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

Pali Textile Cluster

Baseline Energy Audit Report
Raj Kumar Textile




Submitted to

ENERGY IS LIFE
BEE
CONSERVE IT

Submitted by

InsPIRE

InsPIRE Network for Environment

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contents

InsPIRE

List of Tables

List of Figures

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 Rajkumar Textile.

Executive Summary

1. Unit Details

Unit Name	:	**Rajkumar Textile**
Address	:	GS-124, Punayata Industrial Area, Pali, Rajasthan- 306401
Contact Person	:	Mrs. Renu Jain, Proprietor (Cell no: 9414120749)
Products	:	Cloth processing (cotton)
Production	:	10,000 to 20,000 meters of processed cloth per day
DIC Number	:	08201101715 Part-II
Bank Details	:	Corporation Bank, Lalwani Chambers, Pali, A/c No.: 127301601000100, IFSC Code:
TIN / PAN No.	:	TIN: 08393260605 PAN: ADWPJ7128F
Contract demand	:	50 KVA

2. Existing Major Energy Consuming Technology

Biomass Briquettes Based Steam Boiler

- Steam boiler with no provision for pre-heating of boiler feed water. Also, the unit do not have boiler feed water treatment facility.
- Prevailing specific fuel consumption is 0.03 kgs of biomass/wood per meter of processed cloth. High TDS in the feed water leads to frequent blow-down of boiler.

Jigger Machine

- A total of 10 numbers jigger machines used for cotton dyeing at elevated temperature (60-80^{0}C). Jiggers are not equipped with temperature monitoring and control system.
- Each jigger machine uses 2000-2500 liters of water in each cycle.

3. Proposed Energy Saving Technologies with Cost Economics

Proposed Energy Saving Measures

- Installation of economizer in steam boiler for boiler feed-water pre-heating.
- Installation of RO system for treatment of feed water to boiler.
- Installation of temperature monitoring and control system in jigger machines

Table 1: *Cost Economic Analysis*

Technology	Estimated Energy Savings (%)	Savings (in Rs)	Investment (in Rs)	Simple Payback period (Months)
Economizer in steam boiler exit	6.98	2,51,400	3,00,000	14
Reverse Osmosis (RO) system in steam boiler	8.9	3,32,100	2,00,000	7
Temperature Monitoring & Control in Jigger Machines (for 10 Jiggers)	5.7	3,28,168	2,50,000	9

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 is from Jodhpur.

Only resources that are available locally are 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 Rajkumar Textile, Pali, was established in the year 2013 and is engaged in processing of cloth (dyed cotton) which includes raw cloth (grey) processing, dyeing and finishing operations. The manufacturing unit is located at GS-124, Punayata Industrial Area, Pali. The unit operation is overseen by Mrs. Renu Jain, Proprietor.

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 10,000 to 20,000 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 9512 kgs. The average monthly electricity consumption (derived from reported date of last one year) is 4363 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 briquettes consumption vis-à-vis total monthly production for last one year.

