BEE's National Program
on
Energy Efficiency and Technology Up-gradation in SMEs

Pali Textile Cluster

Baseline Energy Audit Report
Shree Rajaram Process




Submitted to

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InsPIRE Network for Environment

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contents

InsPIRE

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List of Abbreviations

APH	Air-preheater
BEE	Bureau of Energy Efficiency
BD	Blow Down
BOP	Best Operating Practice
BFW	Boiler Feed Water
CETP	Common Effluent Treatment Plant
CSE	Center for Science and Environment
CRS	Condensate Recovery System
FD	Forced Draft
HP	Horse Power
ID	Induced Draft
kcal	Kilo Calories
kg	Kilogram
kVA	Kilo Volt Ampere
kW	Kilo Watts
MSME	Ministry of Micro Small and Medium Enterprises
RTHPA	Rajasthan Textile and Hand Processors Association
RO	Reverse Osmosis
SEC	Specific Energy Consumption
SFC	Specific Fuel Consumption
SPC	Specific Power Consumption
SME	Small and Medium Enterprise
SO	Sulphur Oxide
TDS	Total Dissolved Solids
TFH	Thermic Fluid Heater
VFD	Variable Frequency Drive

About The Project

The project titled "BEE's National Program on Energy Efficiency and Technology Up-gradation in SMEs" supported by Bureau of Energy Efficiency (BEE), Ministry of MSME and Rajasthan Textile and Hand Processors Association (RTHPA) aims to bring down the energy demand of MSME industries located at different clusters around the country. Pali Textile Processing cluster located at Pali, Rajasthan is one such cluster, which has been selected under the program. The project aims to support the MSME units in Pali to implement Energy Efficient Technologies in the SME units.

There are more than 400 Small and Medium Enterprise (SME) textile processing units operating in the various industrial pockets of Pali. The project aims to initially diffuse energy efficient technologies in selected units in the cluster. These units will act as demonstration units for long term and sustainable penetration of energy efficient technologies in the entire cluster. InsPIRE Network for Environment, New Delhi has been appointed as the executing agency to carry out the following activities in the cluster:

- Conducting pre-activity cluster workshop in the cluster.
- Conducting initial walk through audits in 5 representative units of the cluster.
- Identify and propose BEE on energy efficient process technologies, relevant to the cluster, with highest energy saving and replication potential, and their cost benefit analysis.
- Identify local technology/service providers (LSP) for the above technologies in the cluster
- Identify SME units willing to implement and demonstrate the energy efficient technologies
- Assist BEE to enter into a contract with each of the shortlisted SME units to enable implementation and showcasing of Energy Efficient technology.
- Conduct comprehensive Baseline Energy Audits in the shortlisted SME units wherein these technologies can be implemented and document the findings in the form of a report.
- Develop technology specific case studies (Audio-Visual and print) for each technology
- Prepare Best Operating Practices (BOP) document for the top 5 energy using equipment / process in the industry cluster
- Enumeration of common regularly monitorable parameter at the process level which have impact on energy performance, and listing of appropriate instrumentation for the same with options including make, supplier, indicative cost specifications and accuracy of measurements.
- Carry out post implementation energy audit in the implemented units to verify energy savings as a result of EE technology implementation.
- Verify and submit to BEE all the relevant documents of each participating unit owner indicating his complete credentials, proof of purchasing the equipment, evidence of implementation and commissioning of the EE technology in the unit.

As part of the activities conducted under the energy efficiency program in Pali Textile cluster, detailed energy audits in 11 Textile units in Pali was conducted in the month of March and April'2016. This specific audit report details the findings of the energy audit study carried out at Shree Rajaram Process.

Executive Summary

1. Unit Details

Unit Name	:	**Shree Rajaram Process**
Address	:	F-329, Mandia Road Industrial Area, Pali, Rajasthan- 306401
Contact Person	:	Mr. Ratan Dhariwal, Manager (Cell no: 9001556789)
Products	:	Cloth processing (Finishing & Felt)
Production		50,000 to 70,000 meters of processed cloth per day
DIC Number		RJSI/21/17/06828
Bank Details		Bank of Baroda, Suraj Pole, Pali, A/c No.: 09790200008137, IFSC Code: BARB0PALIXX
TIN / PAN No.	:	TIN: 08363254365 PAN: AANHS0271G
Contract demand		

2. Existing Major Energy Consuming Technology

Biomass Briquettes Based Steam Boiler

- Steam boiler with no provision for combustion monitoring and control. Also, the unit do not have boiler feed water treatment facility.
- Prevailing specific fuel consumption is 0.015 kgs of biomass per meter of processed cloth. High TDS in the feed water leads to frequent blow-down of boiler.

Jet Dyeing Machine and Zero-Zero Machine

- 1 No. of zero-zero machine with no provision for condensate recovery.
- Zero-zero machine uses steam at 250 kg/hr and processes 40,000 mtrs of cloth per day.

3. Proposed Energy Saving Technologies with Cost Economics

Proposed Energy Saving Measures

- Installation of oxygen based boiler automation.
- Installation of RO system for treatment of feed water to boiler.
- Installation of condensate recovery system for zero-zero machine.

