CASE STUDY-LOW TEMPERATURE EVAPORATOR MODULE (LTEM™)

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OBJECTIVES

- Reduction in steam consumption using waste vapors.
- Capacity enhancement of the plant .

SOLUTION

Low Temperature Evaporator Module (LTEM™) is the successful solution working between the Pan / Last Body Evaporator vapors and Condensers, retrieving waste heat of Spent Vapors.

BACKGROUND OF THE TECHNOLOGY

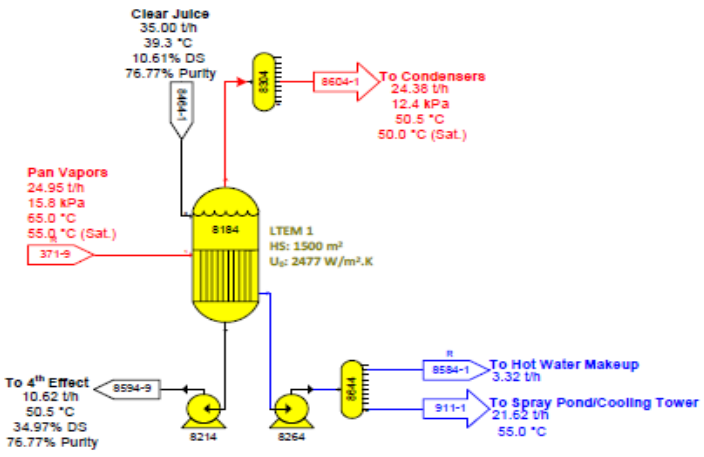
The vapors generated while evaporation of juice & massecuite at evaporator & pan sections in a sugar factory are dumped to condensers as waste heat. Since the inception these vapors were treated as waste for any process use. After the invention of SEDL's LTEM™ these spent vapors have reduced 35-40% evaporation load of existing evaporators.

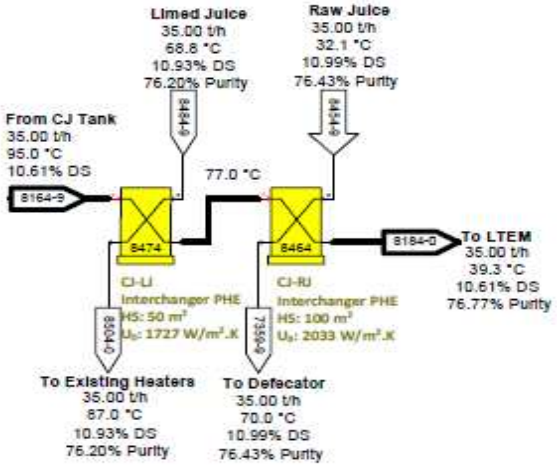
HIGHLIGHTS

- Use of single effect Low Temperature Evaporator Module (LTEM™) on Evaporator and Pan Vapors.
- Increase in imbibition percentage from 45% upto 60% on account of high evaporation & lowering sugar loss in bagasse.
- Overall ΔP in the LTEM™ is ~ 5 kPa
- Overall ΔT in the LTEM™ is ~ 5-7^{0}C
- Low Retention Time.
  * Reduces the Sucrose Inversion.
  * Reduces Color Formation.
  * Reduces Sugar losses.
- Higher Heating Surface Density.
- Wetting Rate: 3-5 L/cm h against 15-20 L/cm h for Tubular FFE.
- Modular Compact Design and low Capex & Opex.

