Capacity II

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Evaporation

Evaporators-

Crushing rate - 100 t.c.h.

M.J.% cane - 110%

Brix of juice - 15

Brix of syrup - 60

R.J. Initial temp - 30^0 C.

R.J. final temp - 70^0 C.

S.J. initial temp- 68^0C.

S.J. final temp- 100^0C.

Massecuite% Cane- 26+12+7= 46%

Evaporation

Evaporation rates-

V.C.- 32 kg/ m^2/hr

1st - 29

2nd - 26

3rd - 24

4th - 18

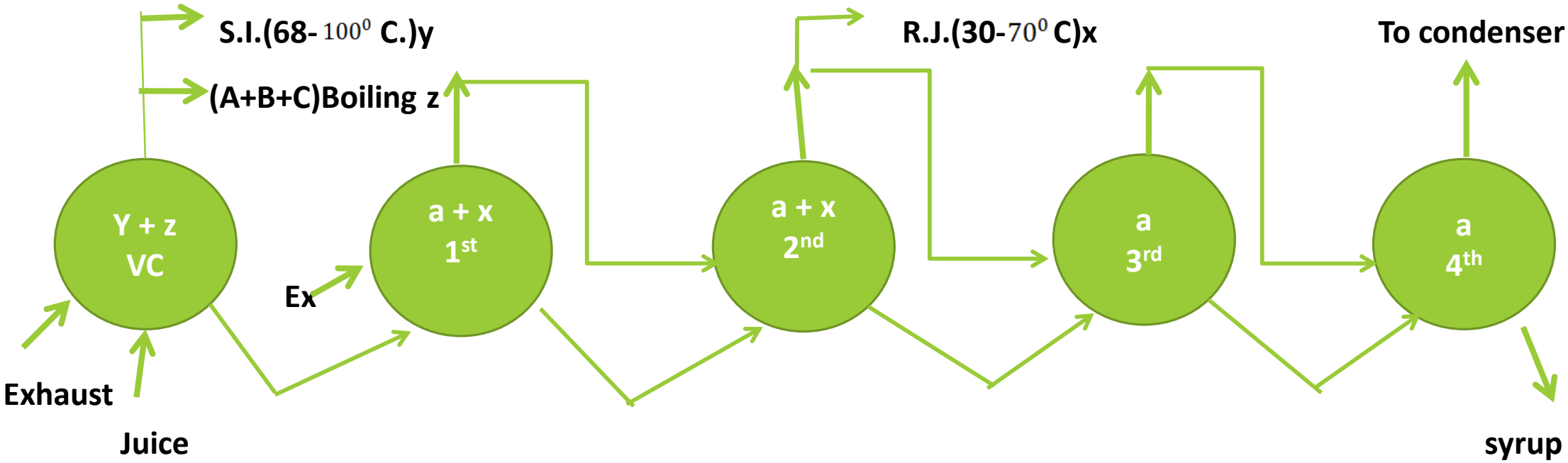
Latent heats-

1st vapour- 532 k.cal/kg

2nd- 540

3rd -550

Evaporation



Evaporation

Total Evaporation = 4a+2x+y+z = 100 x 1.1(1- $\frac{15}{60}$)

= 83T/hr = 83000kg/h

vapours for S.J.= $\frac{MS\Delta t}{532X0.95}$ = $\frac{100X1.1X1000X0.9(32^0C)}{532X0.95}$ = 6268 kg/h

Vapours for (A+B+C) boiling = 45 x 0.6 = 27 T/hr = 27000kg/h

Evaporation in V.C. = 6268+27000 = 33268 kg/hr

H.S. of V.C.= $\frac{33268}{32}$ = 1040 s.q.m.

Evaporation in quad= 83000 – 33268 = 49732 kg/h

4a + 2x = 49732 Kg/h

Evaporation

Value of X

vapours for R.J. = $\frac{100X1.1X1000X0.9(40^0C)}{540X0.95}$ = 7719 kg/h

Now

4a + 2 x 7719 = 49732

a = 8574kg/hr

H.S.- $4^{th} = \frac{8574}{18}$ = 476 sq.m.

$3^{rd} = \frac{8574}{24}$ = 357 sq.m.

