

**Technical proposal for Boiling house
Equipment for expansion of Sugar plant 2500
TCD to 4200 TCD**

**Client : M/s Shri Shankar SSK Ltd.
Sadashivnagar, Tal : Malshiras, Dist : Solapur**

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01) HEAT MASS BALANCE OF 4200 TCD (175 TCH) SUGAR PLANT

Absolute pressure and pressure drop

Exhaust condition: - 2.033 kg/cm² (120 Deg C)

Last body vacuum: - 0.204 (24'' vacuum) kg/cm²

Corresponding pressure/temp. Distribution of quintuple. Total pressure drop = $2.033 - 0.204 = 1.828$ kg/cm²

- 1) Pressure drop in 1st body = $11/50 \times 1.828 = 0.402$ kg/cm²
- 2) Pressure drop in 2nd body = $10.5/50 \times 1.828 = 0.384$ kg/cm²
- 3) Pressure drop in 3rd body = $10/50 \times 1.828 = 0.366$ kg/cm²
- 4) Pressure drop in 4th body = $9.5/50 \times 1.828 = 0.347$ kg/cm²
- 5) Pressure drop in 5th body = $9/50 \times 1.828 = 0.329$ kg/cm²

Then,

- 1) Absolute pressure in 1st body = $2.033 - 0.402 = 1.631$ kg/cm²
- 2) Absolute pressure in 2nd body = $1.631 - 0.384 = 1.246$ kg/cm²
- 3) Absolute pressure in 3rd body = $1.246 - 0.366 = 0.881$ kg/cm²
- 4) Absolute pressure in 4th body = $0.881 - 0.347 = 0.533$ kg/cm²
- 5) Absolute pressure in 5th body = $0.533 - 0.329 = 0.204$ kg/cm²

Corresponding pressure/temp. of quintuple are

I - 1.631 /113.24°C, II -1.246 /105.308°C, III -0.881/95.6°C, IV - 0.533 /82.548°C, V - 0.204 /60.371°C,

Corresponding latent heat are

I – 541.117 II -544.128 III -548.109 IV -553.89 V- 564.634

AMassecuite produced = $175 \times 28.362/100 = 49.633$ T/ Hr = 49633 Kg/ Hr.

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Vapour required For A Massecuite = $0.45 \times 49633 = 22335$ Kg/Hr.

B Massecuite produced = $175 \times 12.019 / 100 = 21.033$ Ton/ Hr = 21033 Kg/ Hr.

Vapour required For B Massecuite = $0.39 \times 21033 = 8329$ kg/Hr

C Massecuite produced = $175 \times 6.331/100 = 11.079$ Ton/ Hr = 11079 Kg/ Hr.

Vapour required For C Massecuite = $0.51 \times 11079 = 5650$ kg/Hr

Mix juice % cane = 100.079 %

Mix juice produced per hour = $4200/24 = 175.139$ Ton / hr = 175139 kg/hr.

Filtrate % cane = 14.2%

Sulphured juice % cane = 115.929%

Sulphured juice produced = $175 \times 1.15929 = 202.877$ ton /hr = 202877 kg/hr

- A) Vapour required for 1st raw juice heating from 30 deg. to 42deg.
in vapour line juice heater by last body vapour
= $175139 \times 0.9 \times (42-30) / 564.634$
= 3394 Kg/Hr

- B) Water required for 2nd raw juice heating from 42°C to 55°C by Hot condensate in
Condensate juice heater

$$= 175139 \times 0.9 \times (55-42) / (105-65) = 56920 \text{ kg/hr} = 51.23 \text{ T/hr}$$

- C) Vapour required for 3rd raw juice heating from 55 deg. to 72deg.
in Tubular juice heater by 4th Body vapour
= $175139 \times 0.9 \times (72-55) / 548.102 = 4954.00$ kg / hr

- D) Vapour required for 1st Sulphured juice heating from 70°C to 85°C
by 2nd body vapour in Tubular juice heater by 2nd Body vapour
= $202877 \times 0.9 \times (85-70) / 548.109 = 5060$ kg / hr

