

Energy Economy Recommendations in Textile Mill

K. Balachander, A. Amudha

Abstract: The ultimate scope of energy savings is by improving the power factor and rising the effectiveness of motors and thereby finding out the areas of energy audit and analyzing it in the Spinning mill. An assessment for the old motor with energy efficient motor is compared and recommended. It is the efficient and procedural approach to identify and check the usage and wastage of input energy and reduce the energy requirements. In this paper, control of motors and procedure of optimization in textile mill on energy conservation is discussed in various departments.

Key words: Energy Auditing, Textile Mill, Conservation, Energy Management

I. INTRODUCTION

In any business, the three major operating costs are energy, employment and equipment. Among these, the cost of energy is rated at the top [1-4]. In textile industry energy include electrical and thermal. Energy assessment provides a benchmark and basis for more successful development for the use of energy in any business [5-11]. Textile industry is the major role player for country's financial system [12-17]. In this paper energy audit of a textile industry situated in Tirupur, Coimbatore is presented. Areas of energy losses are identified; suggestions for cost effective measures to establish efficient energy use and estimation of implementation costs and payback periods are calculated and discussed [18-21].

II. INDUSTRY DETAILS AND LOAD PROFILE

The industry is situated at Tirupur district, Tamilnadu, India . Table 1 shows the industry details; Table 2 describes Existing Electrical Load Profile and Existing Electrical Facility in Table 3.

Table 1 Industry Details

Name of the Industry	M/s. Kumaran Gin & Pressing Private Limited
Address	Factory : SF NO 415/2, Palladam to Dharapuram Road, V.Kalliplayam, Palladam - 641 667, Tirupur. Reg. office : SF NO 33/1B, Uthukuli Main Road, Sarkar Periyapalyam -641 607, Tirupur.

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Table 2 Existing Electrical Load Profile

Source of Power Supply	Sanctioned Demand	Billed Demand (kVA)	Average Power Factor
TANGEDCO	2450 KVA	2205 KVA	0.99

Table 3 Existing Electrical Facility

Description	Nos.	Rating
Transformer (kVA)	1	2500 KVA
DG (kVA)	5	500 KVA
Capacitors (kVAr – HT/LT)	LT	850 KVAR
M V panel	1	4000 A
Sub Switch Board (SSB)	14	-

III. EXISTING MAJOR ENERGY CONSUMING TECHNOLOGY

The major equipments in a textile mill unit are Ring frame, Humidification process unit, Electrical Distribution network and Compressed Air Distribution unit. Compressors, condensers and the motors connected to this equipment. Compressors are the major energy consuming equipment in this textile industry.

IV. PROPOSED ENERGY SAVING AREAS

A. Humidification Plant

Humidification plants have become an essential part of spinning mills. In order to the ambient conditions in the department it is essential to operate a humidification plant in a very efficient manner. Correct ambient condition are most essential to prevent degradation of textile materials upon which a series of operations right from beating in blow room to twisting in spinning are carried out [23-26].

B. Operation of Humidification plants During summer without rain

The dry bulb outside is high, corresponding **Relative Humidity** (RH) level of the air mixture is low. Run the full plant supply design capacity; run the pump fully open the fresh air damper fully. Exhaust the hot air from the department to the outside by keeping exhaust damper full open and keep the return air damper and the bypass damper fully closed.

During summer with rain

The outside dry bulb temperature is high and RH is also high. Run the supply air fans and exhaust fans are operated with 50 % recirculation of inside air. This is worst climate for plant operation. The problem of high RH can only be reduced to a little extent by means of recirculation as the dry bulb temperature rises.

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During winter without rain

The outside dry bulb temperature is low and RH is also low. In this condition, supply air fans, water pumps and exhaust fans are to be operated with 75% recirculation of inside air. The recirculation of inside air can be achieved by carefully adjusting the dampers kept inside the supply side, exhaust side and in between the supply and exhaust plants.