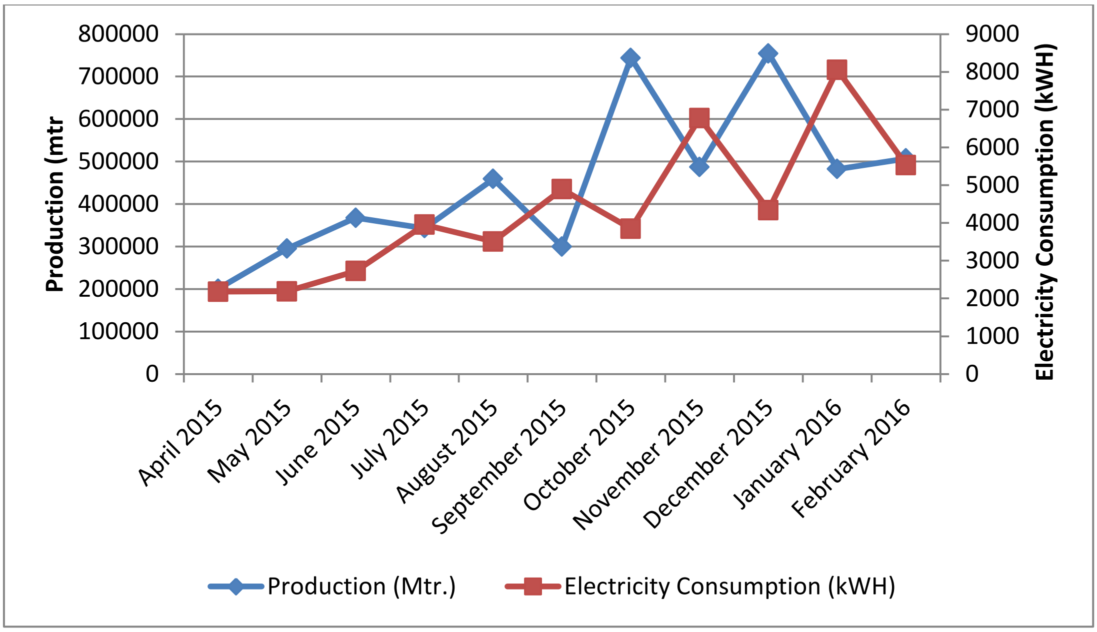


Figure 1.1: ***Monthly variation of production and electricity consumption***

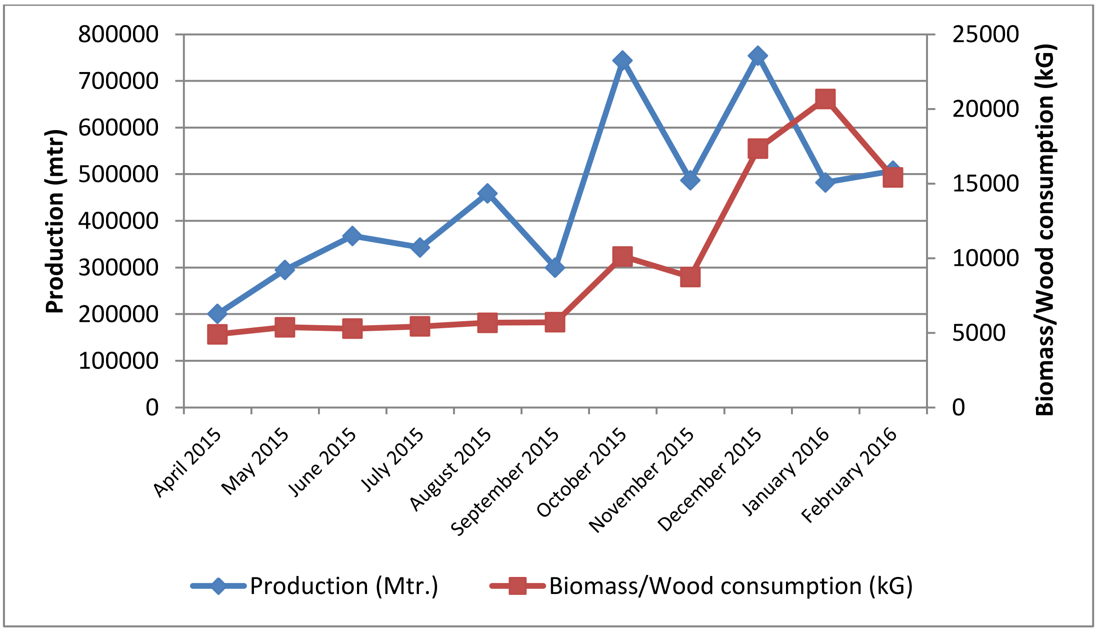


Figure 1.2: ***Monthly variation of production and briquettes cosumption***

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.

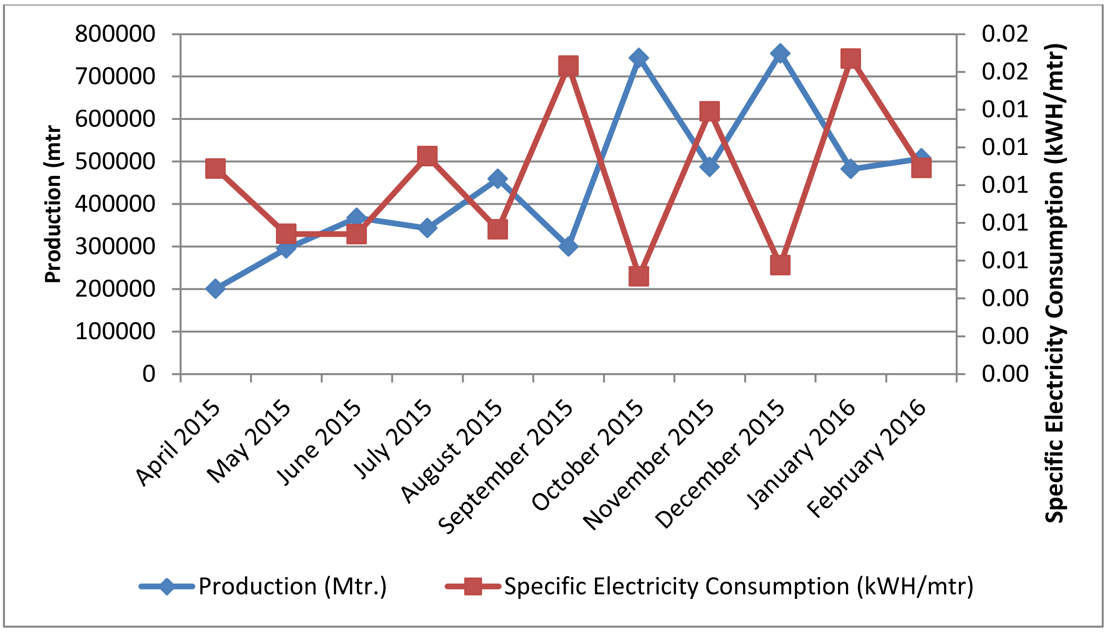


Figure 1.3: ***Variation in specific electrical energy consumption and monthly production***

