Utilizing Modern Energy Saving Techniques for Economic Viability of Sugar Industry

By

Zahid Mahmood Qureshi

Challenges for Sugar Industry:

- Economic uncertainty
- Increase in cost of production
- Competition in sugar market is pushing the industry in tight corner

How to Improve Economic Viability

- Increase in revenues
- Migration from historical model to new model based on latest technology
- This migration is expensive but is justified by returns

- Diversification and value addition of by products
- Export of Power is a gold mine for sugar industry
- Steam economy is a game changer for sugar industry
- Power saving in prime mover a big source of revenue

- Retrofitting of boilers a big source of bagasse saving
- Drying of bagasse to prolong cogeneration period
- Straw Energy a big source for power export & Control of environmental pollution

Export of Power a Gold Mine for Sugar Industry under

- Upfront Tariff Policy
- Replacement of old boiler & Turbines with HP in phases

Upfront Tariff Determined by NEPRA

THAL INDUSTRIES CORPORATION

Year	Fuel cost component	Variable O&M Local	Variable O&M Foreian	Fixed O&M Local	Insurance	Working capital cost	Return on Equity	ROE During Construction	Loan Repayment	Interest Charges	Total Tariff
	Rs. / KWh	Rs. / KWh	Rs. / KWh	Rs. / KWh	Rs. / KWh	Rs. / KWh	Rs. / KWh	Rs. / KWh	Rs. / KWh	Rs. / KWh	Rs. / KWh
1	5.7702	0.1074	0.3223	0.2865	0.2204	0.1924	0.9207	0.0948	1.1705	2.6544	11.7396
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30	5.7702	0.1074	0.3223	0.2865	0.2204	0.1924	0.9207	0.0948			7.9147
Levelized Tariff	**5.7702**	**0.1074**	**0.3223**	**0.2865**	**0.2204**	**0.1924**	**0.9207**	**0.0948**	**1.2831**	**.11.2100**	**10.4078**

Modeling the Scenario

Boiler Pressure (bara)	Steam % Cane	Comment
High	High	New boilers and cogeneration with Condensing Extraction Turbo alternator but with process unchanged

Power Generation scenario during season

Crushing Capacity	10,000 TCD	417 TCH
Bagasse	3,000 Tons/day	125 T/day
Steam demand	49-50%	208 TPH
Steam for prime movers		50 TPH
New HP boiler of 65 bar, 485C		150 TPH
Turbo Generator Capacity		30 MWH
Power generation		25 MWH
Internal Power Consumption		10 MWH
Available Power for export		15 MWH
Crop days		100 days
Expected revenues		Rs.422 Millions

Power Generation scenario during off season

Power Generation		22 MWH
Bagasse requirement	960 Tons/day	40T/ hr
Steam demand		88 TPH
Power for internal consumption		2.0 MWH
Net available power available for export		20 MWH
Operation days		30 days
Expected revenues		Rs.168 Millions
Grand Total revenue (Season + 30 days)		Rs.590 Millions

MUD DECANTER
A
SOLUTION

Of Multiple Problems
&
Source of Extra Export/Revenue

Major Benefits:

- Saving of bagacillo & increase of power export/revenue
- Saving in mud disposal cost
- Sugar loss reduced to 50%
- Reduction in inversion losses
- Steam economy
- Power Saving 20% & low maintenance cost

Bagasse Saving:

- Assumption:
- Plant Size: 10,000 TCD
- Bagacillo saving 80 tons/day
- For 110 days season 8800 Tons
- Extra exportable Power =1000 MWH
- Estimated revenue Rs.11.72 M

Reduction in Losses

- Saving in sugar loss 0.03% on cane
- For 110 days 330 Tons
- Financial saving Rs.19.8 M

Saving in Power 10,000 TCD Plant

• Vacuum Pump drive	350 KW
• Power for bagacillo blower	45 KW
• V. Filter drive 7.5*5	37.5 KW
Total Power	432.5 KW

Note: 2/3 power can be saved using decanter technology.


