
بسم الله الرحمن الرحيم

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ABSTRACT.

In existing scenario, fuel & Electricity rates are not stable and increasing day by day because of this Industry is in crises. Profitable operation of sugar Mills can be achieved with only efficiency and low manufacturing cost of outputs. This Paper defines the different area of sugar Mills where economical operation can be achieved by Technological method.

TOPIC
Improvement with Technological Operation by Misri Khan Khoso
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Recent Pandemic and Russia ,Ukraine war conditions inflation rate and devaluation of currency put tremendous pressure on economic situation of the country. Uncertain conditions of country the high rates of fuel and electricity increased day by day due to this agriculture sector is in crises and their yield and area under cultivations reduced especially all major crops like sugar cane, wheat, rice and cotton production suffered. Above alarming situation is dangerous for agro based Industry . At presents operational cost of Sugar Mills have accelerated and profit minimized . In this situation operation of Sugar Industry is viable only with Technological benefits and efficiency which means less energy /fuel consumption and minimum losses/High recovery.

Cheapest inputs and large out puts are two basic needs or Improvement of Profitability of Sugar Industry can only be achieved with Technological Development. In this paper I would like to share my personal study ,previous experiments and experience of following areas

1. Mill House
2. Boiler House
3. Power House
4. Injection Pumps
5. Refine Machines
6. Automations

1. Mill House

Mills Tandems or Mills House are 2nd large consumers of live steam and through make up steam only exhaust steam to Process house. Previously there was only live steam economy and process requirements were fulfill by exporting power. In 2018 when Govt of Pakistan changed their power procurement policy for Sugar mills than low temperature steam requirement is met by makeup steam through de-super heating station .

Faran Sugar Mills limited (FSML) has two tandems 9000 TCD HMC and 4000 TCD FCB .The Mills live steam load was about 80 TPH . In 1^{st} phase FSML started to replace one by one steam turbine of 9000 TCD with Electric Motors .Calculations and apparently Steam saving of 9000 TCD is as following

Sr. #	Description	Rating of Motor	Electric load & Steam Consumption of Motor	Turbine Rating and steam Load	Remarks
1	Mill # 1	1000 KW with 1200 VFD	(300 KW x10)1000 = 3 TPH	750 KW ,8 TPH	
2	Mill # 2	850 KW with 1000 VFD	(440 KW x10)1000 = 4.4 TPH	750 KW ,7TPH	
3	Mill # 3	850 KW with 1000 VFD	(470 KW x10)1000 = 4.7 TPH	750 KW ,8TPH	
4	Mill # 4	850 KW with 1000 VFD	(400 KW x10)1000 = 4.0 TPH	750 KW ,8TPH	
5	Mill # 5	1000 KW with 1200 VFD	(510 KW x10)1000 = 5.1 TPH	750 KW ,9TPH	
	Total		2120 KW = 21.2 TPH	40 TPH	
	Difference of Steam	18.8 TPH			

After the refusal of power Export by concern disco FSML installed Falling Film Evaporators of 2x6000 M2 and achieved steam economy till to 48 steam% cane. In 2nd phase FSML converted two (1 and 5) Mills of FCB (4000 TCD) Tandem and Cutter Turbines of HMC (9000) Tandem with electric drives and achieved steam economy as following .

Sr. #	Description	Rating of Motor	Electric load & Steam Consumption of Motor	Turbine Rating and steam Load	Remarks
1	Mill #1	850 KW with 1000 VFD	(306 KW x10)1000 = 3.06	500 KW,6.25 TPH	
2	Mill # 5	600 KW with 710 VFD	(243 KW x10)1000 = 2.43 TPH	750 KW ,10TPH	
3	Primary Cutter of HMC Tandem	900 KW	(510 KW x10)/1000 = 5.1 TPH	1000 KW,11 TPH	
4	Secondary Cutter of HMC Tandem	900 KW	(500 KW x10)/1000 = 5.0 TPH	1000 KW,11 TPH	
	Total		15.59 TPH	38.25 TPH	
	Difference of Steam		22.66 TPH		

By overcoming on Makeup steam FSML achieved 43.23% /T-cane

2. Boiler House

FSML is working for relief of steam overloading on Boilers and to improve Bagasse to steam conversion ratio . In previous season FSML installed O2 analyzer online/Auto working with Venturi /FD loop . As we all know that high temperature of vent gases played main role in the deficiency of Boilers . At present our Bagasse to steam conversion ratio is 2/1 and after the completion of online projects it hopes that it will be 2.1/1 to 2.2 /1