Table 1: *Cost Economic Analysis*

Technology	Estimated Energy Savings (%)	Savings (in Rs)	Investment (in Rs)	Simple Payback period (Months)
Oxygen based automation and control system in boiler	18.8	5,08,846	7,00,000	17
Reverse Osmosis (RO) system in steam boiler	8.9	3,27,299	2,00,000	7
Condensate Recovery System (CRS) in Zero-Zero Machine	16.67	4,43,073	5,00,000	13

Introduction

1.1 ABOUT THE CLUSTER

The Pali textile cluster is one of the biggest SME clusters in Rajasthan having over 350 member industries. The units in the cluster are mainly located in industrial areas namely Industrial Area Phase I & Phase II, Mandia Road Industrial Area and Punayata Industrial Area. Balotra and Bhilwara are other textile clusters in Rajasthan. These clusters also have similar processes and any intervention in Pali would benefit entrepreneurs in these clusters as well. Pollution of nearby river was a significant environmental issue. Center for Science and Environment (CSE) conducted a study to assess the situation behind the environmental issues. The units faced closure for a long time due to legal actions and decided to set up a Common Effluent Treatment Plant (CETP) for redressal the waste water related issues. The CETP is being operational under a trust managed by the entrepreneurs themselves.

Ironically, even though none of the resources required for textile processing is available locally, the textile cluster at Pali has grown despite the odds. The industrial area has no water and all the water required is transported from a distance of over 20 KM. The labour working in the cluster is mostly from outside Pali, at times from as far as Eastern UP and Bihar. Equipment suppliers are all based in Gujarat and Pali does not have enough local service providers or consultants. Even the grey (raw) cloth, dye and chemicals are brought mostly from Maharashtra and Gujarat. Biomass Briquettes are available locally.

Only resources that are available locally is the entrepreneurship of the people, availability of clear sky for over 340 days in an year and good power availability. Presence of a pool of dye masters to process over 400 shades through colour recipe based on experience is another plus for Pali. Initially, Surat used to be the largest processing center for dyeing but a large portion of the job there got outsourced to Pali due to problems like Pollution, Flood, Plague etc.

1.2 ABOUT THE UNIT

M/s Shree Rajaram Process, Pali, was established in the year 1995 and is engaged in processing of cloth (both cotton and polyester) which includes raw cloth (grey) processing, dyeing and finishing operations. The manufacturing unit is located at F-329, Mandia Road Industrial Area, Pali. The unit operation is overseen by Mr. Ratan Dhariwal, Manager.

The raw material procured by the unit includes grey (raw cloth) purchased from various sources predominantly from Gujarat and Maharashtra. The unit operates for 12 hours per day, presently.

The daily production lies in the range of 50,000 to 70,000 meters of processed cloth per day. The major energy usage in the unit includes wet steam (generated from biomass fired boiler) and electricity. The average monthly biomass consumption (derived from reported date of last one year) in the unit is 23,090 Kgs. The average monthly electricity consumption (derived from reported date of last one year) is 4,310 kWh. ***Figure 1.1*** depicts monthly electricity consumption vis-à-vis total monthly production of the unit for last one year. ***Figure 1.2*** depicts monthly Biomass Briquettes consumption vis-à-vis total monthly production for last one year.

