CASE STUDY-LOW TEMPERATURE DIFFERENCE EVAPORATOR MODULE

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OBJECTIVES

- Reduction of steam consumption in the plant.
- Capacity enhancement of the plant .

SOLUTION

Low Temperature Difference Evaporator Module (LTEM™) is the successful solution working for energy efficiency by inserting plate type evaporators in multiple effect with minimum temperature and pressure drop between first module inlet and outlet of last module.

BACKGROUND OF THE TECHNOLOGY

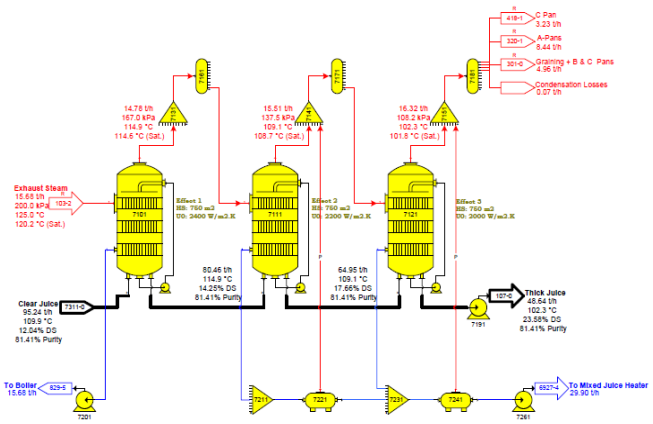
In conventional system, there is significant drop of pressure and temperature between each effect, but with implementation of SEDL technology coupled with use of plate type heating surfaces, the Heat Transfer Coefficient (HTC) has been further enhanced by using our core expertise in fluid dynamics which enables distribution of juice over the heating surface very effectively, and minimizes pressure and temperature drop.

HIGHLIGHTS

- Use of triple effect Low Temperature Difference Evaporator Module (LTEM™) on Exhaust.
- Use of 3rd Effect LTEM™ Vapor for Pan Boiling.
- Overall ΔP in the LTEM™ is ~ 50 kPa in Three Effects.
- Overall ΔT in the LTEM™ is ~ 12^{0}C.
- Low Retention Time.
  * Reduces the Sucrose Inversion.
  * Reduces Sugar losses.
- Higher Heating Surface Density.
- High Heat Transfer Coefficient.
- 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:



PLANT PERFORMANCE : BEFORE & NOW

PARAMETERS	PREVIOUS SCENARIO	AFTER LTEM™ COMMISSIONING
Crushing	**1500—1700 TPD**	**2000-2100 TPD**
Syrup Brix	**45—50%**	**60—65%**
Steam Consumption	**46—49%**	**32—33%**

The following parameters from the plant were examined and accordingly the Heat Transfer Coefficient (HTC) has been calculated.

PARAMETERS	UNITS	PLANT VALUES
Inlet Vapour Pressure 1st Effect	kPa A	158
Inlet Vapour Temperature 1st Effect	^{0}C	112.9
Inlet Vapour Enthalpy 1st Effect	kJ/Kg	2221.7
Pressure Drop Across the Pack	kPa A	20
Heating Surface	m^2	700
Condensate Out	T/h	21
Heat Load	kJ	46656819.94
HTC (1st Effect)	W/m^2/K	4266
Inlet Vapour Pressure 2nd Effect	kPa A	138
Inlet Vapour Temperature 2nd Effect	^{0}C	108.86
Inlet Vapour Enthalpy 2nd Effect	kJ/Kg	2232.7
Pressure Drop Across the Pack	kPa A	17.5
Heating Surface	m^2	700
Condensate Out	T/h	19.5
Heat Load	kJ	43539154
HTC (2nd Effect)	W/m^2/K	4070
Inlet Vapour Pressure 3rd Effect	kPa A	120.5
Inlet Vapour Temperature 3rd Effect	^{0}C	105
Inlet Vapour Enthalpy 2nd Effect	kJ/Kg	2243
Pressure Drop Across the Pack	kPa A	16.7
Heating Surface	m^2	700
Condensate Out	T/h	20.5
Heat Load	kJ	45990471
HTC (3rd Effect)	W/m^2/K	4006

CONCLUSION

After the addition of the SEDL's LTEM™ the plant has achieved steam consumption of 32-33 % on cane and average crush rate of 2100 TPD which was struggling to stabilize at a crush rate of 1700 TPD before implementation of SEDL's scheme.

There is further scope of improvement in crushing, with addition and balancing of equipment & capacity to realize benefits of state of the art but simple, user friendly, highly energy efficient, sustainable and robust technology.