3. Power House

Previously our FSML average kg/KWH steam ratio of power house was 11.0 Kg /KWH and in previous off-Season 2021 FSML made detail study to reduce the power conversion ratio. Purchased and Installed 8.0 MW Turbo Alternator set of 9.99 Kg/KWh and discarded TA set of FCB of 12.13 kg/KWh . After commissioning of TA set when large conversion ratioTA sets off and 8.0 MW T.A set taken in line

SUB: PAYBACK OF 08MW TURBO ALTERNATOR SET

at Power House Commissioned on March 12, 2022
During test trial working results and comparison with other alternators are as follow

08MW						06MW & Other TA Set				
Sr. #	Date	Crushing TCD	Power Generated KWh	Steam Consumed Ton	Make up Steam	Date	Crushing TCD	Power Generated KWh	Steam Consumed Ton	Make up Steam
1	15/03/2022	5395	138,300	1607 P *+ 1430 O* = 3037	328	15/01/2022	4773	156,160	1716+960= 2676	23
2	16/03/2022	5021	163,700	1759 P *+ 1537 O* = 3296	452	16/01/2022	4999	184,320	1715+960= 2675	85
3	17/03/2022	6239	157,600	1573 P *+ 1617 O* = 3226	485	17/01/2022	6035	184,820	1844+1070= 2914	157
4	18/03/2022	5598	164,900	1649 P *+ 1682 O* = 3331	496	18/01/2022	6008	192,280	1993+1071= 3064	303
5	19/03/2022	6232	155,700	1554 P *+ 1517 O* = 3071	403	02/01/2022	5772	180,240	3115+1110= 4225	139
6	20/03/2022	5000	125,600	1296 P *+ 1514 O* = 2810	379	31/12/2022	5469	169,540	1680+990= 2670	155
			905,800	**9438**				**1,067,360**	**12063**	

During test trial working results & comparison with other alternators are as follow,

days independent working of 8 MW shows that Steam to power Conversion ratio is 10.4 Kg /KWh whiles saved steam wasteged in makeup steam

2- 6 days of similar (near about)show that FSML operated two Turbines (6 +4) MW and Steam to power Conversion ratio is 11.3 Kg /KWh

4- Difference is about 0.9 Kg/KWh and for 100 days calculated = (Days x R. Power x Saved Steam x hrs x factor)100x7000x24x0.9x.0.9x=13608 Tons Steam say 6800 Ton Bagasse

5- saving is 6800 x3500 = 23.814 million PKR

4. Injection Pumps

Operation of Injection pumps depend on the consumption of water at Pans and Evaporators. Efficiency of Condensers played major role in the conservation of water . FSML continue working on the condensers improvements and got significant saving by replacing of nozzles, Conversion of injection pumps on Auto-Mode linked with header pressure . In previous off-season 2021 FSML replaced their 3 No old pumps of 1500 M3 with new 2800 M3 and following observation noted

2- During the Season at the Crushing of 10500 TCD and above FSML operated 05 No (3x2800M3 + 1x2500 M3 + 1500 M3) pumps

3- record obtained from Motors of above pumps is 1297 A means 790 KW

4- In previous season 2020-21 at 9500 TCD and above 7 pumps of 1500 M3 & 132 KW Motors load noted 1491 A means 908 KW at same crushing throughput Power Consumption noted 1004 KW

5- Difference is 1004 -790 = 214 KW

6- Saving achieved in 130 days is (Saved power x Power/Steam ratio x bagasse/Steam Ratio x days x hours) = saved bagasse =118x11x1/2 x130 214x24 x130x10/1000 x0.5=3338 Tons

7- Saving in PKR 3338x3500 =11.68 Million PKR (@ 3500/ton)

Payback

Expenditures / Saving of 130 days = 14,504,160 /11.68= 1.24x130 =161 days say two seasons

Beside above monitory benefit operation is smooth ,vacuum is as per requirement of the Boiling ,losses of Molasses reduce and crystal yield increased

5. Refine Machines

It is correct that Operation of Batch type refine centrifugal Machines are to produce white sugar . In existing conditions Technological Operation of Refine Machine is necessary

Comparison of Batch Type Refine Centrifugal Machine BMA E 1810 Silverweibul Machine with Existing DC Motor

1. Existing Silverweibull Machines are installed in 1993 and their Baskets are too old replacement is very expensive .

2. Existing refine Machines have DC non regenerative Motors and consumption of Power are maximum

3. New proposed Machine will be installed/ replaced at R2 refine line . Over all R2 Masscuite is 30% of total Sugar production.

4. If Total crushing assumed 1,200,000 Tons and Recovery assumed 11.0 than R2- Sugar will be (1200000 x11/100)x30/100 = 39,600 tons .