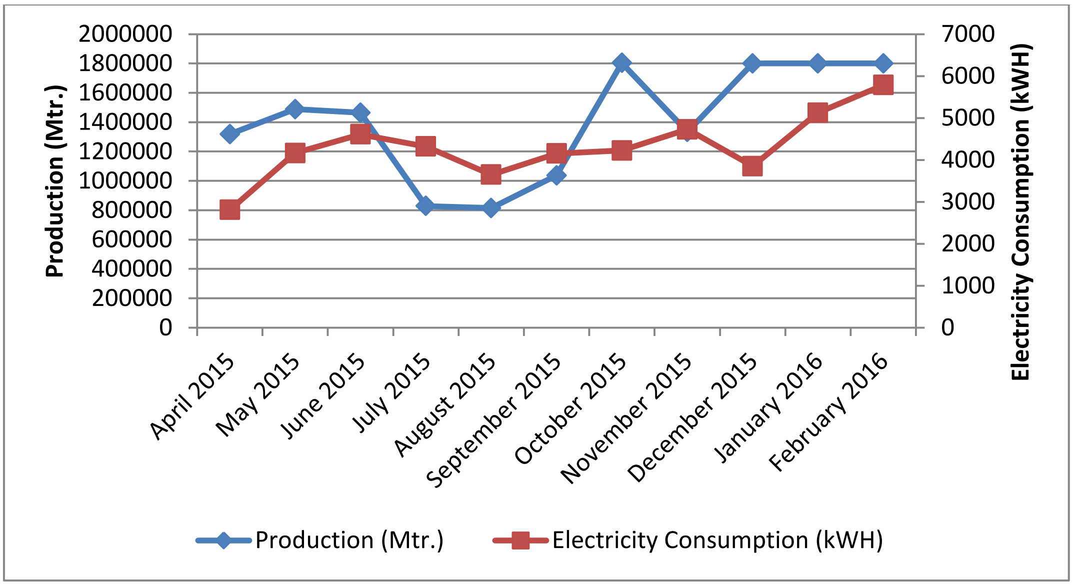


Figure 1.1: ***Monthly variation of production and electricity consumption***

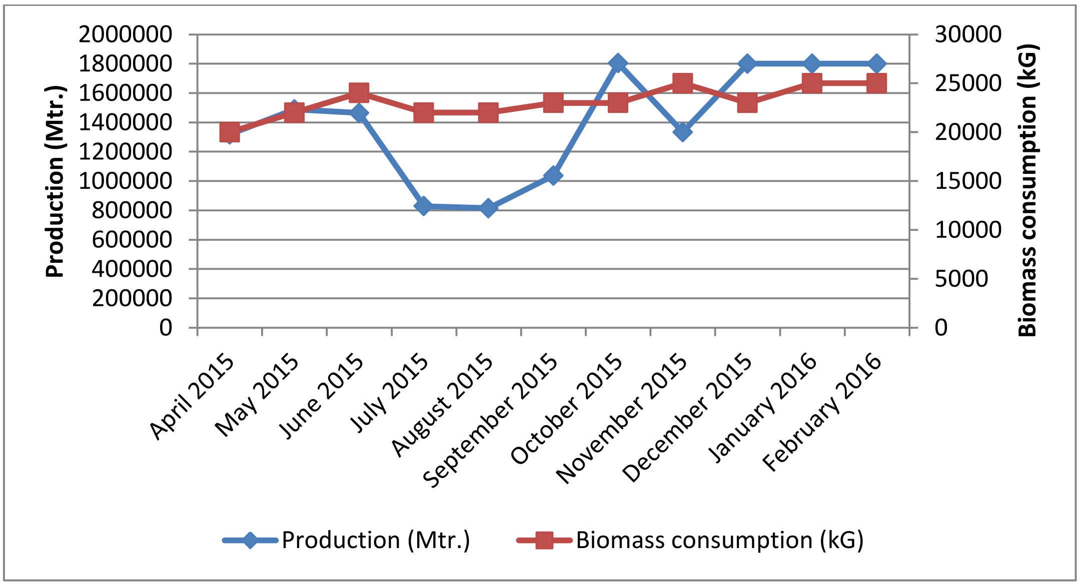


Figure 1.2: ***Monthly variation of production and Biomass Briquettes cosumption***

Figure 1.3 and *Figure 1.4* below respectively depicts the variation in specific electrical energy consumption and specific thermal energy consumption vis-à-vis the monthly production for last one year.

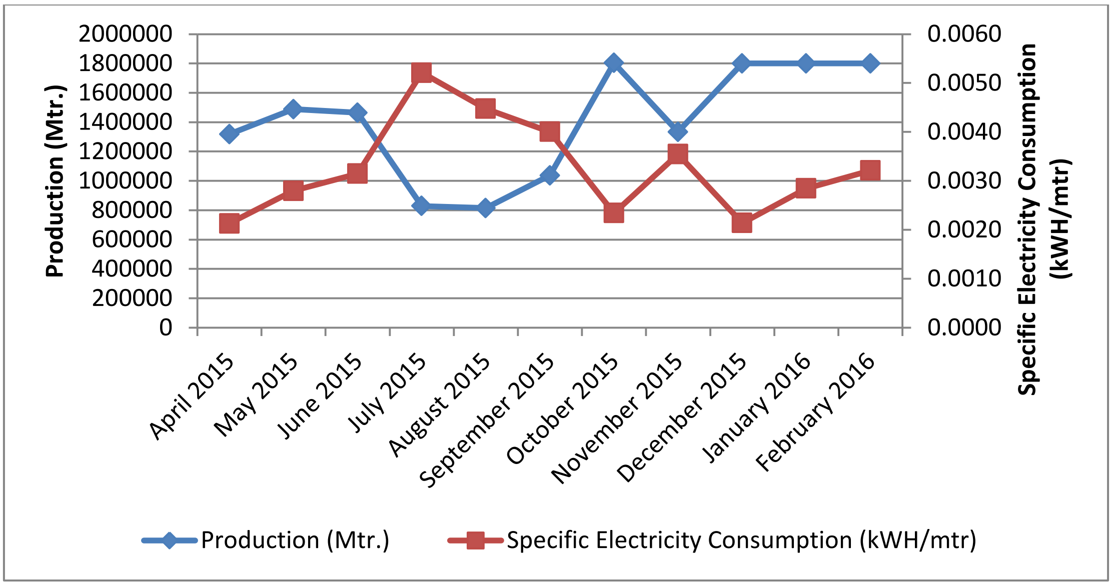


Figure 1.3: ***Variation in specific electrical energy consumption and monthly production***

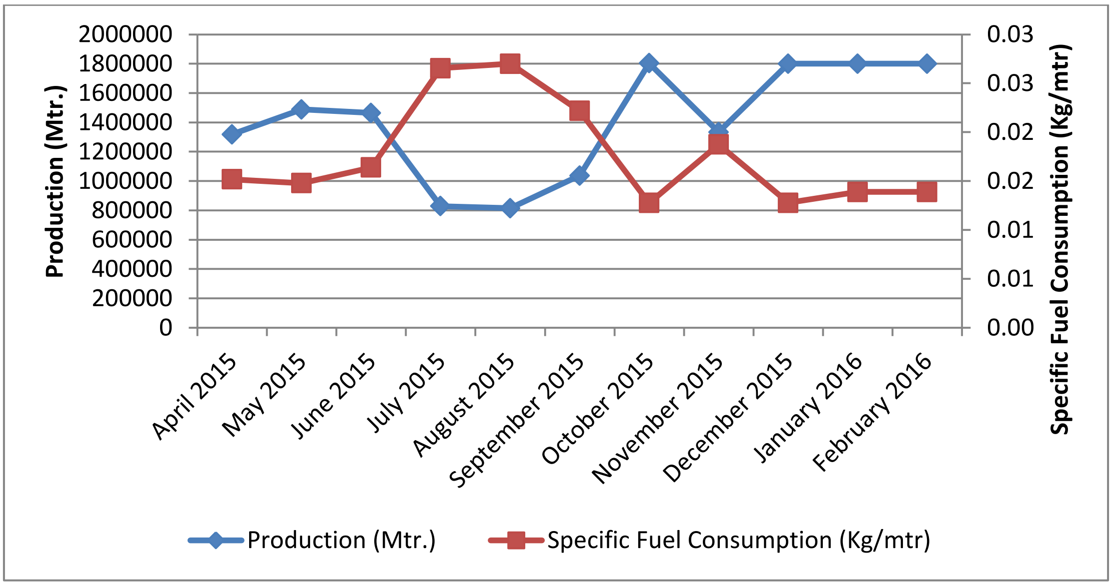


Figure 1.4: Variation in specific fuel consumption (Biomass Briquettes) and monthly production