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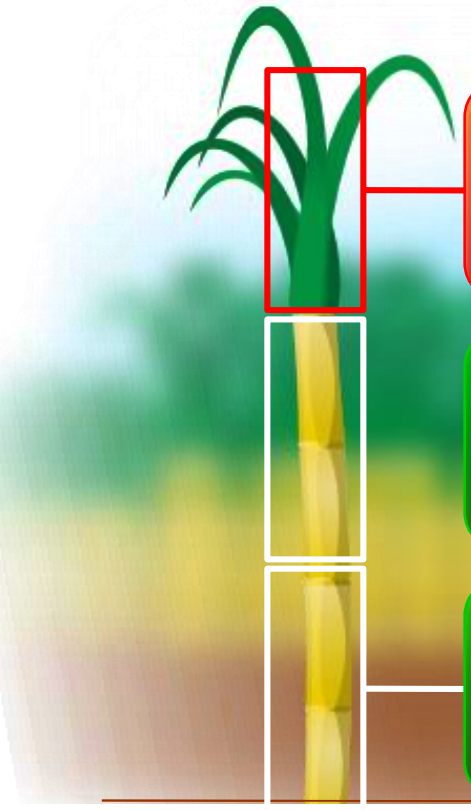
Straw Energy
A
Potential Source of Energy
&
Power Export

But Straw is Energy



Energetic Constitution of Sugar Cane

Straw and leaves: underused
Left in the field
145 kg of ATR
608 x 10^3 kcal

Juice: production of sugar and ethanol
276 kg
50% Water
598 x 10^3 kcal

Bagasse: used as fuel in boilers
165 kg
15% Water
512 x 10^3 kcal

1718 x 10^3 kcal

Leaving all the straw

Leaving all the trash in the fields is the same as burning money is

Benefits of Collecting trash from the field :

- Cheap raw material for cogeneration
- Prevention of pests e g Sugar Cane (roots & leaves) spittle bugs
- Reduction in fire risks
- No environmental pollution