- E) Vapour required for 2nd Sulphured juice heating from 85°C to 102°C
by 1st body vapour in Tubular juice heater

$$= 202877 \times 0.9 \times (102 - 85) / 541.117 = 5812 \text{ kg/hr}$$

F) Vapour required for Clear juice heating from 96°C to 110°C by 1st body vapour in DCH
 $= 180129 \times 0.9 \times (103 - 96) / 541.117 = 2084 \text{ kg/hr}$

G) Vapour required for Clear juice heating from 103°C to 110°C
By Exhaust steam in tubular JH
 $= 180129 \times 0.9 \times (110 - 103) / 538.729$
 $= 2093 \text{ Kg/Hr}$

Vapour produced by 5th body = $X + 3394$

Vapour produced by 4th body = $X + 3394$

Vapour produced by 3rd body = $X + 3394 + 4954 + 5060$

Vapour produced by 2nd body = $X + 3394 + 4954 + 5060 + 22335 + 8329 + 5650$

Vapour produced by 1st body = $X + 3394 + 4954 + 5060 + 22335 + 8329 + 5650 + 5812 + 2084 + 3500$

Total vapour produced = $5X + 131054$

Total evaporation = $180129 (60 - 14.409 / 60) = 134210 \text{ kg/hr}$

$$5X + 131054 = 134210 \quad X = 0631 \text{ kg/hr}$$

1) Vapour produced by 5th body = 4026 Kg/Hr

2) Vapour produced by 4th body = 4026 Kg/Hr

3) Vapour produced by 3rd body = 14042 Kg/Hr

4) Vapour produced by 2nd body = 50356 Kg/Hr

5) Vapour produced by 1st body = 61761 Kg/Hr

Then

A) Heating surface of 1st body $= 61761 / 28 = 2206 \approx 2800 \text{ m}^2$ approximate

B) Heating surface of 2nd body – $50356/22 = 2289 \text{ m}^2 \approx 2500 \text{ m}^2$ approximate

C) Heating surface of 3rd body – $14042/15 = 936 \approx 900 \text{ m}^2$ approximate

D) Heating surface of 4th body – $4026/12 = 335 \approx 540 \text{ m}^2$ approximate

E) Heating surface of 5th body – $4026/12 = 335 \approx 440 \text{ m}^2$ approximate

$$\begin{aligned}\text{Steam \% cane} &= (61.761/175) \times 100 \\ &= 35.292\%\end{aligned}$$

(Considered 2.968 Mt/Hr exhaust required for CJ2 heating and Misc. use)

$$\text{Steam \% on Cane Will be} = (64.729/175) \%$$

$$= \mathbf{36.99 \%}$$

Brixes in Quintuple bodies

1. 1st Effect Evaporator Body

$$B \times J = B1 \times J1$$

$$14.409 \times 176.627 = B1 \times (176.627 - 61.761)$$

$$B1 = 22.156$$

2. 2nd effect Evaporator Body

$$B1 \times J1 = B2 \times J1$$
$$22.156 \times 114.866 = B2 \times (114.866 - 50.356)$$

$$B2 = 39.451$$

3. 3rd Effect Evaporator Body

$$B2 \times J2 = B3 \times J3$$
$$39.451 \times 64.509 = B3 \times (64.509 - 14.042)$$

$$B3 = 50.428$$

4. 4th Effect Evaporator Body

$$B3 \times J3 = B4 \times J4$$
$$50.428 \times 50.467 = B4 \times (50.467 - 4.026)$$

$$B4 = 54.799$$

5. 5th Effect Evaporator Body

$$B4 \times J4 = B5 \times J5$$
$$54.799 \times 46.442 = B5 \times (46.422 - 4.026)$$

