
بسم الله الرحمن الرحيم

ENERGY MANAGEMENT AND CONSERVATION

THE OPTIMAL DESIGN OF EVAPORATORS AND BLEED CONFIGURATION

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ABSTRACT

- The Haseeb Waqas Sugar Mills Limited was confronted with the problem of energy balance. The problem became severe when crushing level reduce/increase imbibition percentage.
- Various steps were taken previously in order to overcome energy balance at low crushing rates along with moderate imbibition rates. To reduce energy input in all areas of sugar plant.

CONTD…

- Now by the grace of Allah Almighty in crushing season 2013-14, we tried our best to run the plant efficiently by energy conservation

(Maximum fuel saving) to run our co-generation 5MW/65bar plant at HWSML distillery.

INTRODUCTION

- Energy is one of the major operating costs for plant, responsible for protection of industry. Efficient energy management system leads to reduction in energy consumption and the method consists of equipment and technological improvements coupled with process design operations, and behavioral changes among the staff to institute energy efficiency

CONTD…

- In house energy management is key of improving energy efficiency in every corner of the plant at very low cost.
- To stay alive in the low recovery zone, it is very essential to have a great vision and an eagle's eye on every corner of the plant, where we can save energy and reduce production cost to further move on co-generation. **The co-generation of electricity in sugar industry is linked to the energy security**, (minimizing the energy expenditure during sugar processing).

CONTD…

- Thermal and electrical energy are primary energy management. Evaporators, Pans and heating media setup are the major source of energy consumption in sugar industry (maximum utilization of low grade vapors).
- Our steam% cane remained 49.5% during crushing season 2012-13. In the last season (2013-14), After installation of one F.F.E of 4000m^2 (Complete erection and commissioning was done by our own staff) and in house modifications along with maximum utilization of low grade vapors we have achieved steam% cane 46.40% along with 105% mixed juice minimum.
- Our targets were to run the plant on the following parameters to save maximum Bagasse and to achieve optimum results. (Table-1)

TABLE - 1

Sr	BASIS	PARAMETERS		TARGET ACHIEVED		REMARKS
	CROP. DAYS	125	MIN.	110	DAYS	Non availibility of cane
1	BEST QUALITY OF CANE .	(PLAY MAJOR ROLE)				
2	CANE CRUSHING RATE	8000	TCD	5554.75	TCD	@ Average Crushing Rate
3	MINIMUM CRUSHING	800000	TONS	611023	TONS	Non availibility of cane
4	STEAM % CANE	< 47%		46.40%	MIN	With better utilization of low grade vapour steam%Cane achieved even at low crushing rate along with 105% mixed juice.
5	BAGASSE % CANE	31.0%	APPROX	30.70%		
6	MINIMUM BAGASSE SAVING	56000	TONS	26000	TONS	Less bagasse saved from target due to low crushing rate.
7	REC% CANE	9.5	%	9.23	%	Mix varity cane available (low recovery zone)
	EXTRACTIONS:					
8	PREPARATION INDEX	> 90 %		89 - 90	AVERAGE	1st Cutter Clearance adjusted at 3", 2nd Cutter Clearance adjusted at 2", Sherreder hammer weight increased from14.5 to 17.5 Kg (228 Nos)
9	MILL EXTRACTION	> 95.50 %		96.06		Hot Imbibition (85°C)/Better preparation/roller groving Angal, lottus roller, mill's low RPM
10	BAGASE POL	< 1.65 %		1.4		Hot Imbibition (85°C), Lottus roller, Mill's low RPM/better preparation.
11	BAGASSE MOISTURE	< 48 %		47.5		Quantity of energy generated depends upon the NCV of bagasse and NCV increased with decrease of bagasse moisture contents
12	IMBIBITIONS % CANE	MIN. 30 %		35%		At 48% moisture of bagasse the NCV is 7670 Kj/Kg. Moisture reduced 2% due to Mill, 3% due to Bagasse dryer from flue gases.
13	ELEC.POWER CONSUMPTION	< 0.9	KW/T.CANE	0.87	KW/T.CANE	By improving Power Factor, Indian pumps, condensers etc.
14	SYRUP BRIX	> 65		65 - 67		By utilization of maximum vapour bleeding management.