PROJECT DETAILS

The proposed modifications are given below in the heat and mass balance diagram:



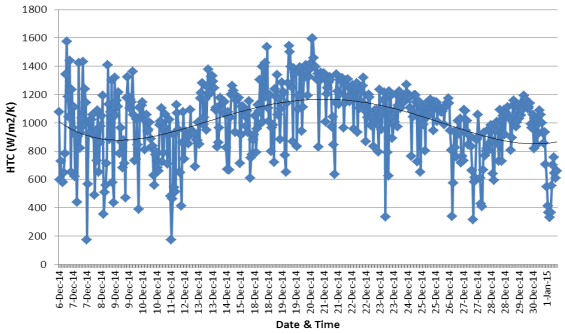


PROJECT PARAMETERS: DESIGNED Vs. ACHIEVED

S N.	Parameters	Designed Parameters		Achieved Parameters	
1	Mix Juice Flow	130 Ton/hr		126 Ton/hr	
2	Steam Consumption On Cane	41.00 %		41.00 %	
3	Exhaust Steam	41.06 Ton/hr		40-42 Ton/hr	
4	CJ- RJ Interchanger PHE	RJ In Temp.	32 ^{0}C	RJ In Temp.	26-28 ^{0}C
		RJ Out Temp.	70 ^{0}C	RJ Out Temp.	65-70 ^{0}C
		CJ In Temp.	77 ^{0}C	CJ In Temp.	74-76 ^{0}C
		CJ Out Temp.	39.3 ^{0}C	CJ Out Temp.	38-42 ^{0}C
5	CJ-SJ Interchanger PHE	SJ In Temp.	68.8 ^{0}C	SJ In Temp.	65-70 ^{0}C
		SJ Out Temp.	87 ^{0}C	SJ Out Temp.	80-85 ^{0}C
		CJ In Temp.	95 ^{0}C	CJ In Temp.	93-95 ^{0}C
		CJ Out Temp.	77 ^{0}C	CJ Out Temp.	74-78 ^{0}C
6	CJ Flow	35 Ton/hr		27 Ton/hr	
7	SJ Condensate PHE	SJ In Temp.	68.8 ^{0}C	SJ In Temp.	65-70 ^{0}C
		SJ Out Temp.	81.9 ^{0}C	SJ Out Temp.	78-83 ^{0}C
		Cond. In Temp.	93.4 ^{0}C	Cond. In Temp.	90-95 ^{0}C
		Cond. Out Temp.	75 ^{0}C	Cond. Out Temp.	70- 74 ^{0}C
8	LTEM™ Parameters	CJ In Temp.	39.3 ^{0}C	CJ In Temp.	38-45 ^{0}C
		CJ Out Temp.	50 ^{0}C	CJ Out Temp.	50-54 ^{0}C
		CJ In Brix	10.61 %	CJ In Brix	10-11 %
		CJ Out Brix	34.97 %	CJ Out Brix	30-36 %
		Cond. Flow	24.94 m^3/hr	Cond. Flow	22-26 m3/hr

PLANT PERFORMANCE: BEFORE & NOW

Parameters	Previous Scenario	After LTEM™ Commissioning
Crushing	2200-2300 TPD	2400-2500 TPD
Syrup Brix	50-55%	55-60%
Steam Consumption	48-50%	39-41%



* The above mentioned are average values taken while running the LTEM™.

The HTC observed during LTEM™ operation has been graphically represented above with respect to average values achieved on hourly basis since 6th December, 2014 to 1st January, 2015.

THE LIST OF PARAMETERS EXAMINED FOR CALCULATING HTC

Parameters	Units	Plant Values
Inlet Vapour Pressure	kPa A	16.5
Inlet Vapour Temperature	^{0}C	56.0
Inlet Vapour Enthalpy	kJ/kg	2367.54
Pressure Drop Across the Pack	kPa A	5
Outlet Vapour Pressure	k Pa A	11.6
Inlet Vapour Temperature	^{0}C	49
Heating surface	m^2	1500
Condensate Out	T/h	25
Heat load	kJ	59188474.16
HTC	W/m^2/K	1518.55

INSTALLATION SITE

CONCLUSION

After the addition of SEDL's LTEM™ the plant is operating at steam consumption of 39-41% on cane which was previously running on steam consumption of 50% on cane and is now crushing a maximum of 2620 TPD with an average of 2400 TPD, which was previously 2000 TPD.

There is further scope of capacity utilization up to 2800 TPD with improvement and balancing in downstream side machinery.

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