During winter with rain

The outside dry bulb temperature is low and RH is high. In this condition, supply air fans and exhaust fans can be operated with 100 % recirculation of air. But it is advised to switch off all the fan motors and pump motors in order to conserve energy in humidification. The dry bulb temperature will raise and RH will come down due to heat load inside the department.

Ambient conditions and remedies

Various Ambient Conditions, Causes of Error and Corrective Measures are shown in Table 4.

Table 4 Ambient conditions and remedies in Humidification Plant

Ambient Conditions	Cause of Error	Corrective Measures
Low RH, High dry bulb	Low air circulation/Low saturation	Check filters, elimintors, dampers and nozzles
Low RH , Correct Dry bulb	Low saturation and high air volume	Check nozzles, filters and adjust air circulations
Low RH , and low Dry bulb	Insufficient heating and moisture	Recirculation the air
High RH , low Dry bulb	High air circulation	Reduce air circulation
High RH, Correct dry bulb OR high RH, high dry bulb	Low air circulation	Check Eliminator
Correct RH, high dry bulb	Recirculation adopted	Reduce recirculation take more outside air.
Correct RH, low dry bulb	Low wet bulb out side	Re circulate the department air

V. ENERGY STUDY AND RECOMMENDATIONS

Energy studies were conducted on various departments' in the textile mill and recommendations and energy saving potential are given in Table 5, 6, 7, 8, 9 and 10.

A. Study 1

Table 5 Carding Department

Department	System	Installed Motor (kW)	Actual Load (kW)	Load (%)
Carding	Supply Air Fan (SAF) - 1	15.00	11.80	78.66
	Supply Air Fan - 2	15 .00	11.70	78.00
	Rotary Air Filter (RAF) - 1	18.50	17.80	96.22

	Pump - 1	7.50	7.20	96.00
	Pump - 2	7.50	7.15	95.33

It is to be noticed here pump motors and Return air fan motor gets more than 95% loading and the load should be reduced to 85%

Recommendations

- The Pump motor has to be replaced to higher efficiency centrifugal pumps.
- The pressure should be maintained at 3.5 Kg/cm²
- The Air washer system has to modify to downstream opposite each other.
- The SAF and RAF motor Impeller has to be changed to High efficiency impeller.
- The SAF and RAF Motor have to be changed as Super Premium Efficiency Motor.
- The Rotary air filter felt cloth could be replaced by 750holes/in² nylon mesh.

Energy saving potential

The Annual Total Expected Saving Will Be 32,000 Units

B. Study 2

Table 6 Simplex Department

Department	System	Installed Motor (kW)	Actual Load (kW)	Load (%)
Simplex	Supply Air Fan (SAF) - 1	9.30	7.80	83.88
	Supply Air Fan - 2	9.30	7.70	82.79
	Supply Air Fan (SAF) - 3	9.30	7.80	83.87
	Rotary Air Filter (RAF) - 1	18.50	17.20	92.97
	Pump - 1	3.75	3.15	84.00
	Pump - 2	3.75	3.25	86.66

Recommendations

- The Pump motor has to be replaced to higher efficiency centrifugal pumps.
- The pressure should be maintained at 3.5 Kg/cm²
- The Air washer system has to modify to downstream opposite each other.
- The SAF and RAF motor Impeller has to be changed to High efficiency impeller.
- The SAF and RAF Motor has to be changed as Super Premium Efficiency Motor.
- Increase the "V" filter area in Supply Air intake side and Increase the Exhaust air damper area at Outside.