5. BMA E-1810,Silverweibul 1750/E Existing Machines Comparison are as following

Sr. #	Description	BMA E 1810	Siverweibull 1750/E	GGEGC	Silverweibull old	Remarks
1	Power rating	200 KW	250 KW	250 KW	215 KW	
2	Type	Regenerative	Regenerative	Regenerative	Non regenerative	
3	Cycle	23	22	17	17	
4	Capacity /charge	1810	1500	1750	1200	
5	Refine Mascuit /H	41.6 T	33 T	30 T	20.4	
6	Electric Load	97 KW	118 KW	118KW	294 KW	
7	Power /T- mascuit	2.33 KWh	3.57 KWh	3.93 KWh	14.55 KWh	
8	Price in Million PKR	43	42	29.25	20.0	

6. Refine centrifugal machine is in replacement

7. Replacement of basket of Existing machines and Conversion in regenerative mode is advisable because power consumption is high

Sr. #	Description	BMA E 1810	Siverweibull 1750/E	GGEGC	Silverweibull old	Remarks
1	Total power consumtion at 39600 Tons R2 Sugar	*2.33 x39600 = 92268/2=46134 KWh	3.57x39600 =141372/270686 KWh	3.93x39600 =155628/277814 KWh	14.55x39600=576180/2 288090 KWh	
2	Total bagasse consumption	46134x10/1000=461 T	70686x10=706 T	77814x10/1000=778 T	288090x10/1000=2880 T	

*39600 Tons is total R2 Sugar which cure 2 refine machines

NOTE: payment difference of BMA Machine against Silverweibul 1750 will be recovered in 2 seasons

6. Automations

Automation of sugar Industry is very necessary without automation operation is just like search of black cat in dark room . FSML made phase wise Automation at different houses results are as following

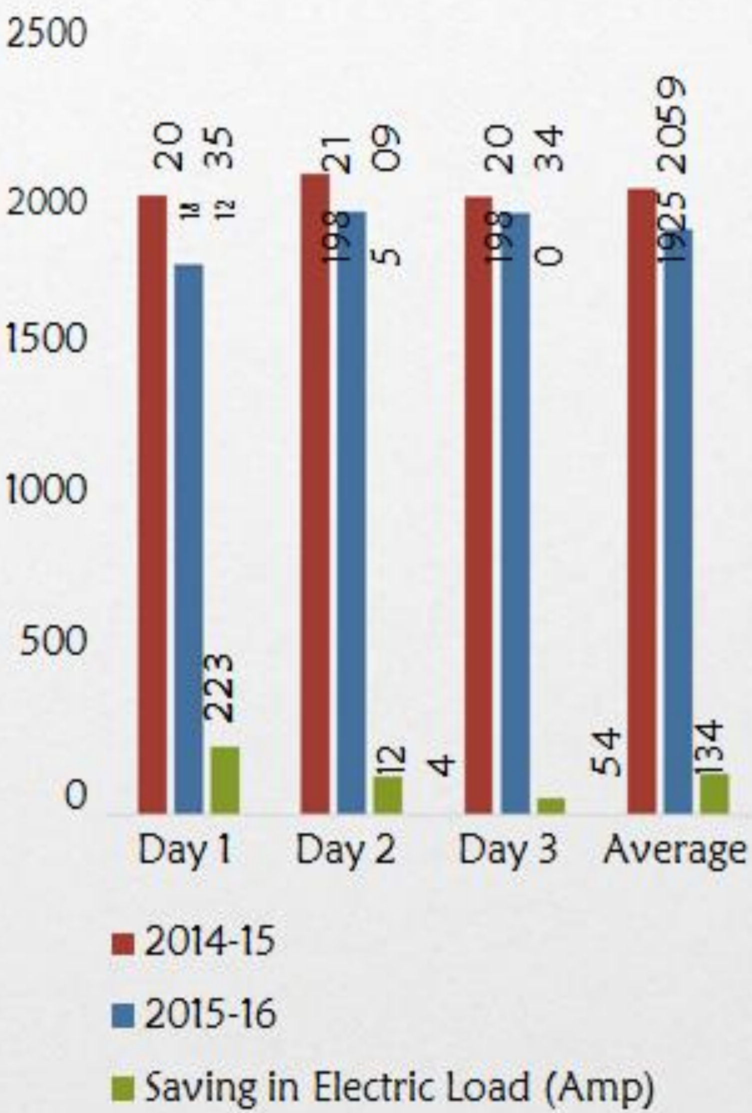
Boiler House.

In 2016 operation of Boilers converted on Auto mode and achieved sustainable Burning , minimized faults ,accurate data of steam and water flow . we achieved 2.0 /1.0 Steam/bagasse conversion ratio . FSML achieved significant power conservation at high throughput of steam detail

During the season 2015-16, FSML operated all Boilers on fully automated mode, due to this following power Conservation observed on an average load of Boilers.