$$B5 = 60.00$$

AVERAGE BRIXES IN QUINTUPLE EVAPORATOR BODIES

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Raw Juice Brix = 14.214

1. 1st Effect Evaporator Body

$$\frac{14.409 + 22.156}{2}$$

B1 = 18.283

2. 2nd effect Evaporator Body

$$\frac{22.156 + 39.451}{2}$$

B2 = 30.804

3. 3rd Effect Evaporator Body

$$\frac{39.451 + 50.428}{2}$$

B3 = 44.940

4. 4th Effect Evaporator Body

$$\frac{50.428 + 54.799}{2}$$

B4 = 52.614

5. 5th Effect Evaporator Body

54.799+60.00

= -----

2

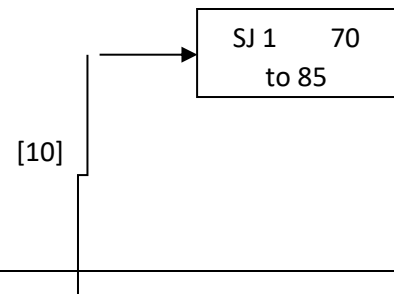
B5 = 57.400

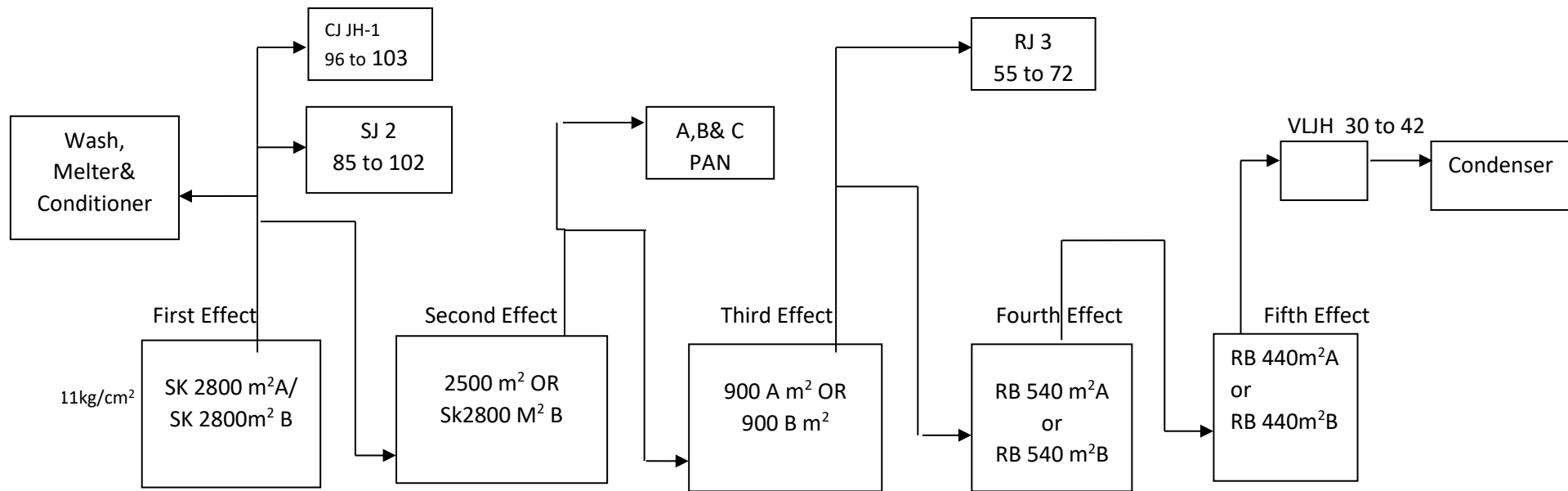
2) EXISTING AND PRAPOSED EVAPORATOR AND JUICE HEATER ARRANGEMENT

Evaporators			
EXISTING	PROPOSED Case 1	PROPOSED Case 2	PROPOSED Case 3

WORKING	STANDBY	WORKING	STANDBY	WORKING	STANDBY	WORKING	STANDBY
2,800	NIL	2800A	2800 B	2800A	2,500	2800B	2800A
2,500	900A+700	2,500		2800B		2,500	
900B	NII	900B	900A	900A	900B	900B	900A
560	560	560A	560B	560B	560A	560A	560B
440	440.000	440A	440B	440B	440A	440A	440B