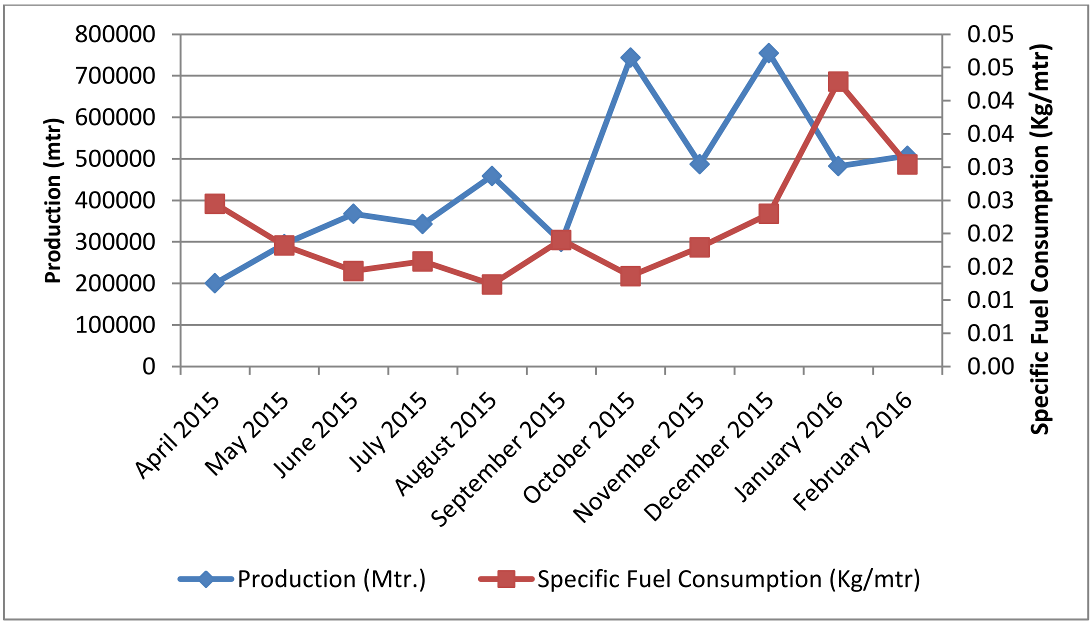


Figure 1.4.: ***Variation in specific fuel consumption (briquettes) and monthly production***

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 18 kCal/mtr to 58 kCal/mtr over a period of one year with an average of 37 kCal/mtr. The specific electrical energy consumption of the unit varies from 0.01 kWh/mtr to 0.02 kWh/mtr over a period of one year with an average of 0.01 kWh/mtr. The unit uses 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 46.08 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 Rajkumar Textile***

SN	Parameter	Unit	Value
1	Name and address of unit	Rajkumar Textile, GS-124, Punayata Industrial Area, Pali, Rajasthan-306401	
2	Contact person	Mrs. Renu Jain, Proprietor	
3	Manufacturing product	Processed cloth (Dyed Cotton)	
4	Daily Production	10,000 to 20,000 mtr per day	
Energy utilization			
5	Average monthly electrical energy consumption	kWh	4363
6	Average monthly fuel (biomass) energy consumption	kg	9512
7	Average specific thermal energy consumption	kCal/mtr	37.19
8	Specific electrical energy consumption	kWh/mtr	0.01
9	Specific energy consumption[1,2]	kCal/mtr	46.08
10	Electrical energy cost[3]	Rs/mtr	0.07
11	Thermal energy cost[3]	Rs/mtr	0.11

Note:

[1]: Specific gross calorific value of biomass/wood 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 briquettes 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 Rajkumar Textile:

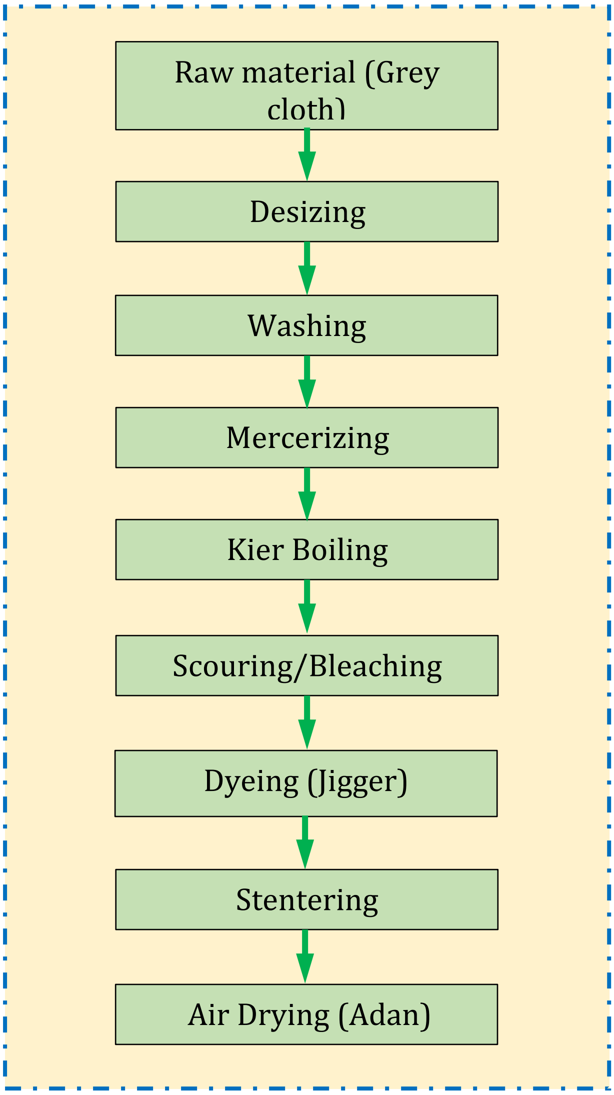


Figure 1.5: ***Production process at Rajkumar Textile***

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:

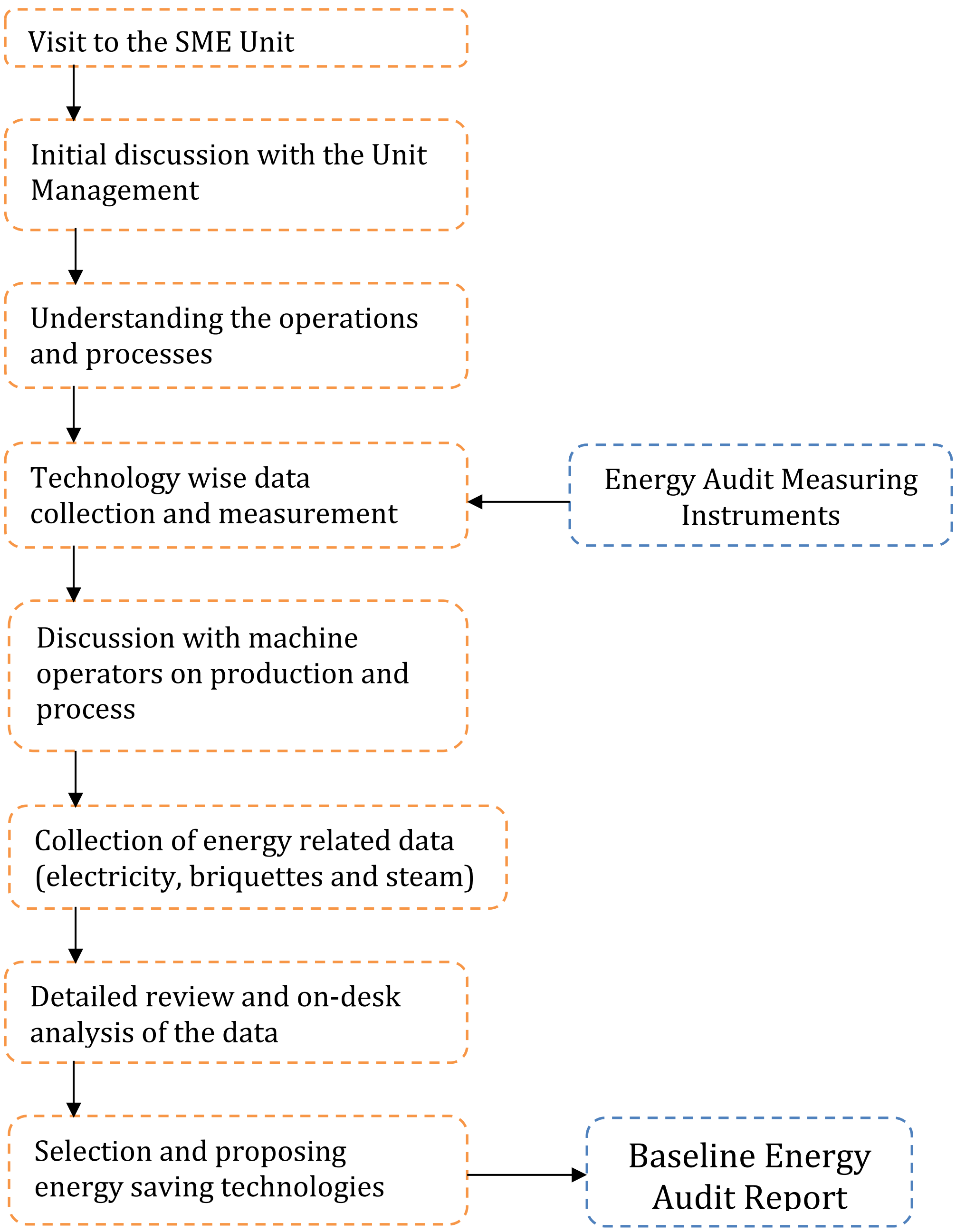


Figure 1.6: ***Energy audit methodology***

1.5 UNIT PHOTOGRAPHS

Caption: Biomass briquettes used at Rajkumar Textile

Caption: Cotton fabric dyeing using Jigger Machines

Caption: Boiler unit at Rajkumar Textile

Caption: Kier Boiler at Rajkumar Textile

Caption: Desizing operation at Rajkumar Textile

Caption: Finished fabric at Rajkumar Textile

Present Process, Observations and Proposed Technology

2.1 BOILER FEED WATER TREATMENT

2.1.1 Present Process:

Rajkumar Textile has installed 1 number of steam boiler of 1 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 Rajkumar Textile, 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.

2.1.2 Observations

The TDS level of the feed water used for the steam boiler at Rajkumar Textile 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 Rajkumar Textile, 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.

2.1.3 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

2.1.4 Cost Economics Analysis

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

Table 2.1: *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	200
3	Quantity of fuel used to generate 1 kg of steam	kg/kg	0.200
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
8	Steam lost in year	kg	480000
9	Fuel used to generate lost steam	kg	96000

SN	Parameter	Unit	Value
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	31980
16	Annual saving in fuel	kg	64020
17	Percentage saving in fuel consumption	%	8.9
18	Annual cost saving in fuel	Rs	320100
19	Annual cost saving in terms of make-up water and boiler maintenance	Rs	12000
20	Annual cost savings	Rs	332100
21	Equipment cost	Rs	200000
22	Pay back	months	7

*Cost of fuel taken as Rs 5/kg

The proposed RO system will lead to a saving of 64,020 kgs of biomass leading to a monetary saving of Rs 3,32,100 annually. Thus the estimated cost of Rs 2,00,000 can be recouped in 7 months period.

2.2 TEMPERATURE MONITORING AND CONTROL IN JIGGER MACHINES

2.2.1 Present Process:

Rajkumar Textile has installed a total of 10 Jigger machines running with 3 HP motor each. These jigger machines are used for dyeing of cotton cloth at elevated temperature of 60-80^{0}C depending on the type of fabric and the dye used. Steam is fed into the system for the required amount of elevated temperature. Once the dyeing process is over, the hot water is drained out of the factory. The temperature requirement for water is different for different grades of dyes and quality of fabric. However, no temperature monitoring system has been installed in the jigger machines. Monitoring and control of temperature of water is done purely based on manual interference.

2.2.2 Observations

Dyeing of cotton fabric is done with the help of a jigger machine. In this process the fabric is rotated in a shallow dip containing hot water. The temperature of the water depends on the type of dyeing agent and the quality of the fabric. Typically a temperature range between 60^{0}C to 80^{0}C is adopted based on different fabric quality and dye. Steam is used to bring amount the required temperature in the process. In case of Rajkumar Textile, no temperature monitors is being installed in any of the jiggers. The monitoring of water temperature and its control is purely done by manual interference. A study of the jigger water temperature showed off-shooting of temperature at certain places. Thus, a significant amount of energy in the form of steam required to heat water is being lost due to the absence of temperature monitoring and control system. It is suggested for installation of sensor based automatic temperature control and monitoring system in the jiggers.

2.2.3 Conclusion

In order to maintain the correct temperature profile in the jigger water, it is suggested to install a sensor based temperature monitoring and control system. This system can be used to monitor the temperature level of water in the jiggers and control the flow of steam by a pneumatically operated valve. This will be lead to optimum utilization of steam in the jiggers thus leading to a substantial energy savings.

Benefits of the installation of the temperature monitoring and control system in Jiggers machines are:

- Precision temperature control
- Reduced energy consumption
- Better quality of production
- Savings in terms of feed water to jiggers.

2.2.4 Cost Economics Analysis

The section below provides cost benefit analysis for the installation of temperature monitoring and control system in jiggers. For calculation purpose, it has been assumed that the system is installed in 10 nos. of jiggers.