	2014-15		2015-16		Saving in Electric Load (Amp)
	Boiler Load (Tons)	Electric load (Amp)	Boiler Load (Tons)	Electric Load (Amp)	
	186.62	2035	191.64	1812	223
	187.12	2109	195.27	1985	124
	189.50	2034	194.58	1980	54
TOTAL	563.24	6178	581.49	5777	401
AVERAGE	187.74	2059	193.83	1925	134

ELECTRIC LOAD (AMP)

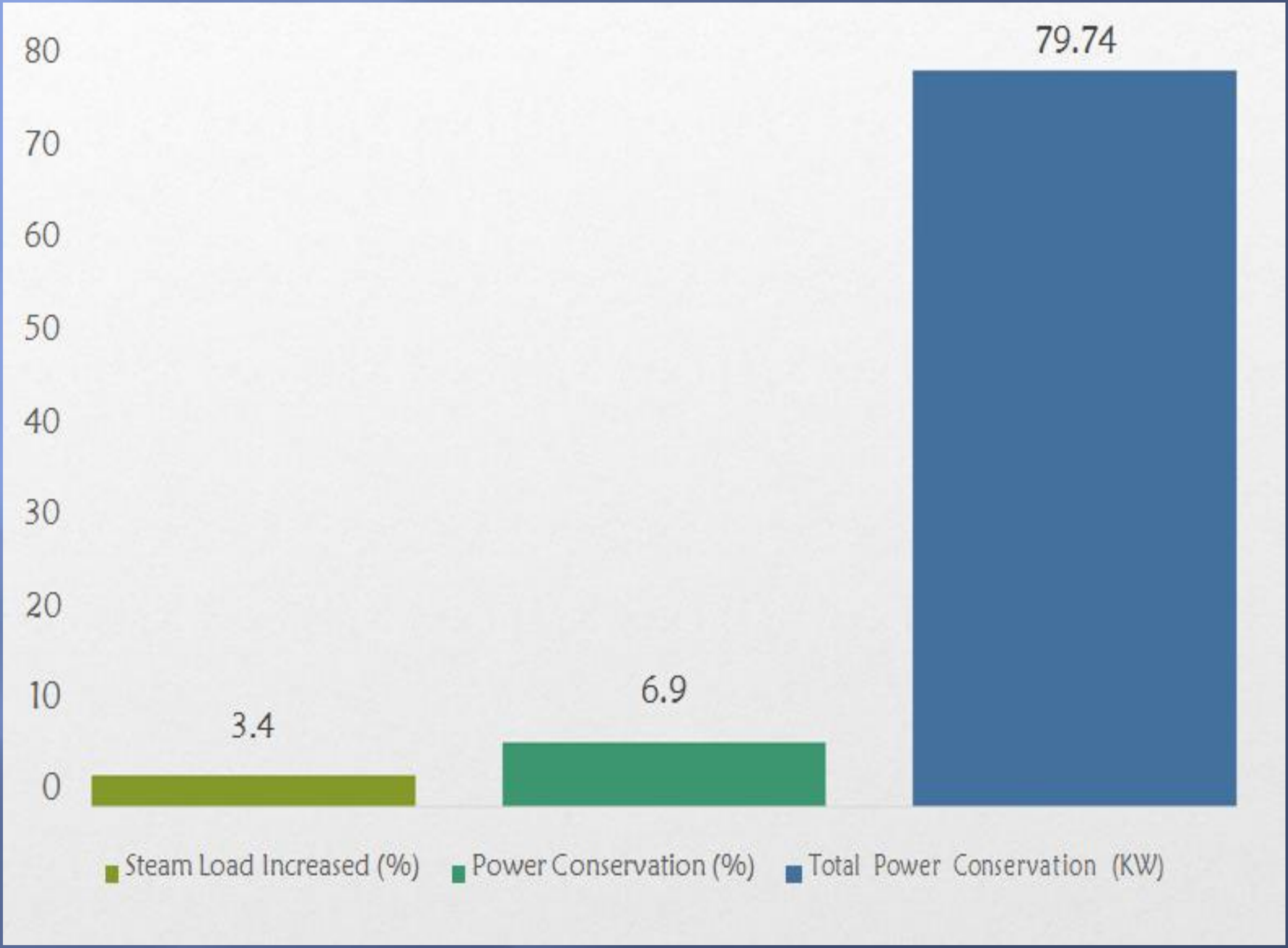


BOILER LOAD (TONS)

3.4% was higher throughput.

6.9% was power conservation.

79.74 KW Total power Conservation noted.


80
70
60
50
40
30
20
10
0
79.74
6.9
3.4
Steam Load Increased (%)
Power Conservation (%)
Total Power Conservation (KW)


THANK
YOU