JC Heaters					
Heating	EXISTING		PROPOSED		New
	WORKING	STANDBY	WORKING	STANDBY	
RJ1	350 M2	350M2	350M2	350M2	Nil
RJ2	NIL	NIL	170M2	170M2	Use spare JH
RJ3	170M2	170M2	170M2	170M2	Existing JH rearrange
SJ1	170M2	170M2	170M2	170M2	
SJ2	170M2		170M2		
CJ1	170M2	NIL	170M2	No need	Existing JH rearrange
CJ2	NIL	NIL	170M2		





	I Effect	II effect	III Effect	IV Effect	V Effect
Existing	SK2800 M2 A	2500 M2	900 M2	540M2	440M2
Case i	SK2800 M2 A	2500 M2	900 M2 B	540M2 A	440M2 A
Case ii	SK2800 M2 B	2500 M2	900 M2 A	540M2 B	440M2 B
Case iii	SK2800 M2 A	SK 2800 M2 B	900 M2 B	540M2 A	440M2 A

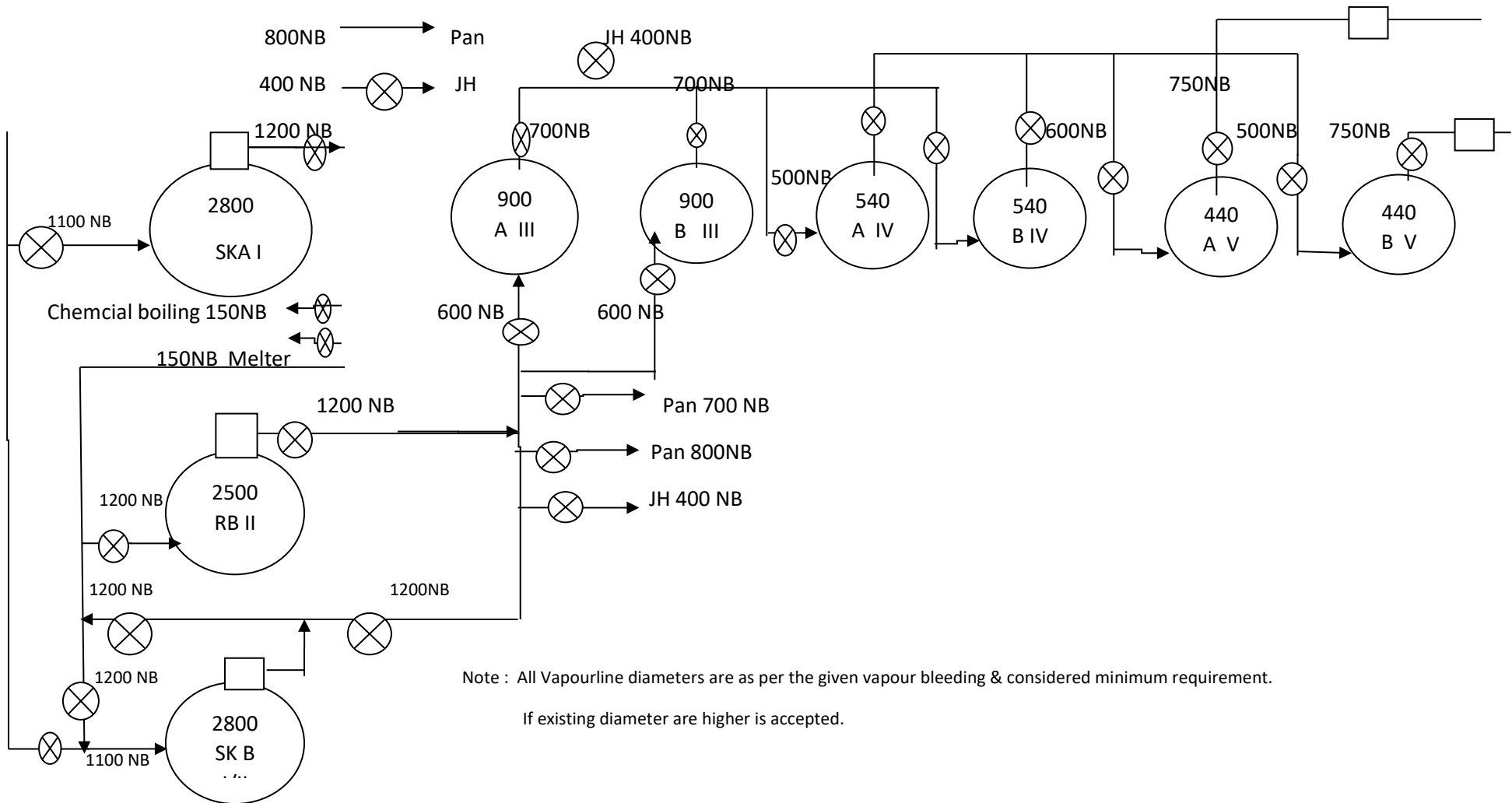
Shri Shankara SSK Proposed Vapour bleeding scheme considering vapourline for 5500 TCD