Energy saving potential

The Annual Total Expected Saving Will Be 22,500 Units

C. Study 3

Table 7 Spinning Plant – 1

Department	System	Installed Motor (kW)	Actual Load (kW)	Load (%)
Spinning Plant - 1	Supply Air Fan (SAF) - 1	11.00	9.90	90.00
	Supply Air Fan - 2	11.00	9.80	89.09
	Rotary Air Filter (RAF) - 1	11.00	9.95	90.45
	Rotary Air Filter (RAF) - 2	11.00	9.80	89.09
	Rotary Air Filter (RAF) - 3	15.00	13.20	89.89
	Pump - 1	5.50	5.10	92.72
	Pump - 2	5.50	5.25	95.45

Recommendations

- The Pump motor has to be replaced to higher efficiency centrifugal pumps.
- The pressure should be maintained at 3.5 Kg/cm²
- The Air washer system has to modify to downstream opposite each other.
- The SAF and RAF motor Impeller has to be changed to High efficiency impeller.
- The SAF and RAF Motor have to be changed as Super Premium Efficiency Motor.
- The Rotary air filter felt cloth could be replaced by 750holes/in² nylon mesh.

Energy saving potential

The Annual Total Expected Saving Will Be 30.200 Units

D. Study 4

Table 8 Spinning Plant – 2 Department Loads

Department	System	Installed Motor (kW)	Actual Load (kW)	Load (%)
Spinning Plant - 2	SAF - 1	11.00	10.10	91.81
	SAF - 2	11.00	10.08	91.63
	RAF - 1	11.00	10.25	93.18
	RAF - 2	11.00	10.30	93.63
	Pump - 1	5.50	5.30	96.36
	Pump - 2	5.50	5.45	99.09

Recommendations

- The Pump motor has to be replaced to higher efficiency centrifugal pumps.
- The pressure should be maintained at 3.5 Kg/cm²
- The Air washer system has to modify to downstream opposite each other.
- The SAF and RAF motor Impeller has to be changed to High efficiency impeller.
- The SAF and RAF Motor have to be changed as Super Premium Efficiency Motor.

- The Rotary air filter felt cloth could be replaced by 750holes/in² nylon mesh.

Energy saving potential

The Annual Total Expected Saving Will Be 24,700 Units

E. Study – 5

Table 9 Spinning Plant – 3 Loads

Department	System	Installed Motor (kW)	Actual Load (kW)	Load (%)
Spinning Plant - 3	SAF - 1	9.30	8.70	93.55
	SAF - 2	9.30	8.60	92.47
	RAF - 1	15.00	12.80	85.33
	RAF - 2	15.00	12.78	85.20
	Pump - 1	5.50	5.25	95.45
	Pump - 2	5.50	5.35	97.27

Recommendations

- The Pump motor has to be replaced to higher efficiency centrifugal pumps.
- The pressure should be maintained at 3.5 Kg/cm²
- The Air washer system has to modify to downstream opposite each other.
- The SAF and RAF motor Impeller has to be changed to High efficiency impeller.
- The SAF and RAF Motor have to be changed as Super Premium Efficiency Motor.
- The Rotary air filter felt cloth could be replaced by 750holes/in² nylon mesh.

Energy saving potential

The Annual Total Expected Saving Will Be 25,600 Units

F. Study – 6

Table 10 Auto Coner Plant

Department	System	Installed Motor (kW)	Actual Load (kW)	Load (%)
Auto Coner Plant	SAF - 1	11.00	10.20	92.72
	SAF - 2	11.00	10.30	93.63
	RAF - 1	11.00	10.25	93.18
	RAF - 2	11.00	10.30	93.63
	Pump - 1	7.50	6.78	90.4
	Pump - 2	7.50	6.90	92.00

Recommendations

- The Pump motor has to be replaced to higher efficiency centrifugal pumps.
- The pressure should be maintained at 3.5 Kg/cm²
- The Air washer system has to modify to downstream opposite each other.
- The SAF and RAF motor Impeller has to be changed to High efficiency impeller.
- The SAF and RAF Motor have to be changed as Super Premium Efficiency Motor.
- Increase the "V" filter area in Supply Air intake side.



- Increase the Exhaust air damper area at Outside.