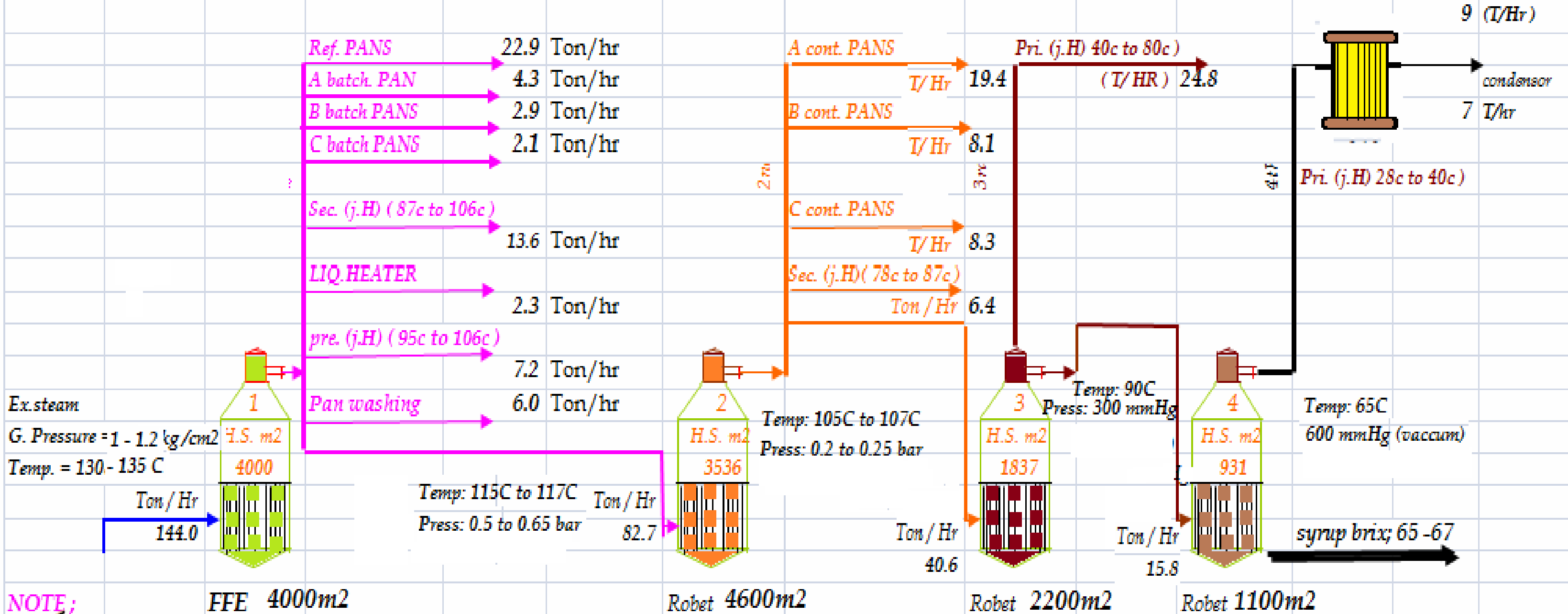
TO GET 100% TROUBLE FREE SYSTEM , THE PLANT MAINTENANCE & MODIFICATION HAS BEEN DONE ON SOLID BASIS & TRIED BEST TO ACHIEVE THE ABOVE SAID TARGETS.