200 NB  Body wash



[11]

VLJH



3) SOLID BALANCE REPORT AS PER GIVEN DATA

POL BALANCE	PARTICULARS	SOLIDS(MT)	% BRIX	% PURITY	SOLIDS T/HR	QUANT % CANE
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POL IN CANE	13.04		SYRUP	14.84	60.00	84.00	25.98	24.74
POL IN MJ	12.34		A MASSECUITE	25.81	91.00	88.00	45.17	28.36
POL IN BAGASSE	0.70		A HEAVY	11.58	80.00	74.00	20.27	14.48
POL IN FC	0.10		A LIGHT	0.60	75.00	88.00	1.05	0.80
POL IN FM	1.26	1.26	A SUGAR	13.63	99.98	99.90	23.85	13.63
POL UNDETERR	0.10		AFW SUGAR	14.23	99.40	99.40	24.89	14.31
TOTAL LOSS	2.16		B MASSECUITE	11.30	94.00	75.00	19.77	12.02
			B HEAVY	5.09	80.00	53.00	8.91	6.37
RECOVERY	10.90		B SUGAR	5.92	90.00	95.00	10.36	6.58
			C MASSECUITE	6.33	100.00	55.00	11.08	6.33
			C LIGHT	0.95	78.00	60.00	1.66	1.22
			FINAL MOLASSES	3.64	88.00	35.00	6.36	4.13
			CFW SUGAR	2.69	96.00	82.00	4.71	2.81
			CAW SUGAR	1.74	95.00	94.00	3.05	1.83
			DRY SEED	2.42	90.00	-	4.24	2.69
			MELT	13.04	65.00	95.00	22.82	20.06
			Total Masecute% Cane					46.71

4) BOILING HOUSE EXISTING & PRAPOSED EQUIPMENT LIST

Sr. No	Equipment particulars	Existing	Required as per 4200 TCD	REMARK
		Working	Working	
1	Raw Juice receiving tank	21 M3		No change
2	Mass Flow meter	300T/HR	300T/HR	No change
3	Juice heaters			All RJC,S,JC & CL.JC lines to be replace by 8" line & JH beat valves to change by 200NB size
4	1) VLJH (Tubular)	350 M2 x2No's	350 M2 x2No's	No change
5	2) Condensate R.JC heater (Duplex heater)	Nill	170M2 x2 No's	Existing JH re arranged
6	3) R.JC 3rd heating (Tubular)	170M2 x2 No's	170M2 x2 No's	Existing JH re arranged
7	S.JC 1st & 2nd heating (Tubular)	170M2 x3 No's	170M2 x3 No's	Existing JH re arranged
8	Cl.Juice heater 1st & 2nd (Tubular)	170M2 x1 No's	170M2 x2 No's	Existing spare JH re arranged
9	Juice sulphitor	300 HL	300HL	Existing is Suitable
10	Juice sulphitor Auto pH control system	Manual		Single loop Auotamtion with Suitable capacity required
11	Sulphured Juice Receiving Tank	20 M3	40 M3 Capacity tank required	Tank to be modify to suit requirement
12	Sulphur Burners			
	Juice side	140Kg/Hr x 2 Nos	140 Kg/Hr x 2 Nos	