Energy saving potential

The Annual Total Expected Saving Will Be 26,200 Units

VI. COMPRESSOR AND AIR DISTRIBUTION

Compressed Air is more or less required at every stage of the textile manufacturing. Particularly large volume of air is required for integrated cotton textile industries having air-jet looms as well in the polyester yarn industries [27-29]. Compressed air is a very critical requirement in the PFY (Polyester Filament Yarn) value added segment such as texturing. Compressed Air is one of the most expensive utilities, but more often than not, this fact is not understood. Unlike the other utilities, many users find it difficult to measure their cost per CFM (Cubic Feet per Minute). Primarily, it should be understood that the compressed air frictional drag of compressed air jet coming from a main nozzle. Sub-nozzles are provided along the profiled reed to support the weft yarn during its insertion. Installed capacity of compressor motor is 25kW and 30kW in various departments shown in Table 11.

A. Compressor Study

Table 11 Compressor

S. No.	Description	Installed Motor (kW)	Actual Load (kW)	Load (%)
1	Compressor 1	25.00	23.56	94.24
2	Compressor 2	25.00	22.78	91.12
3	Compressor 3	25.00	21.56	86.24
4	Compressor 4	25.00	22.89	91.56
5	Compressor 5	30.00	28.90	96.33
	Total	130.00	119.69	

Recommendation

- At presently compressor running at 7 to 7.5 Kg/cm² bar due more air leakage in air distribution system and check the air leakages and arrest immediately, After that Pressure setting has to be changed to 6.8 to 7.2 Kg/cm².
- The design should ensure that the pressure drop should not be more than 0.5 kg/cm² (7 psi) in the longest line
- All compressor Radiator was choked and it will caused to increase the energy of compressor and it is advised to clean the radiator at regular interval.
- Better to replace the Screw compressor to BOP Compressor for better air quality and better energy consumption

Energy saving potential

The Annual Total Expected Saving Will Be 93.600 Units

Compressed Air Leakage & Effect

As we all of us know Compressed air is not a peanut to throw it freely. It is a priceless one to preserve. At 7 bar pressure in 1mm hole, there is 1.6 CFM has been leaked. So, if we have 10 Nos. of 1mm hole in a mill, air leakage must be 16 CFM. If we take 1 KW produces 5 CFM (Very Minimum), for 16 CFM it must be 3 KW. So, 3 Units/Hour means 72 Units / Day, 25560 Units/ Annum. Approximately Power cost wasted is Rs.2, 00,000/Annum @ Unit Cost of Rs.8/-

Compressed Air Measurement

Off Line Measuring

In this off line measuring you will have to stop the machine every time and connect your air inlet tube to our Air Flow meter. After that Air flows meter's outlet to be connected to your machine inlet.

It will be very useful to measure the air consumption of machines like Ring frame.

On Line Measuring

In this system you will have to fix the flow meter in a fixed pipe line, which is to be connected as machine inlet. By the way we can measure the instant air flow without stopping the machine.

Air Leak Detection

1. Use an ultrasonic detector to find out air leakages in air distribution system.
2. A simpler method is to apply soap water with a paint brush to suspect areas.
3. Draw a single line distribution diagram with details of compressor location, receivers, piping network and use points

Efficient operation of compressors

1. Clean inlet air
2. Lower inlet air temperature
3. Minimum moisture in the compressed air
4. Correct capacity of air receiver
5. Proper maintenance

Energy saving in compressor

The three major areas are

Compressed Air - Generation, Distribution and Utilization

Generation

The following points to be considered, compressor type, (single stage or multi stage), capacity required and capacity utilization Screw and centrifugal compressors are suitable for base load or full load applications but not for part load operations.