We achieved most of the results, but rew were not achieved due to low crushing and mixed quality of cane. The new evaporator's setup and energy balance system is shown

EVAPORATORS SETUP & HEAT BALANCE

BASIS; (HASEEB WAQAS SUGAR MILLS LTD)

CANE CRUSHED	8000	TCD	*(season 13- 14)*		
MIX JUICE % CANE	105.04	%	MIX. JUICE FLOW	350	TON/HR
STEAM REQUIRED	154.7	TON/HR			
STEAM % CANE	46.40	%			

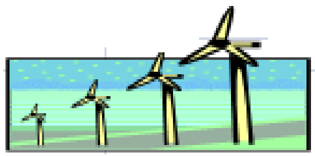


NOTE ;

MELT LIQUOR HEATING WITH FLASH VAP. / IST. VAPOUR (65 c TO 87 c)	2.3	Ton/Hr
REFINE SUGAR DRYING WITH / PAN WASHING (IST. VAP.)	6.00	Ton/Hr
4 BAR / EXHAUST STEAM USE AT RAW , REFINE CENT. & CUTOVER LINES& MOLASSES COND.	6.7	Ton/Hr
PRE. JUICE HEATING (IST.VAP/ EX. STEAM) (106c to 112c)	4	Ton/Hr

- EVAPORATOR SETUP QUAD/QUINT
- C-BATCH PAN RAN ON SECOND EFFECT VAPOR EFFICENTLY AND NOW FOR CURRENT SEASON WE MADE CONNECTION OF SECOND VAPOR FOR A AND B BATCH PANS.

TABLE - 2



SAVING OF BAGASSE PER DAY

Basis

S.No.	Description	Value	Unit	Remarks
1	Crushed Cane	8000	TCD	
2	Bagasse%Cane	30.7	%	
3	Bagasse:Steam	1	: 2.25	47.5% Bagasse Moisture approx.
4	Total Production of Bagasse	2456	Tons/day	
5	Steam Req @46.40%	3712	Tons/day	
6	Bagasse Consumed	1650	Tons/day	
7	Saving of Bagasse	806	Tons/day	
8	Price of Bagasse	3000	Rs/Ton (approx)	
9	**Money Saving**	**2.42**	**Million Rs/Day**	

RESULTS & DISCUSSION

- Energy conservation results can be seen during the season 2013-14 by the above mentioned vapor bleeding system and parameters sets (table-1).

  Following major achievements were made during this practice:

- Moisture of Bagasse was reduced upto 5% i.e. 52.5% to 47.5% by taking following steps, which enhanced the calorific value of Bagasse up to 10%. Bagasse moisture contents reducing steps are:
  - Better preparation of cane
  - Change in the groove angles of mill rollers
  - Applying of Lotus top rollers
  - Bagasse drying through flue gases dryer

CONTD…

- Utilization of low grade vapor gives extra benefit in boiling house to reduce steam% cane upto 3.1%. It was fulfilled by taking following steps.
  - Installation of F.F.E ($4000m^2$), which have better ΔT, so next evaporator's vapors were used.
  - A, B, C continuous pans ran on 2^{nd} effect Vapors
  - 3^{rd} /2^{nd} effect vapors were bled for primary/ secondary juice heating respectively etc.
  - Utilization of the last effect vapors.
  - Pans washing/liquor heating/sugar drying on 1^{st} vapor/flash.