	Syrup side	70 Kg/Hr x 2 Nos	70 Kg/Hr x 2 Nos	Existing is Suitable but proper heat recovery system to be install
13	Air Blowers			
	Juice side	846 M3/Hr	924 M3/Hr	Existing is Suitable
	Syrup side	600 M3/Hr x 2	630 M3/Hr	Existing is Suitable
14	Lime Slacker Unit	1200 Kg/Hr	1200 Kg/Hr	Existing is Suitable
15	Lime cyclone	Not available		SUITABLE FOR SLAKER CAPACITY required
16	Lime classifier	Not available		
17	MOL Screening	Not available	Suitable to screen 20M3/Hr MOL vibro x 2 No's needed	
18	MOL receiving tanks	15 M3 x 2 no's	15 M2 x 3 No's tank required	Existing is Suitable but Screended MOL Recireving purpose 1 tank of same capcity required
19	Juice clarifier	490MT		Existing is Suitable
		555 Type		
20	Clear Juice Receiving tank	Not Mentioned	28 M3 X 1 No's Tank required	
21	Vacuum filter Filtering area	236		
22	Vacuum filter	8' X 16' = 36		Existing is Suitable
		10' x 20' = 56		
		16' x 32' = 144		Spare VF accsseries not available
	Mud tank	8 M3		Existing is Suitable

	Filtrate tank	4M3		Existing is Suitable
	Cake wash tank	NA		To be install
	Mud Mixer	4M3		Existing is Suitable
	Bagacillo blower			
	Bagacillo cyclone			Existing is Suitable
	Inter connecting pipeline	270mm Dia		Leakages to be arrest
	Barometric condenser			Existing is Suitable but line leakages to be arrest
	Vacuum pump			
23	Evaporator bodies			
	SK vessel	2800 M2	2800SK	Spare 2800M2 body to be relocate & use as a stand by to 1st/2nd body
	1st/ 2nd Vessel	2500 M2	2800SK	
	2nd vessel		2500	900 M2 B body to be relocate & Existing is Suitable but vapour line & cut line to be re arrange as per the flow drawing
	3rd A vessel	900	900	
	3rd B vessel	700/900	700/900	
	4th A vessel	560	560	
	4th B vessel	560	560	
	Vth A Vessel	440	440	
	Vth B Vessel	440	440	
24	Un Sulphured syrup Receiving tank			Existing is Suitable
25	Ev.setMultijet condenser	Single entry x 2 No;s		Existing is Suitable
26	Syrup Sulphitor	120HL		Existing is Suitable but leakages to be arrest
27	Sulphured Syrup receiving tank	1.5M3		Existing is Suitable
28	Syrup + molasses supply tanks			

29	For Syrup + Melt	18.75 M3 x 10 No's		Existing is Suitable
	For A Light	8.24 M3 x 2 No's		Existing is Suitable
30	For A-Heavy Molasses	8.24 M3 x 13 No's		Existing is Suitable
31	For B-Heavy Molasses			
32	For C-Light Molasses			
33	Molasses conditioners			
	AH Diluter	5M3		Existing is Suitable
	BH/CL Diluter	9.5 M3		Existing is Suitable
34	Vacuum pans			
	A Pan	80 T x 1 No's		Spare under erection
		80 T x 2 No's		Existing is Suitable
		50T x 2 No's		
		60T x 1 No's		
	B Grain Pan	40 T x 1 No's		Existing is Suitable
	B Pan	15 Mt/Hr		Existing is Suitable
	C Grain Pan	40 T x 1 No's		Existing capacity is bottle neck so B grain pan to be use alternatively as per need
	C Pan	50 T x 1 No's		
35	Pan Condensate tank			
36	Dry seed Crystallizer	50MT		Existing is Suitable
37	B seed Crystallizer	30MT		Existing is Suitable
38	A VC	NIL		Existing is Suitable
39	B VC	25.87 T + 22.68 T		Existing is Suitable
40	C VC	33 MT		Existing is Suitable
41	Molasses Conditioner			