Reciprocating compressors are suitable for variable loads where no-load power is 10 to 12% of the full load power. Minimum and maximum pressure required type of cooling required space requirement type of capacity control On/Off control Load and Unload Throttling control Speed control. initial cost Where there are more than one compressor then modulation should be based on If all are of similar size then one compressor should handle load variation If all are of different size then smallest compressor is allowed to modulate IF all are of different type then allow screw/centrifugal compressors to run on full load In general allow the compressor whose no-load power consumption is less to modulate

Distribution

Efficient air distribution ,Air Receiver installation ,Optimum pipe sizes Avoiding leaks and wastage ,Avoiding unnecessary pressurization of piping system, Proper location of moisture separators and drain valves

Utilization

Use of blower air instead of compressed air Use of PRV for low pressure air requirement. Use of electrical tools instead of pneumatic tools

Power Quality Improvement In Low Voltage AC Networks

Power Quality problems originate from the following

- Current Harmonics caused by non-linear loads.
- Unbalanced currents with dynamically varying amplitude and phase angle caused by dynamic single phase or unbalanced loads (example: welding machines).
- Dynamically fluctuating load kW and power factor due to sudden load fluctuations that occur due to operation of large presses, rolling mill motors/drives, starting of induction motors etc.

Such Power Quality problems can cause mal-operation / failure of sensitive loads and electrical protection systems. This will result in reduced productivity and profitability of the industry/user of electrical energy. Therefore necessary to find effective solutions for such Power Quality problems. It is also necessary to ensure that penalties levied by Electric utilities for low power factor are avoided. However it is now becoming more important to avail the financial incentives for high power factor as are now being offered by several Electric utilities.

This will improve the profitability of the industry/user of electrical energy. The earlier approach of providing conventional capacitor banks &/or tuned harmonic filters for power factor improvement and reduction of harmonics is increasingly becoming inadequate.

The constant upgrading of design and manufacturing technologies in the fields of reactive power management systems & harmonic control, combined with the use of sophisticated static control devices has made it possible to

apply new methods to solve POWER QUALITY problems in LV networks.

Total Load at Transformer (ACB type)

In transformer study, the transformer connected in the mill is ABC type connection. Transformer electrical parameters are tabulated in Table 12.

Table 12 Transformer Parameter

Electrical Parameter	Value
Voltage (Volt)	425.70
Current (Amp)	2808.00
Power (kW)	2013.00
P.F	0.99
V _{thd} (%)	3.10%
I _{thd} (%)	5.00%

- The Total voltage harmonics (%V_{thd}) is 3.10 % with capacitors are within the limit as specified in the IEEE 519-1992.i.e 5%
- The Total Current harmonics (% I_{thd}) is 5.00% with capacitors are within the limit of 8% as specified in the IEEE 519-1992.
- The instantaneous power factor is 0.98 to 0.99 lagging with capacitor.

Recommendation

Connect 100 KVAR - Detune Harmonic filter with 7% Block reactor at M V Panel to maintain current harmonics within the limit the of 8% as specified in the IEEE 519-1992 and maintaining the unity power factor.

Overall Recommendations

Based on energy study, recommendations were tabulated in Table 13 and 14 and consolidated power quality study and recommendations were shown in Table 15.

Table 13 Machine wise Recommendation – I

S. No.	Description	Volts	Amps	Power in KW	Power factor	Recommendations	Expected Savings
1	Blow room Trumac	408.9	68.12	36.03	0.76	<ul style="list-style-type: none"> • Connect 15 KVAR Capacitor at Control panel. • All Transmission "V" belt has to be changed to Cogged Belt. 	15500 Units/Year
2	Blow room Rieter	409.8	67.87	35.78	0.78	<ul style="list-style-type: none"> • Connect 15 KVAR Capacitor at Control panel. • All Transmission "V" belt has to be changed to Cogged Belt 	14500 Units/Year
3	Waste Collection System Batliboy	409.6	127.51	77.37	0.86	<ul style="list-style-type: none"> • Centrifugal Fan Impeller has to be changed to Energy Saving Impeller. • All Transmission "V" belt has to be changed to Cogged Belt 	120000 Units/Year
4	Waste Collection System - VXL	409.6	134.51	79.37	0.85	<ul style="list-style-type: none"> • Centrifugal Fan Impeller has to be changed to Energy Saving Impeller • All Transmission "V" belt has to be changed to Cogged Belt 	125000 Units/Year
5	Carding 1 - DK 780	408.7	11.06	5.86	0.85	NIL	NIL
6	Carding 2 - DK 780	408.7	11.86	5.87	0.85	NIL	NIL
7	Carding 3 - DK 780	408.7	11.86	5.89	0.85	NIL	NIL
8	Carding 4- DK 780	408.7	11.86	5.87	0.85	NIL	NIL