Table 2.2: *Cost Economic Analysis of jigger water temperature monitoring and control system*

SN	Particulars	Units	Value
1	Temperature observed in Jigger	°C	95
2	Temperature to be maintained	°C	80
3	Machine Capacity	kg	200
4	Steam pressure	kg/cm^2	4
5	Steam Enthalpy @ 4 Kg /cm^2 pressure	kCal/kg	657
6	Liquor Ratio		0
7	Water Capacity	Kg	400
8	Specific heat coefficient (Cp)-water	kCal/kg °C	1
9	Specific heat coefficient (Cp)-fabric	kCal/kg °C	0.5
10	No. of batches per day	nos.	2
11	Saving of steam per batch	kg / hr	11
12	Saving of steam per day (considering 10 hrs. heating period in 2 batch)	kg/day	114
13	Savings of steam per annum	kgs/annum	37648
14	Annual fuel savings	kgs	6563

SN	Particulars	Units	Value
15	Annual monetary savings	Rs	32817
16	Investment per jigger	Rs	25000
17	General payback period	Months	9
18	Annual fuel savings for 10 jiggers	Kgs	65634
19	Annual monetary savings for 10 jiggers	Rs	328168
20	Investment for 10 jiggers	Rs	250000
21	Pay-back	Months	9

* Cost of fuel taken as Rs 5/kg

The temperature monitoring and control system installed in 10 nos. of jigger machine will lead to an annual fuel saving of 65,634 kgs of biomass thus leading to a monetary saving of Rs 3,28,168. Thus the estimated investment of Rs 2, 50,000 can be recouped in a period of 9 months.

2.3 INSTALLATION OF ECONOMIZER IN THERMIC-FLUID HEATER EXIT

2.3.1 Present Process

Rajkumar Textile 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 2-3 kg/cm^2. Biomass briquettes are used as the fuel for the steam boiler. The heating chamber consists of a fluidized bed biomass wherein air is supplied from bottom. The heat generated by combustion of 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. The unit is presently using an air pre-heater wherein waste heat from flue gas is used to preheat the combustion air.

2.3.2 Observations

The steam boiler operating in the unit is a packaged boiler with fire tube design. Steam is the main agent of energy used in the textile processing unit. Thus, the boiler is the major energy utilizing source in the unit. The existing boiler used at Rajkumar Textile does not have provisions for boiler feed water preheating. However, the unit has installed an air preheater wherein waste heat from the flue gas is utilized for preheating of combustion air. The feed water to the boiler is fed at ambient temperature (35^{0}C) and the stack temperature was observed to be around 150^{0}C. The combustion air to the boiler firing unit is also being fed at a temperature of 60^{0}C. No monitoring is being done towards feeding of briquettes and air into the boiler. In order to analyze the boiler performance, a detailed study was carried out in the unit.

The specific fuel consumption of briquettes was observed to be around 0.03 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.

The flue gas temperature leaving at 150^{0}C from the steam boiler provides a potential for waste heat recovery. Stack temperature needs to be maintained above 120^{0}C in order avoid condensation of Sulphur oxides (SO) present in the flue gas which can cause corrosion. The available heat from a temperature difference of 30^{0}C is sufficient to rise the boiler feed water temperature by 60-65^{0}C. The increase in boiler feed water temperature can lead to substantial increase in boiler efficiency thus leading to reduction in specific fuel consumption.

2.3.3 Conclusion

As per the study conducted in the unit, it is suggested to install an economizer (boiler feed water heating system) in the steam boiler exit. This heat can be utilized to raise the boiler feed water temperature; thus pre-heating the boiler feed water.

The installation of the economizer in the steam boiler and utilizing the same for pre-heating boiler feed water will lead to following benefits:

- Waste heat recovery
- Improvement in boiler efficiency
- Reduction in FD/ID fan power usage
- Improved environment

2.3.4 Cost Economics Analysis

The section below provides a cost benefit analysis for installation of economizer in the existing thermic-fluid heater for pre-heating boiler feed water of the unit:

Table 2.3: *Cost Economic Analysis of proposed economizer*

SN	Parameter	Unit	Value
1	Quantity of steam generated per hr (Q)	kg/hr	1000
2	Quantity of fuel used per hr (q)	kg/hr	200
3	Working Pressure	kg/cm^2	10
4	Temperature of feed water	°C	35
5	Type of fuel		Briquettes
6	Calorific Value of fuel		8200
7	Enthalpy of steam	kCal/kg	665
8	Enthalpy of feed water	kCal/kg	35
9	Boiler Efficiency	%	38
10	Flue gas temperature (in steam boiler)	°C	150
11	Steam generation per Kg of fuel	kg/kg	5
12	Flue gas quantity	kg/kg	9
13	Quantity of flue gas	kg/hr	1739
14	Quantity of heat available in flue gas	kCal/hr	12000