	A Heavy	4.62 Mt capacity		Existing is Suitable
	B Heavy	9.4 Mt Capacity		Existing is Suitable
	C Light	9.4 Mt Capacity		Existing is Suitable
42	Air cooled receiving crystallizers			
	For A-Masseuite receiving	85 x 3 No's +55 x 3 No's		Existing is Suitable
	For B-Masseuite receiving	30 x 4 No's + 150Mt MVC		30 x 4 No's + 150Mt MVC
	For C-Masseuite receiving	30 x 2 No's + 200Mt MVC +120MVC		Existing 150Mt C VC to be used for B M/C & 120Mt VC use for C M/c
43	Centrifugal machines			
44	A Pugmill	11.0 MT		Existing is Suitable
45	Batch Machines For A M/C	1750Kg/Cysl x 2 No's		1750Kg/Cysl x 1 No's new machine is required
46	A Heavy Run off Tank	4.2M3		Existing is Suitable
47	A Light Run off tank	4.2M3		Existing is Suitable
49	B Pugmill	4.8 M3		Existing is Suitable
50	Machine For B Masseuite	NK1100 x 3 No's		New NK1100 x 1 No's machine required for B M/c / CAW curing
51	Bh Run off Tank	1.7M3		Existing is Suitable
52	B seed magma Mixer	6 M3		Existing is Suitable
53	CFW Pugmill	3M3		Existing is Suitable

54	Transient heater	Nil		4Nos new transient heaters to suit for NK1100 machine to be required
55	Machine For CFW	NK1100 x 4 No's		Existing is Suitable
56	CFW Magma mixer	10.2M3		Existing is Suitable
57	CAW Pugmill	3.5 M3		Existing is Suitable
58	For CFW magma	NK1100 x 1 No's		New NK1100 x 1 No's machine required for B M/c / CAW curing
59	Meltercapacity	15Mt		To be modify to handle 35 Mt melt load
60	Rorimelter	15 MT		Existing is Suitable
61	Air Compressor	2Nos x 225 CFM		Existing is Suitable
62	Sugar Hopper A	4 No's x 1.5 mtr width		Not in Use
	Hot Blower for A set	5550 CFM		
	Cold Blower for A set	5550 CFM		
63	Sugar Hopper B	3 No's x 2.0 mtr width		Existing is Suitable
64	Hot Blower for A set	6550 CFM		Existing is Suitable
65	Cold Blower for A set	6550 CFM		Existing is Suitable
66	Sugar Elevator B	40Mt/Hr		Existing is Suitable
67	Sugar Grader A	40Mt/Hr		1 No's 6 Dec 35 MT Grader is required
	Sugar Grader B	10Mt/Hr		
68	Sugar Silo capacity	NIL		
69	Sugar Weighing Machine	2 No's		Capacity not mentioned
70	Sugar Bag Sticking machine	2 No's of capacity 100 bag/Min		Speed to be rectify

71	Cold Water Overhead tank capacity	8.49 M3		Existing is Suitable
72	Hot Water Overhead tank capacity	11.64 M3		Existing is Suitable
73	2nd body condensate water tank	NIL		10M3 new overhead water tank required