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9	Carding 5 -DK 780	408.7	11.89	5.37	0.85	NIL	NIL
10	Carding 6 - DK 780	408.7	11.86	5.87	0.85	NIL	NIL
11	Carding 7 - DK 780	408.7	11.86	5.89	0.85	NIL	NIL
12	Carding 8 - DK 780	408.7	11.86	5.87	0.85	NIL	NIL
13	Carding 9 - DK 780	408.7	11.89	5.37	0.85	NIL	NIL
14	Carding 10 -DK 780	408.7	11.86	5.87	0.85	NIL	NIL
15	Carding 11 -DK 780	408.7	11.86	5.89	0.85	NIL	NIL
16	Carding 12 -DK 780	408.7	11.86	5.87	0.85	NIL	NIL
17	Carding 13 -DK 780	408.7	11.89	5.37	0.85	NIL	NIL
18	Carding 14-DK 780	408.7	11.86	5.87	0.85	NIL	NIL
19	Carding 15 -DK 780	408.7	11.86	5.89	0.85	NIL	NIL
20	Carding 16C 60	408.9	13.78	7.61	0.79	NIL	NIL
21	Carding 17C 60	408.9	13.88	7.81	0.79	NIL	NIL
22	Carding 18C 60	408.9	13.88	7.81	0.79	NIL	NIL
23	Carding 19C 60	408.9	13.78	7.61	0.79	NIL	NIL
24	Carding 20C 60	408.9	13.78	7.61	0.79	NIL	NIL
25	Carding 21C 60	408.9	13.88	7.81	0.79	NIL	NIL
26	Carding 23TC 5-3	408.9	11.88	6.81	0.89	NIL	NIL
27	Carding 24TC 5-3	408.9	13.78	7.61	0.79	NIL	NIL
28	Carding 25LC 300 A	408.9	11.98	6.81	0.89	NIL	NIL

Table 14 Machine wise Recommendation – II

S. No.	Details	Existing	Recommended	Difference
1	Pneumafil Motor Capacity in KW	5.5	5.5	0
2	Pneumafil impeller Size (Dia in mm)	460	460	0
3	Pneumafil impeller Weight in Kg	14.2	11.0	3.2
4	Pneumafil impeller No of FAN Vanes	12	8	4
5	Suction Pressure in Kg/cm2 RHS (Gear end)	40	20	20
6	Suction Pressure in Kg/cm2 RHS (Middle)	50	30	20
7	Suction Pressure in Kg/cm2 RHS (Off end)	110	65	45
8	Suction Pressure in Kg/cm2 LHS (Gear end)	35	22	13
9	Suction Pressure in Kg/cm2 LHS (Middle)	50	34	16
10	Suction Pressure in Kg/cm2 LHS (Off end)	110	65	45
11	Expected Power saving in Units/Hr	4.25	3.05	1.2

Expected Energy Saving and Cost Calculations

The present “Pneumafil impeller” can be changed to “LMW energy saving impeller” to get the savings of 30 % of power.

Energy Saving/Hour - 01.20 Units
 Energy Saving/Day (1.2 x 24 Hr) - 28.80 Units
 Energy Saving/Month (28.80 x 30) - 864.00 Units
 Energy Saving Cost/Hr (24 x INR 6.35) - 6.35 INR
 Energy Saving Cost/Month (864xINR6.35) - 5486.40 INR

Cost of new LMW Impeller - 3600 INR
 Total number of Impeller Required - 25.00
 Cost of Impeller - 3600 INR
 Total Investment Cost (25 x 3600) - 90000.00 INR
 Expected Power saving in Units/Hr (1.2 * 25) - 30.00
 Saved Units/Month (24* 30*30) - 21600 INR
 Saved Power cost/Month @6.35/Unit- 137160 INR
 Return of Investment - 19.69 Days
 Payback period - < 1 month