According to the assessment of the energy consumption data as reported by the unit (filled in questionnaire attached), the specific thermal energy consumption of the unit varies from 7 kCal/mtr to 18 kCal/mtr over a period of one year with an average of 11.73 kCal/mtr. The specific electrical energy consumption of the unit varies from 0.002 kWh/mtr to 0.005 kWh/mtr over a period of one year with an average of 0.003 kWh/mtr. The unit used biomass briquettes as fuel with a calorific value of 3600 kCal/mtr. The total average specific energy consumption (in kcal), based on reported data for one year, is estimated as **14.54 kCal/mtr** of product. The energy consumption pattern for the unit has been summarized below at ***Table 1.1.***

Table 1.1: ***Energy consumption details of Shree Rajaram Process***

SN	Parameter	Unit	Value
1	Name and address of unit	Shree Rajaram Process, F-329, Mandia Road Industrial Area, Pali, Rajasthan-306401	
2	Contact person	Mr. Ratan Dhariwal, Manager	
3	Manufacturing product	Processed cloth (Cotton/ Polyester)	
4	Daily Production	70,000 mtr per day	
Energy utilization			
5	Average monthly electrical energy consumption	kWh	4,310
6	Average monthly fuel (Biomass Briquettes) energy consumption	kg	23,090
7	Average specific thermal energy consumption	kCal/mtr	11.73
8	Specific electrical energy consumption	kWh/mtr	0.003
9	Specific energy consumption[1,2]	kCal/mtr	14.54
10	Electrical energy cost[3]	Rs/mtr	0.02
11	Thermal energy cost[3]	Rs/mtr	0.09

Note:

[1]: Specific gross calorific value of biomass has been considered as 3600 kCal/kg

[2]: Thermal equivalent for one unit of electricity is 860 kCal/kWh.

[3]: The unit operates for 25 days a month (1 shift of 12 effective hours per day).
Cost of electricity has been taken as Rs 6.50 / kWh
Cost of biomass has been taken as Rs 5 /kg

1.3 PRODUCTION PROCESS OF PLANT

The ***Figure 1.5*** below shows the typical process employed at processing of textile products at Shree Rajaram Process:

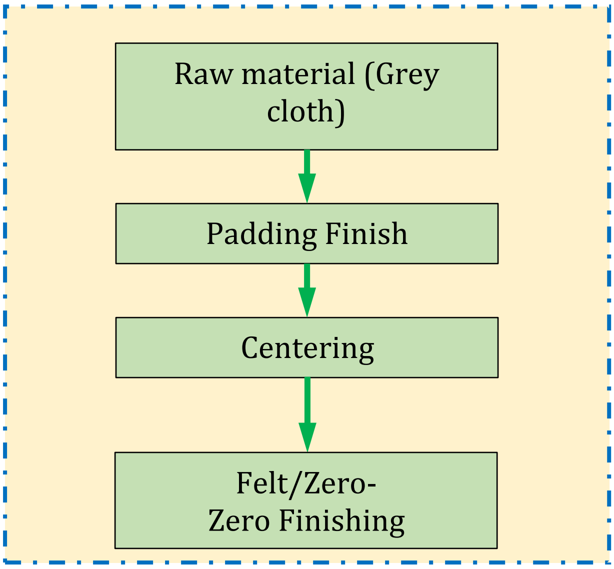


Figure 1.5: ***Production process at Shree Rajaram Process***

1.4 ENERGY AUDIT METHODOLOGY

The primary objective of the energy audit was to quantify the existing energy consumption pattern and to determine the operating efficiencies of key existing systems. The key points targeted through energy audits were determination of specific energy consumption, various losses, operation practices like production, fuel consumption, steam utilization and losses, process temperatures, electrical energy consumptions etc. Pre – planned methodology was followed to conduct the energy audits. Data collected at all above steps were used to calculate various other operating parameters like material processing rate (mtr/hr), specific electricity consumption (kWh/kg), specific steam utilization (kg/kg), etc. The energy audit methodology is depicted in ***Figure 1.6*** below:

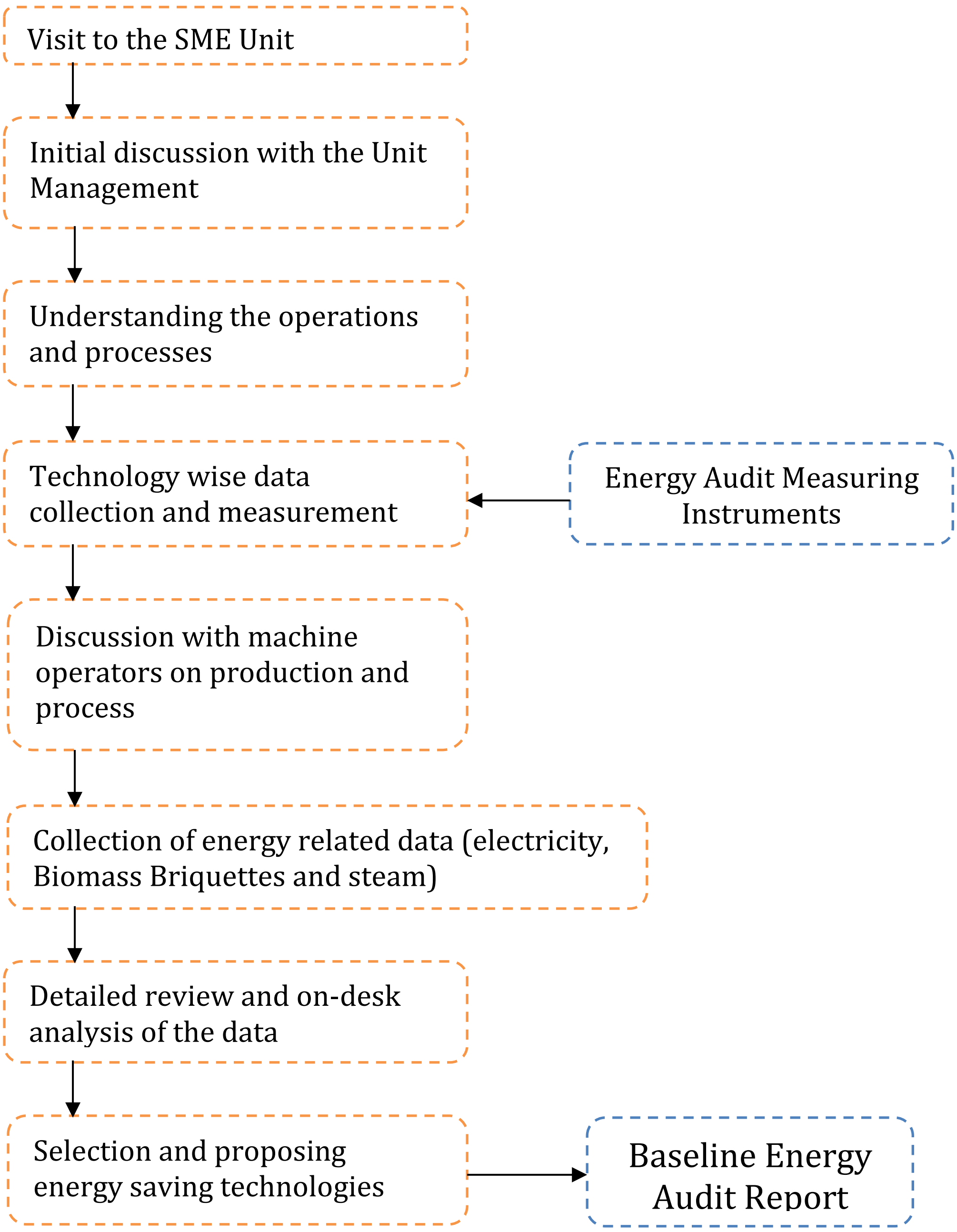


Figure 1.6: ***Energy audit methodology***

1.5 UNIT PHOTOGRAPHS

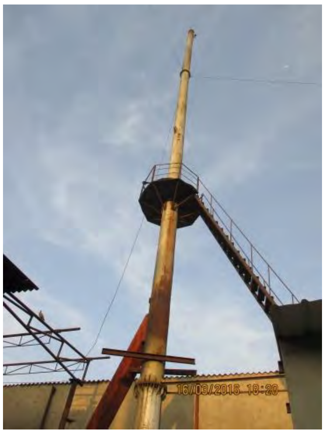
Caption: Boiler unit at Shree Rajaram Process

Caption: Finishing operations

Caption: Natural drying of fabric

Caption: Zero-Zero / Felting operations

Caption: Cotton Padding Finish operations



Caption: Chimney at Shree Rajaram Process

Present Process, Observations and Proposed Technology

2.1 INSTALLATION OF BOILER AUTOMATION

2.1.1 Present Process

Shree Rajaram Process has installed a steam boiler of 1 tonnes capacity to generate wet steam required for the process. Steam is used at a working pressure of 3-4 kg/cm^2. Biomass is used as the fuel for the steam boiler. The heating chamber consists of a fluidized bed of Biomass Briquettes wherein air is supplied from bottom. The heat generated by combustion of Biomass Briquettes and air is used to heat water to form steam. The steam generated is used in various processes across the unit. The boiler operates for an average of 12 hours daily.

2.1.2 Observations

Combustion efficiency is an important parameter to determine the boiler efficiency. Combustion efficiency depends on 3 'Ts" i.e. temperature, turbulence and time. In case of Rajaram Mills, there is not control on the fuel feeding rate and air supply to the boiler combustion chamber. Also, the unit does not have monitoring system for measuring the chamber temperature and free oxygen in the flue gas. In order to determine the combustion efficiency in the boiler chamber, oxygen percentage in the flue gas outlet was monitored in the unit using a flue gas analyser. The oxygen percentage was observed to be 15% instead of the required level of 8%. This led to high amount of excess air in the boiler chamber thus leading to poor efficiency of the boiler.

The specific fuel consumption of Biomass Briquettes was observed to be around 0.015 kgs of biomass per meter of the processed cloth which is higher in comparison to the values for other units. It was observed that during operation, fuel supply was controlled manually without controlling the air flow rate. Further, there was no provision for measuring the temperature inside the boiler heating chamber.

Based on the detailed study of the unit, it is proposed to install an oxygen based control system in the steam boiler of the unit. The system will work based on the oxygen percentage in the flue gas, which will automatically control the forced draught (FD) and the induced draught (ID) fan. The fuel flow rate can also be monitored using an integrating a temperature based control system with the same. The correct amount of excess air maintained will lead to significant improvement in the combustion efficiency of the unit.

2.1.3 Conclusion

As per the study conducted in the unit, it is suggested to install an oxygen based automation control system in the steam boiler. This system will be able to maintain the correct oxygen and excess air percentage thus improving the boiler efficiency.