SN	Parameter	Unit	Value
15	Rise in feed water temperature	°C	42
16	Savings in terms of fuel from pre-heated boiler feed water	%	6.98
17	Savings in terms of fuel	kg/hr	14
18	Annual operating hrs.	hrs.	3600
19	Annual savings of fuel	kgs	50280
20	Annual cost savings	Rs/yr	251400
21	Cost of economizer	Rs	300000
22	Pay-back		14

*Every rise of 6ºC in boiler feed water temperature through waste heat recovery would offer about 1% fuel savings.
**Cost of fuel taken as Rs 5/kg

As per the detailed calculations done, it is proposed to install an economizer in the existing steam boiler outlet and utilizing the heat to pre-heat the boiler feed water. The estimated fuel saving with the installation is 50,280 kgs annually which can save an amount of Rs. 2,51,400 per year. Thus the cost of the economizer (estimated to be Rs. 3, 00,000) can be recouped in a period of 14 months.

Questionnaire

7

Energy Audit – Questionnaire Form

BEE National Programme

On

"Energy Efficiency in SMEs – Pali Textile Cluster"

Name of the MSME unit	RAJ KUMAR TEXTILE
Address:	GS-124, Punayata Ind. Area PALI-MARWAR 306401 (Raj.)
Ph. No:	9414120749
Name of the respondent	
Designation:	
Mobile No. / Email id	
Unit details	
Year of Establishment	2013
Type of Products	dyed cotton
Installed Capacity	200 t/d
Operating hrs per day	12 hrs
Connected Load (kVA or kW please specify)	59 h.p
Supply Voltage (Volt)	400 V
Duration of electricity supply	

Annual Energy Consumption/ Production

Financial Year (April to March)	2013-14	2014-15	2015-16
Coke consumed (kg)			
Biomass Briquettes / Wood	277575.00	555977.00	513199.00
Cost of coke (in Rs.)			
Electrical units consumed (In kWh)			
Electricity charges (in Rs.)	190613.00	221130.00	445261.00
LDO/HSD/ FO consumption (L)			
Fuel Cost (in Rs.)	175272 Kg	177912	342126 Kg
(THAN) Production (Kg)	21909	22239	38014

Source and Calorific Value of Fuels:

Fuel	Source	Calorific Value (kCal)
Coke (Kg)		
Biomass Briquettes	Jodhpur	3200

FOR RAJKUMAR TEXTILE

[signature]

~~Prop~~ /Manager

		Wood	
		HSD (L)	
		LDO (L)	
		FO (L)	
		Electricity (kWh)	

Monthly Energy Consumption and Production Data

Month	Production ~~(Kg)~~ (THAN)	~~Coke consumption~~ (Kg) Production (Kg)	Biomass /Wood Consumption Rs. ~~(Kg)~~	Electricity consumption ~~(kWH)~~ Rs.	HSD/LDO /FO (L) kWh	Any other fuel (specify units)
April'15	1541	12328	24525.00	24507.00	2179	
May'15	2268	18144	26850.00	29083.00	2186	
June'15	2828	25452	26410.00	44357.00	2724	
July'15	2638	23742	27132.00	36579.00	3953	
August'15	3550	31950	28364.00	48324.00	3510	
September'15	2305	20745	28539.00	38256.00	4892	
October'15	5722	53215	50596.00	54353.00	3849	
November'15	3748	34856	43703.00	36017.00	6775	
December'15	5802	53960	86658.00	65793.00	4339	
January'16	3710	30793	103360.00	46550.00	8056	
February'16	3902	32387	77062.00	43261.00	5531	
March'16	—				5440	