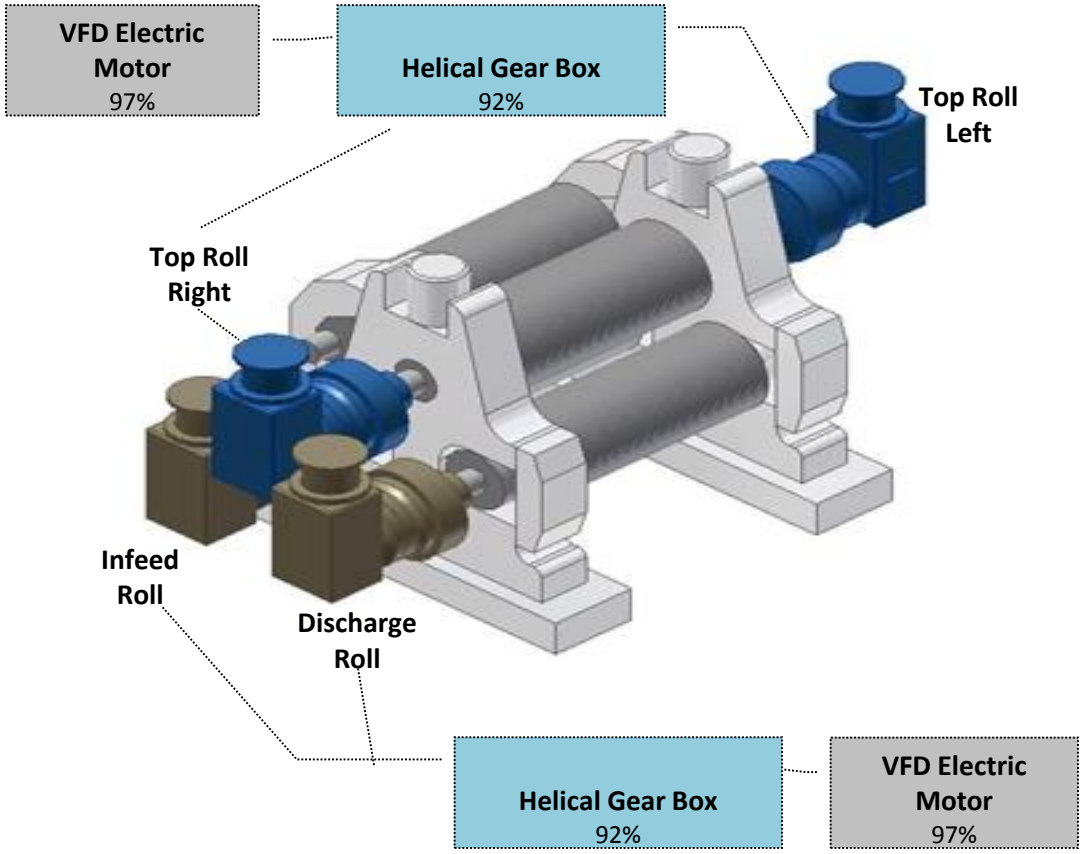
Power Saving from Drives

- Conventional slow speed gears and pinion gears are highly inefficient
- Mill drive and transmission system is worth considering to save power
- To make sugar mill viable, each KW not only needs to be saved but also put into export grid to earn revenue

Comparison of Transmission efficiency of Conventional Vs. Pinion less

EQUIPMENTS	PINIONLESS DRIVE	CONVENTIONAL MILL
AC Motor	96%	96%
REDUCTION GEARS	95%	92%
Low speed OPEN GEAR		60%
Tail Bar		97%
CROWN PINION		92%
TOTAL EFFICIENCY	**91%**	**47%**
Power Consumption KW/TFH	7.72	20.35

Innovative Mill Drive



EFFICIENCY
91%

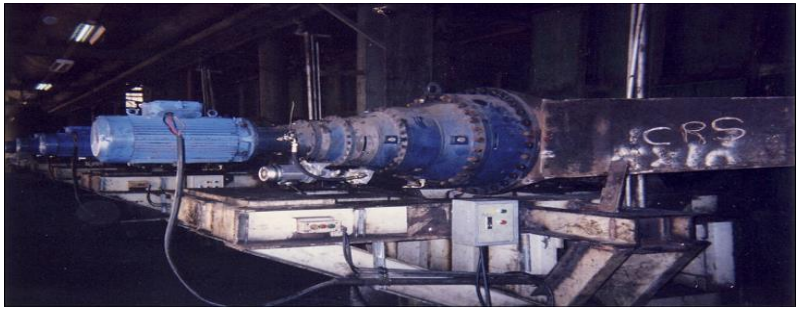
ADVANTAGES
Saving in Power Consumption : up to 60%
Extra REVENUES with Cogeneration
Reduction in Maintenance cost : Up to 35%
Reduction in Capital Investment : 20% to 25% (for new mill installation)
Less space requirement
Low noise
Eco Friendly system with minimum pollution

Calculation for Power Saving

- Normal drive size in 8000-9000 TCD plant is 850 KW.
- 20% saving means 170 KW
- For 5-Mill tandem, daily power saving will be 20.4 MW
- For 110 days crop season, saving in power will be 2244 MW
- This saved power can be exported to grid
- Expected revenue will be Rs.26.0 Millions

Drive of Crystallizer

- Second important area is crystallizer drives in process.
- Significant improvement is required in this area
- Normally, second hand gear motors having high power but low efficiency are installed.
- Open worm wheel are also another source of wastage of energy
- Overall efficiency of these drives is 40%
- Planetary drives have 90% efficiency, investment payback is two years



Steam Economy Using Falling Film Evaporators

- Steam economy is a game changer for sugar industry
- Alhamdulillah, local industry has enough capability and serving the sugar industry at reasonable price
- There is healthy sign that sugar mills are rapidly replacing their evaporators to get steam economy and to save bagasse
- Bagasse saving may be a substantial source of revenue as such through sale and additional source of revenue through power export.

Thank You