The installation of the oxygen based automation in the steam boiler will lead to following benefits:

- Saving of fuel feed.
- Savings in electrical energy consumption
- Improvement in boiler efficiency
- Lower maintenance
- Improved environment

2.1.4 Cost Economics Analysis

The section below provides a cost benefit analysis for installation of oxygen based control system in the existing steam boiler of the unit.

Table 2.1: *Cost Economic Analysis of proposed oxygen based automation system*

SN	Parameter	Unit	Value
1	Present O_2 level	% age	15
2	Theoretical air requirement	kg of air/kg of fuel	10.8
3	Excess air supply at present condition	% age	250
4	Actual mass of air supplied at present condition	kg of air/kg of fuel	37.8
5	Proposed O_2 level required	% age	8
6	Excess air supply after implementation of technology	% age	61.5
7	Reduction in sensible excess air		188.5
8	Reduction in fuel consumption	%	18.8
9	Hourly fuel consumption (present)	kg/hr	197
10	Hourly fuel consumption after installation	kg/hr	160
11	Annual fuel saving	kg/yr.	67846
12	Annual monetary saving	Rs/yr.	508846
13	Investment	Rs	700000
14	Payback	months	17

* With every 10% reduction in excess air leads to a saving in specific fuel consumption by 1%

It is therefore proposed to install an oxygen based automation control system in the existing steam boiler the estimated fuel saving with the installation is 67,846 kgs annually which can save an amount of Rs. 508846 per year. Thus the cost of the economizer (estimated to be Rs. 7, 00,000) can be recouped in 17 months period.

2.2 CONDENSATE RECOVERY SYSTEM IN ZERO-ZERO (FELT) MACHINE

2.2.1 Present Process:

Shree Rajaram Process has installed 1 number of felt machines. These machines are used for finishing operations wherein the fabric is rotated in circular rubber drum with blanket of steam rotating around it. Steam at a working pressure of 4-5 kg/cm^2 is used in the process. A significant amount of steam is lost during the operation, as the portion of the latent heat is transferred to the equipment line resulting in condensate formation. The unit has 1 number of zero-zero (felt) machine, having a capacity to use steam at 200 to 250 kg/hour. Around 40,000 meters of cloth is processed in zero-zero machine every day

2.2.2 Observations

The felting or zero-zero process is carried through controlled compression shrinkage or pre-shrinking of the fabric by passing the fabric into rubber unit. This process forces the yarns closer together and the fabric becomes thicker and heavier and the dimensional stability of the fabric improves. This process is also called "sanforization".

In the zero-zero finishing operation, fabric is passed between hot cylinder with steam in the inner line and endless rubber, heating of the cylinder takes place by steaming arrangements. Pressure is applied on the fabric between the rubber and cylinder by pressure roll. During this above operation shrinkage takes place on the fabric. During drying of fabric in the felt unit, the moisture is uniformly absorbed from the fabric by the felt blanket and the shrinkage of the fabric is set. The unit also has a cooling cylinder which is used to further cool the fabric to normal temperature.

A significant portion of steam is converted into water droplets due to condensation in the zero-zero and felt operations. When steam condenses, at the threshold or instant of phase change, the condensate temperature is the same as steam because only the latent heat has been lost, and the full amount of sensible heat remains. This condition is known as "Saturated Water". Not wasting, but rather recovering and reusing as much of this sensible heat as possible through installation of condensate recovery system.

2.2.3 Conclusion

In order to recover heat lost through condensate, it is proposed to install a condensate recovery system in the zero-zero machines. Condensate recovery is a process to reuse the water and sensible heat contained in the discharged condensate. Recovering condensate instead of throwing it away can lead to significant savings of energy, chemical treatment and make-up water. Condensate can be reused in many different ways, for example:

- As heated feed water, by sending hot condensate back to the boiler's deaerator
- As pre-heat, for any applicable heating system
- As steam, by reusing flash steam
- As hot water, for cleaning equipment or other cleaning applications

The system includes a positive displacement condensate pump which can recover (suck) hot condensate and flash steam from the steam pipeline and feed the same into the boiler feed water tank. The pump may also be equipped with an in-built receiver for condensate which eliminates the need for a separate storage tank. The installation of the system will allow 100% recovery of condensate formed during the jet dyeing process. The technology can be suitably modified for mechanical or sensor based control.

Benefits of the condensate recovery system are:

- Reduced fuel cost
- Lower water related expenses
- Positive impact on safety and environment

2.2.4 Cost Economics Analysis

The section below provides cost benefit analysis for the installation of condensate recovery system in the zero-zero machine.

Table 2.2: *Cost Economic Analysis of proposed condensate recovery system in zero-zero machine*

SN	Particular	Unit	Value
1	No. of zero-zero machine	No	1
2	Steam consumption for zero -zero machine	kg/hr	250
3	Operating hours per day	hrs.	12
4	Condensate recovery potential	kg/day	3000
5	operating days	days	300
6	Sensible heat @ 4kg/cm^2	kcal/kg	144
7	Sensible heat @ 0.5 kg/cm^2	kcal/kg	111
8	Latent heat @ 0.5 kg/cm^2	kcal/kg	532
9	Flash steam quantity saved	kg/day	186
10	Savings with flash stem (A)	Rs	55827
11	Balance condensate stem	kg/day	2814
12	Temperature of condensate	°C	95
13	Inlet temperature	°C	35
14	Gain in enthalpy	kcal/d	168835
15	GCV of fuel	kCal/kg	3600
16	Cost of fuel	Rs/kg	5
17	Savings with condensate stem	Rs	117246
18	Total quantity of RO water generated per day	Ltr/day	3000
19	Cost of RO water per liter	Rs	0.30
20	Savings from Ro water per year (B)	Rs	270000
21	Total Saving (A +B)	Rs	443073
22	Cost of condensate recovery system	Rs	500000
23	Simple pay back	months	13.54
24	Fuel saving	kg/hr	87
25	Energy saving	%	16.67

*Cost of fuel has been taken as Rs 5/kg

The proposed condensate recovery system to be installed in the zero-zero machine will lead to an annual monetary saving of Rs.4,43,073. Thus the estimated cost of Rs 5, 00,000 can be recouped in a period of 13 months.