5) EXISTING AND PRAPOSED BOILNG HOUSE PUMP LIST														
Expansion from 2500 TCD to 4200TCD														
	CANE – Tons	4200/175		Colour codes : Yellow - New Pumps to be procured										
				Green - Existing pumps used										
				Red - Points to be discussed										
			EXISTING PUMPS					RE ARRANGEMENT FOR 175 TCH						
SI.No	DESCRIPTI ON OF THE PUMP	Make	NO. OF PUMPS	CAPACI TY IN M ³ / Hr	HEA D	HP	RP M	NO. OF PUMPS	CAPACI TY IN M3/Hr	HEA D	H P	RP M	REMARKS	
1	Screened RJuice Pumps	PSP	2	250	45	100	1485						250m3 X 2 No's new pump with 70mtr head required.	
2	Exhaust Condensate Pumps For (2800 M2)	Sintech	2	80	40	30	1460						No Change	
3	2500 M2 body	Wilo	2	100	30	20	1460	2	100	30	20	1460	No Change	
4	900 M2 body	KPD	1	80	30	10	1455	1	80	30	10	1455	No Change	
5	700 M2 body	Wilo	1	10	25	3	1450	1	10	25	3	1450	No Change	
6	4A Body	KPD	1	55	25	20	1450	1	55	25	20	1450	No Change	

7	4B Body	KPD	1	55	25	15	145 0	1	55	25	15	145 0	No Change
8	5A Body	KPD	1	55	25	15	145 0	1	55	25	15	145 0	No Change
9	5B Body	KPD	1	55	25	10	145 0	1	55	25	10	145 0	No Change
10	VLJH Condensate pump			Not Given									If avaialble exisitng used
11	JH No 01 Condensate	Wilo	1	10	25	3	145 5						NA Since used as a Cond Heater
12	JH No 02 Condensate	Wilo	1	10	25	3	145 5						
13	JH No 03 Condensate	KPD	1	55	25	10	145 5	1	55	25	10	145 5	No Change
14	JH No 04 Condensate	KPD	1	55	25	5	145 5	1	55	25	5	145 5	No Change
15	JH No 05 Condensate	Wilo	1	10	25	3	145 5	1	10	25	3	145 5	
16	JH No 06 Condensate	KPD	1	55	25								No Change
	CJ2 JH		NIL										10M3 x 1 No's pump required
17	Pan Cond Pump	KPD	3	55	25	Not given		3	55	25	Not given		IF HP suitable then exisitng used
18	Sulphured Juice	PSP	1	200	32	75	147 5						No Change

		SHD	1	55	25	15	145 0							
27	Lime Pump			Not Given										If existng suitable then use existing
28	Service Pump	KPD	3	NA				2	150	30	30	148 0		If existng suitable use existing
29	A Masecuite pump	INDO	2	60	30	25	144 0							Existng pumps used
		PSP	1	50	30	25	144 0							
30	B Masecuite pump	PSP	2	20	30	15	144 0							Existng pumps used
		PSP	2	40	30									
31	C Masecuite		2	40	30	20	144 0							Existng pumps used
32	B seed	PSP	1	30	30	15	144 0							Existng pumps used
			1	40	30	20	144 0							
33	CAW	PSP	1	30	30	15	144 0	2	30	30	15	144 0		one new pump of same capacity required
34	CFW	PSP	1	20	30	10	144 0	2	20	30	10	144 0		one new pump of same capacity required

35	C MVC Pump	PSP	1	20	30	15	1440	1	20	30	15	1440	Existing pumps used
36	B MVC Pump	PSP	1	20	30	15	1440	1	20	30	15	1440	Existing pumps used
37	A Heavy Pump	Hiflow	1	40	40	15	1440	1	40	40	15	1440	one new pump of same capacity required
38	A Light Pump	Hiflow	1	40	40	15	1440	1	40	40	15	1440	one new pump of same capacity required
39	B Heavy Pump	Hiflow	2	40	40	20	1440						Existing pumps used
40	C Light Pump	Hiflow	1	40	40								Existing pumps used
41	Final Molasses	Hiflow	1	40	40								one new pump of same capacity required
42	B Grain Feeding pump			Not Given									If Suitable capacity pump then existing used
43	Filter cake wash pump			Not Given				2	20	20	3	2850	2 No's new cake wash pump required