Evaporation

$$2^{nd} = \frac{8574 + 7719}{26} = 627 \text{ sq.m.}$$

$$1^{st} = \frac{8574 + 7719}{29} = 562 \text{ sq.m.}$$

Pan Capacity

Crushing rate – 3500 TCD(150 TCH)

	m/c % cane	m/c per day	Boiling time	No. of strikes/day	Pan Cap.
A	25	875 T	4Hrs.	6	146 T
B	11	385 T	6Hrs	4	196 T
C	8	280 T	8 Hrs.	3	93 T

For Continuous Pans for B &C massecuite

B-massecuite per/hr – 16.5 T/hr.

C-massecuite per/hr- 12 T/hr.

Crystallizer

	m/c % cane	m/c per day	cooling time	cycles/day	Cryst. Cap.
A	25	875 T	4Hrs	6	146 T
B	11	385 T	12Hrs	2	193 T
C	8	280 T	24Hrs	1	280 T

For Continuous Crystallisers

Holding Cap. of B - Crystalliser – 200 T

Holding Cap. of C - Crystalliser – 300 T

Crystallizer

Capacity Factor for Crystallizer = 222 ft^3 / tch

Water requirement for crystallizer = 0.8 kg/kg of massecuite

$$W = \alpha \, v \, d \, c \, (T_0 - T) / (t - t_0)$$

Where,

α - Coefficient of cooling (1.20)

V – volume of massecuite m^3 /hr

d- Density of massecuite

T_0 & T – initial and final temp. of massecuite

t_0 & t initial and final temp. of water

Centrifugal

	m/c % cane	m/c per Hrs	curing time	cycles/hr	m/c per cycle
A	25	38T	6 min	10	3.8 T
B	11	17T	15 min	4	4.25 T
C	08	12T	30 min	2	6 T

Continuous machines for B&C

O.D.(mm)	Capacity T/hr
1100	7 for B & C after curing, 4 for C fore curing
1300	10 for B & C after curing, 6 for C fore curing
1500	12 for B & C after curing, 8 for C fore curing

Centrifugal

Gravity Factor – It is ratio of centrifugal force exerted on material to that of gravity.

$$G = m\, \omega^2 R_m / m\, g$$

Where,

m - mass of the material in kg

ω - angular velocity

R_m –mean equivalent radius

g – gravitational force

Centrifugal

Screen area of batch centrifugal machine

= 0.12 m^2 /tch for A & B massecuite

= 0.13 m^2 /tch for C massecuite

- Power Consumption = 3 – 4 kw / ton of massecuite
- Water qty. required in centrifugal machine = 10 % on weight of sugar
- Steam required in centrifugal machine = 20 % on weight of sugar

Drying & Conveying

Gross Hopper Q = S A n k d

Where,

Q – out put of sugar in kg/ min.

S – cross section of hopper in m^2

A – movement of sugar / stroke in m (3 in.)

n – rotational speed in rpm (300)

K – coefficient of slip (0.5)

d – density of sugar (kg/ m^3)

Power (kw) = 2.25 + S (length * width)

Drying & Conveying

Sugar Elevator Q= G V N

Where,

Q – output of sugar in kg/ min.

G – weight of sugar / bucket in kg

V – speed of belt (m/ min.)

N – no. of bucket / m of belt

Distance between buckets 30 - 40 cm

Speed of belt 18 - 30 m/min.

Cooling & Condensing

Condenser water requirement,

$$W = 607 + 0.3\ t_v - t_2 / (t_2 - t_1)$$

Where,

W – weight of cooling water necessary / unit weight of vapour to be condensed

t_1, t_2 & t_v – temp. of cooling water, warm water & vapour.

Area of spray pond = 750 kg / m2 /hr (of water to be treated)

Distance between pipes = 2.5 – 4 m

Distance between nozzles = 2 – 2.5 m

Cooling & Condensing

Qty. of water delivered by a nozzle $q = 0.36\ c\ s\ \sqrt{2\ g\ H}$

Where,

q – capacity of nozzle m^3 /hr

c – contraction coefficient (0.5)

S – cross section of nozzle orifice cm^2

g – gravitational force

H – pressure at nozzle in m

Cooling & Condensing

No. of nozzles N = Q /q

Where,

Q – total water to be cooled (m^3/hr)

q – qty of water delivered by one nozzle

THANK YOU