2.3 BOILER FEED WATER TREATMENT

2.3.1 Present Process:

Shree Rajaram Process has installed 1 number of steam boiler of 3 tonnes capacity. Since, Pali cluster do not have any internal source of water, water to be used in the boiler is sourced from nearby areas. Presently, the unit is not applying any kind of process treatment for the feed water to the boiler. The total dissolved solids (TDS) content in the boiler feed water intends to surplus the maximum permissible TDS of the boiler due to repeated use of water. This leads to frequent boiler blow-down operation of the boiler, where a certain amount of water is blown off and is automatically replaced by feed water thus maintaining the optimum level of total dissolved solids (TDS) in the boiler water. In Shree Rajaram Process, boiler blow-down is carried out at a frequency of 4 hours every day. The frequency of blow-down is predominantly dependent of the high level of TDS in the boiler feed water. During each Blow-Down (BD) operation, a large quantity of energy in the form of steam is wasted into the atmosphere.

2.3.2 Observations

The TDS level of the feed water used for the steam boiler at Shree Rajaram Process was reported to be 500 ppm, which when continuously used intends to surplus the permissible TDS level which is around 2000-3000 ppm. When feed water enters the boiler, the elevated temperature and pressure cause the components of water to behave differently. Under heat and pressure, most of the soluble components in the feed water come out of the solution as particulate solids, sometime in crystalized forms and other times as amorphous particles. When solubility of a specific component in water is exceeded, scale or deposits develop. Deposit in boilers may result from hardness contamination of feed water and corrosion products from the condensate and feed water system. Deposits and corrosion result in localized heating, efficiency losses and may ultimately result in failure of boiler tube and inability to produce steam. In order to avoid deposits or scale formation in the boiler lining, blow-down operation is carried out in the boiler. The process of blow-down involves blowing off a portion of the water and replacing it with fresh feed water.

In case of Shree Rajaram Process, intermittent blow-down operation is practiced at frequency of 4 hours. The blow-down is done with the use of a valve fitted to discharge pipe at the lowest point of the boiler. The blow-down process is carried out for a period of 1-2 minutes. Approximately 1500-1700 liters of water is lost every day in the blow-down operation.

In order to reduce the blow-down operation in the boiler and to maintain the permissible level of TDS, it is suggested for pre-treatment of boiler feed water. This external treatment of boiler feed water can be done in a number of ways. One of the most feasible options is the 'Reverse Osmosis' processes.

2.3.3 Conclusion

In order to maintain the TDS of boiler feed water close to the permissible range, it is suggested to install a revise osmosis (RO) plant in the unit. When solution of differing concentration are separated by a semi-permissible membrane, water from less concentrated solution passes through the membrane to dilute the liquid of high concentration, which is called osmosis. If the solution of high concentration is pressurized, the process is reversed and water from the solution of high concentration flows to the weaker solution. This is known as reverse osmosis. The quality of water produced depends upon the concentration of the solution on the high-pressure side and pressure differential across the membrane. The process is suitable for waters with high TDS.

Installation of the RO system of required capacity can lead to considerable reduction in boiler blow-down, thus leading to a saving in steam. The membrane for RO system can be suitably selected based on the TDS level of the unit.

Benefits of the installation of the RO system are:

- Lower boiler blow-down
- Less make up water consumption
- Steam saving as a result of reduced blow down
- Reduced maintenance downtime
- Increased boiler life
- Reduced fuel cost

2.3.4 Cost Economics Analysis

The section below provides cost benefit analysis for the installation of RO system in the boiler feed water line:

Table 2.3: *Cost Economic Analysis of proposed RO system*

SN	Parameter	Unit	Value
1	Quantity of steam generated per hour	kg/hr	1000
2	Quantity of fuel used per hour	kg/hr	197
3	Quantity of fuel used to generate 1 kg of steam	kg/kg	0.197
4	**Without RO**		
5	Frequency of blow down per month	no.	75
6	No. of blow downs in a year	no.	900
7	Steam lost in each blow down	kg	533

SN	Parameter	Unit	Value
8	Steam lost in year	kg	480000
9	Fuel used to generate lost steam	kg	94560
10	**With RO**		
11	Frequency of blow down	no.	25
12	No. of blow downs in a year	no.	300
13	Steam lost in each blow down	kg	533
14	Steam lost in year	kg	159900
15	Fuel used to generate lost steam	kg	31500.3
16	Annual saving in fuel	kg	63059.7
17	Percentage saving in fuel consumption	%	8.9
18	Annual cost saving in fuel	Rs	315298.5
19	Annual cost saving in terms of make-up water and boiler maintenance	Rs	12000
20	Annual cost savings	Rs	327299
21	Equipment cost	Rs	200000
22	Pay back	months	7

The proposed RO system for boiler feed water treatment can lead to annual saving of 63,059 kgs of biomass leading to an monetary saving of Rs 3,27,299 annually. The estimated cost of the system i.e. Rs 2,00,000 can be recouped in a period of 7 months.