CONTD…

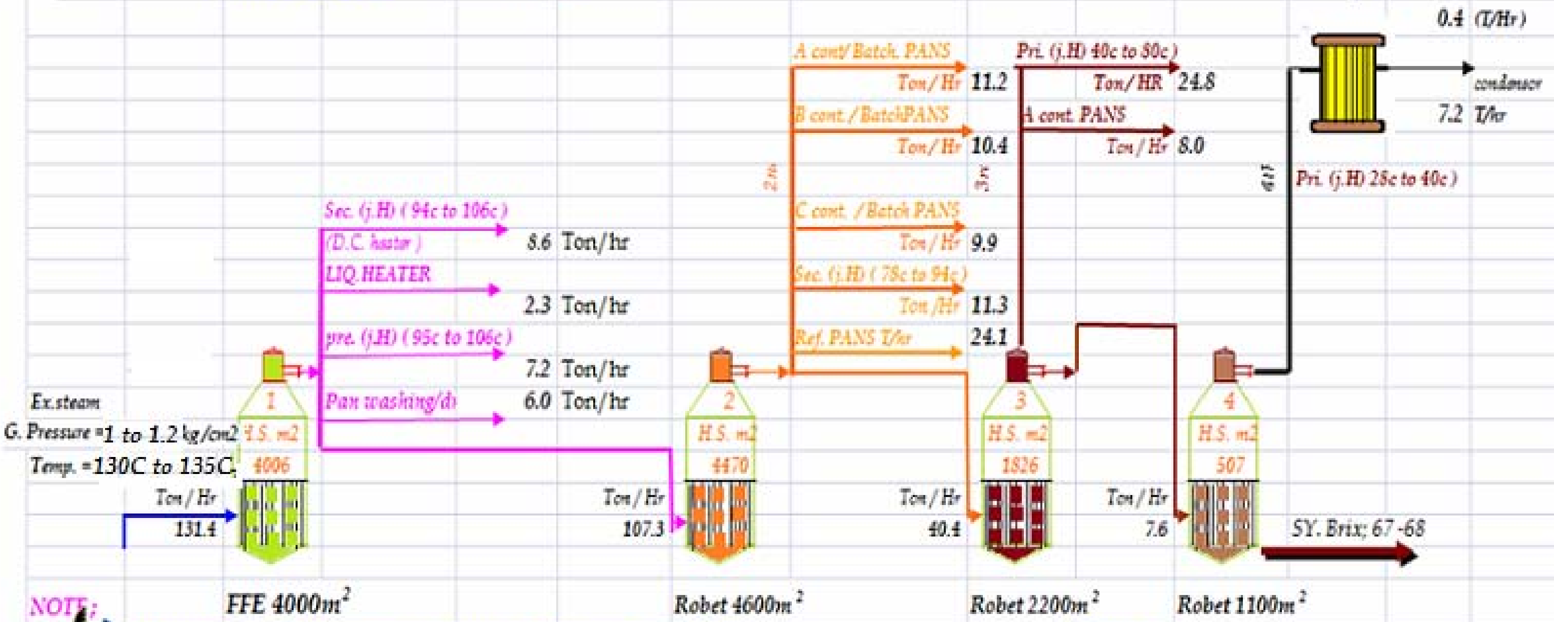
- In next crushing season, due to availability of extra heating surface at 3rd effect are available to run one continuous pan efficiently then steam% cane will be further reduced upto 3.8% .
- In future, we will install 130 ton HP boiler and 25 MW co-generation plant (In progress)

FUTURE PLANS

EVAPORATORS SETUP & HEAT BALANCE

BASIS; (HASEEB WAQAS SUGAR MILLS LTD)

CANE CRUSHED	8000	TCD	(season 14-15)		
MIX JUICE % CANE	105.04	%	MIX. JUICE FLOW	350	TON / HR
STEAM REQUIRED	142.0	TON / HR			
STEAM % CANE	42.61	%			



NOTE:

- MELT LIQUOR HEATING WITH FLASH VAP. / IST. VAPOUR (65 c TO 87 c) — 2 Ton/Hr
- REFINE SUGAR DRYING WITH / PAN WASHING (IST. VAP.) — 6.00 Ton/Hr
- 4 BAR / EXHAUST STEAM USE AT RAW, REFINE CENT. & CUTOVER LINES& MOLASSES COND. — 6.7 Ton/Hr
- PRE. JUICE HEATING (IST.VAP/ EX. STEAM) — 4 Ton/Hr
- ALL BATCH PANS WILL BE EQUIPPED WITH MECHANICAL CIRCULATORS
- EVAPORATOR SETUP QUAD/QUINT

CONCLUSIONS

- There are many opportunities depending on the factory setup (in-house improvements at every corner of plant) exist in plant and need to exploit for better energy conservation and capital that can be invested for the improvement.

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THANKS

ANY QUESTIONS