Consolidated Power Quality Study and Recommendations

Table 15 Consolidated Power Quality Study and Recommendations

S. No.	Name of the Feeder	Voltage (V)	Current (Amp)	Power (kW)	P.F	V _{thd} (%)	I _{thd} (%)	Capacitor Connected (KVAR)	Capacitor Required (KVAR)	Recommendations
1	SSB 1 (Sub Switch Board)	416.30	346.60	203.35	0.82	0.09	2.70	50	50	Failure of (2 X 25 KVAR) EPCOS Capacitor can be removed and new MOMYA Capacitor can be connected.
	SSB 2	416.30	108.40	62.05	0.80	3.30	6.20	50	25	Connect only 25 KVAR Capacitor

3	SSB 14	417.10	197.60	138.17	0.96	0.06	2.50	100	0	NIL
4	SSB 4	427.10	165.40	120.21	0.99	2.80	5.20	100	0	NIL
5	SSB 5	423.20	327.70	212.70	0.88	2.10	6.50	50	0	Connect Detuned Harmonic Filter of 50 KVAR and connect 2 Runs of 3 1/2C,240 SQMM AL XLPE Cable and remove the old cable
6	SSB 10	418.50	238.10	140.54	0.97	3.40	4.70	100	0	NIL
7	SSB 11	419.20	221.40	158.86	0.99	3.50	2.90	100	0	NIL
8	SSB 13	417.50	217.70	134.70	0.85	3.40	6.70	50	0	Connect Detuned Harmonic Filter of 50 KVAR
9	SSB 9	417.90	112.60	76.35	0.94	3.20	22.10	80	30	Remove the all Capacitor and Connect Detuned Harmonic Filter of 30 KVAR
10	SSB 7	418.70	227.90	158.40	0.96	3.80	3.90	75	0	Additionally Connect 1 runs of 3 1/2C,185 Sq. mm AL.XLPE Cable
11	SSB 3	416.50	213.50	150.99	0.99	3.50	3.30	100	0	NIL
12	SSB 6	415.70	147.70	99.04	0.93	3.50	2.30	0	50	Remove the 50 KVAR Capacitor from MCC 1 and Connect the Capacitor at SSB Outgoing
13	SSB 14 A/C SSB	415.60	95.20	49.55	0.74	3.50	11.20	0	0	Connect Detuned Harmonic Filter of 30 KVAR
14	MCC 1 (Motor Control Center)	416.00	51.40	27.17	0.72	2.80	20.50	50	0	Remove 50 KVAR Capacitor
	MCC 2	413.80	67.90	48.20	0.99	2.30	7.50	50	25	Remove 25 KVAR Capacitor
15	MCC 3	412.60	77.50	43.33	0.79	2.30	3.10	0	25	Connect 25 KVAR Capacitor
16	MCC 4	400.60	101.00	55.26	0.79	3.00	3.70	0	25	Connect 25 KVAR Capacitor
17	MCC 5	416.90	132.80	78.65	0.83	2.10	2.70	0	25	Connect 25 KVAR Capacitor
18	Transformer Load (ACB)	425.70	2808.00	2013.00	0.99	3.10	5.00			Connect 100 Detune Filter with APFC

VII. CONCLUSION

Improving operating parameters of the mill towards safety and enhanced efficiency. The above mentioned recommendations are some of the finer points of energy economy measures being tried and to be tried in the mill. The above measures are aimed at running existing machineries to the maximum possible effectiveness. We want to reduce the avoidable losses to the maximum in the transmission of energy from one state to other in the equipment and we are tried to match existing efficiency of equipments to suit the process. Simultaneously we try to

improve the existing ambient conditions surrounding the equipments to suit and comfort the equipments, that they can give better output to process.

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