Questionnaire

Srp

(2)

Energy Audit – Questionnaire Form

BEE National Programme

On

"Energy Efficiency in SMEs – Pali Textile Cluster"

Name of the MSME unit		Shree Rajaram Process.
Address:		F-329 Mandia Road Ind. Area, Pali-306401 Raj
Ph. No:		-
Name of the respondent		Ratan Dhariwal
Designation:		Manager
Mobile No. / Email id		90015-56789
Unit details		
Year of Establishment		03-10-1995
Type of Products		Finishing + Felt
Installed Capacity		~~As per detail Annexed.~~ (70000 mtr/day)
Operating hrs per day		12 hours.
Connected Load (kVA or kW please specify)		As per detail Annexed.
Supply Voltage (Volt)		
Duration of electricity supply		20 hours – 24 hours

Annual Energy Consumption/ Production

Financial Year (April to March)	2013-14	2014-15	2015-16
Coke consumed (kg)			
Biomass Briquettes			
Wood			
Cost of coke (in Rs.)			
Electrical units consumed (In kWh)			
Electricity charges (in Rs.)			
LDO/HSD/ FO consumption (L)			
Fuel Cost (in Rs.)			
Production (Kg)			

Source and Calorific Value of Fuels:

Fuel	Source	Calorific Value (kCal)
Coke (Kg)	—	—
Biomass Briquettes	Wood Briquettes	4600

For Shree Rajaram Process

		Wood	–	–
		HSD (L)	–	–
		LDO (L)	–	–
		FO (L)	–	–
		Electricity (kWh)	Jodhpur Vidhyut Nigam	–

Monthly Energy Consumption and Production Data

Month	Production (Kg)	Coke consumption (Kg)	Biomass /Wood Consumption Briquettes. (Kg)	Electricity consumption (kWH)	HSD/LDO /FO (L)	Any other fuel (specify units)
April'15	13,18,000 mtr.	–	Apx 20 ton	2808	–	
May'15	14,88,000 mtr	–	22.00	4164	–	
June'15	14,64,000 mtr	–	24.00	4608	–	
July'15	8,29,000 mtr	–	22.00	4320	–	
August'15	8,15,000 mtr	–	29.00	3648	–	
September'15	10,37,000 mtr	–	23.00	4152	–	
October'15	18,03,480 mtr	–	23.00	4224	–	
November'15	13,34,000 mtr	–	25.00	4728	–	
December'15	18,00,000 mtr	–	23.00	3852	–	
January'15	18,00,000 mtr	–	25.00	5124	–	
February'15	18,00,000 mtr	–	25.00	5784	–	
March'15		–			–	

Cost variables per Kg of Production

Cost Variable	Cost/ kg of production
Electricity Cost	Rs 6.5/1kwh
Coke Cost	Rs 7.5/kg
Fuel Cost (LDO/HSD/FO) etc.	NA
Labour Cost	
Material Cost	
Other Cost	

For Shree Rajaram Process

Process Layout

Padding finish → Centre felt

For Shree Rajaram Process

Shree Rajaram Process

As on 18 March 2016

Felt

Khadi → 7.5 x 1

Rubber Belt → 7.5 x 1

Blanket → 5 x 1

Grinding → 7.5 x 1

Rubber Pressure → 0.25 x 1

Damping → 0.50 x 2

Centre

Chain → 15 HP x 1

Damping → 0.50 HP x 1.

Rail motor → 2 HP x 1

Finish Padding → 5 HP x 1

Stirring Motor → 5 HP x 1

Water Pump → 5 HP

Mud Pump → 3 HP

Light Load → 2 HP

Boiler

Pump + ID fan → 15 HP

For Shree Rajaram Process

जोधपुर विद्युत वितरण निगम लिमिटेड

विद्युत उपभोग बिल

उपखण्ड का नाम					बिल क्रमांक
AEN(CSD-1,PALI)	3204210	0571/0103	0	18001806045	3204210737457

नाम, पता एवं टेलीफोन नं.
एम एस श्री राजा राम
एफ 329 , मंडिया रोड पाली

बिल माह	पठन तिथि	बिल जारी करने की तिथि	नियत भुगतान तिथि
Feb/2016	गत 01-01-2016 वर्तमान 01-02-2016	08-02-2016	22-02-2016
फीडर कोड		शहरी/ग्रामीण	
0	E	URBAN	10300
बिल अवधि			मीटर सुरक्षा राशि
1.0000		42684.00	

ईमेल 320421030478

CIN

	टैरिफ कोड					
NIP	400018	400 V	400 V	37.50 HP	57.00 HP	

							कुल उपभोग/डिमाण्ड
35405	KWH	DR		38537.0025085.00	482.00	5015	5784.00
	KVAH			28361.0027838.00	527.00		6324.00
	KVA			1.3200	1.8200		21.8400

								कुल उपभोग/डिमाण्ड
0.914	3482	0				LT REGULAR		5784.00

क्रम सं.	विवरण	बिल राशि (रू.)	क्रम सं.	विवरण	बिल राशि (रू.)
1.	विद्युत शुल्क	36150.00	17.		578.40
2.	स्थाई शुल्क	4130.00	18.		867.60
3.			19.		
4.			20.		
5.			21.		
6.			22.		
7.			23.		
8.			24.		
9.			25.		
10.			26.		
11.			27.		
12.		100.00	28.		
13.			29.		
14.		40380.00	30.		40282.00
15.			31.		730.44
16.		2313.60	32.		41012.00

BOI
CH No 005535
Date 22-02-2016
Rs 40282=00

J. V. V. N. LTD., PALI
M/s. Ashok Jain
S. No. 4
22 FEB 2016

	Jan16	Dec15	Nov15	Oct15	Sep15	Aug15
	5124	3852	4728	4224	4152	3648

For Shree Rajaram Process
(Karta of Sureshchand)

InsPIRE