	Exhaust	# 1	# 2	# 3	# 4	# 5	Live Steam
	0.00	17.73	121.42	13.74	15.49	15.17	0.00

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Steam / Vapour Properties	Exhaust	# 1	# 2	# 3	# 4	# 5	Live Steam
Steam Temperature C	120.2	112.7	103.8	96.6	83.8	55.0	
Specific Volume m ³ /Kg	0.90	1.13	1.48	1.87	2.94	9.58	
Velocity m/sec	25.0	30.0	35.0	40.0	45.0	50.0	

Line Size for Bleeding	Line Size	Line Size	Line Size	Line Size	Line Size	Line Size	Line Size
	mm	mm	mm	mm	mm	mm	mm
Juice, Syrup, Melt Heaters							
Mixed juice					470.24	1013.52	
Sulphited juice		176.90	355.10	477.09			
Clear juice		347.79	283.16				
Melt Heater		0.00					
Syrup					239.43		
Filterate Heating					178.56		
Melt Concentrator			0.00				
Molasses Conditioners							
A Heavy					149.57		
B Heavy					112.81		
C Light					94.59		
C1 Heavy					58.14		
R1 Molasses					1.24		
R2 Molasses					1.24		
R3 Molasses					1.24		
Total Molasses conditioners					161.35		
Pan Boiling - Sulphitation / Raw							
A Masseccuite			1019.44				
B Masseccuite			526.43				
C Masseccuite			487.38				
C1 Masseccuite			211.04				
Pan Boiling - Refinery							
R1 Masseccuite			0.00				
R2 Masseccuite			0.00				
R3 Masseccuite			0.00				
R 4 Masseccuite			0.00				
Total Pan Boiling			1163.09				
Miscellaneous Requirements							
Pan Washings		241.78					
Sugar Melting		157.20					
Sulphur Melting							
Steam Ejectors							
Magma Pumps							
Centrifugal wash water							

Quintuple Line Size	# 1	# 2	# 3	# 4	# 5
Inlet Vapour Quantity	185.00	158.226	37.435	27.282	16.1747
Flash Inlet	0	0.77004	2.9901	1.9585	9.79701
Total Inlet	185.00	159.00	40.43	29.24	25.97
Vent	1.80	1	0.3	0.1	0.1
Vapour Bled	17.73	121.42	13.74	15.49	15.17
Vapour to Next Calendria	158.226	37.4355	27.282	16.175	15.0163
Line Size	# 1	# 2	# 3	# 4	# 5
Inlet Vapour	1532.30	1449.87	749.26	672.59	611.55
Flash Inlet	0.00	101.15	211.76	180.21	475.95
Total Inlet	1532.30	1453.39	778.61	696.31	774.94
Vent	151.14	115.26	67.07	40.72	48.09
Vapour Bled	485.36	1349.42	477.33	598.39	1014.03
Vapour to Next Calendria	1449.87	749.26	672.59	611.55	1008.96