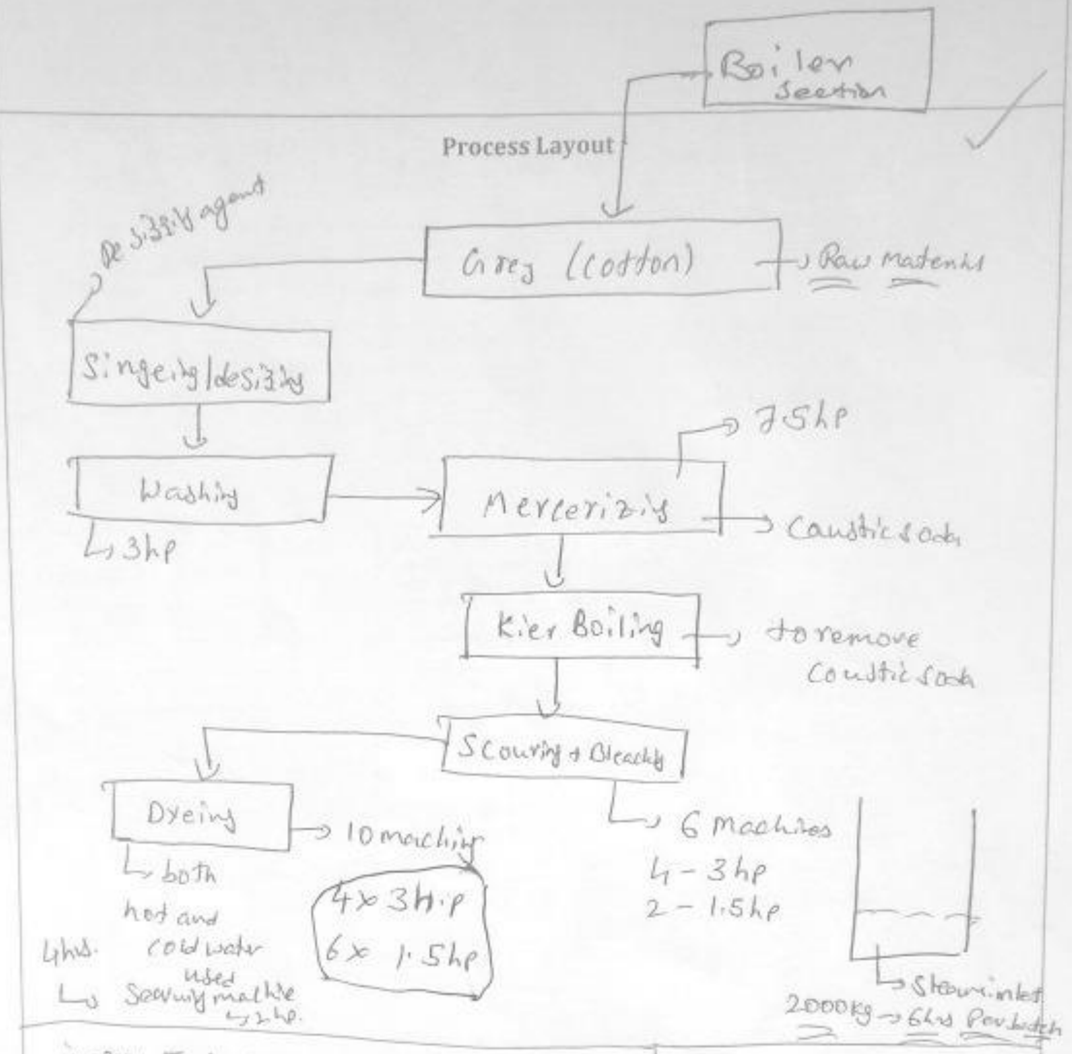
* Wood is 5 Rs per Kg

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

FOR RAJKUMAR TEXTILE

[signature]

Prop /Manager



Technologies that can be recommended

- Auto temperature controller in Jigger dyeing machines.
- Insulation of steam trap lines.
- Modification of Kier boiler with high end technology.
- Condensative recovery system for Kier boiler.

Steam generation they are using boiler 1 tph capacity.

For dyeing → 350 kg / per day

Kier boiler to bleaching and dyeing → 1100 kg / per day

FOR RAJKUMAR TEXTILE

Prop./Manager

जोधपुर विद्युत वितरण निगम लिमिटेड

विद्युत उपभोग विपत्र (उपभोक्ता प्रति.)

उपखण्ड का नाम	उपखण्ड कोड	वर्तमान खाता संख्या	कार्यालय टेलीफोन नं.	शिकायत केन्द्र टेलीफोन नं.	बिल क्रमांक
AEN(CSD-2,Pali)	3204220	0591/0210	0	0	3204220880051

नाम, पता एवं टेलीफोन न.: राजु कुमार टैक्स टेल, जीएस 124 पुनायता इंडसट्री एरिया पाली
ईमेल: 0
के. नम्बर: 320422000677
CIN:

बिल माह	पठन तिथि	बिल जारी करने की तिथि	नियत भुगतान तिथि
Apr/2015	गत 01-03-2015, वर्तमान 01-04-2015	10-04-2015	24-04-201
फीडर कोड	उपभोक्ता की स्थिति	शहरी/ग्रामीण	मार्ग विवरण संख्या
	0488/05/04/04	R	URBAN
बिल अवधि	न्यूनतम बिलिंग राशि	आधार राशि	मीटर सुरक्षा राशि
1.0		19470.00	

स्वी. श्रेणी	टैरिफ कोड	सप्लाई वोल्टेज	मीटरिंग वोल्टेज	स्वी. लोड (कि.वा./हा.पा.)	कनक्टेड लोड (कि.वा./हा.पा.)	कांट्रेक्ट डिमांड
MIP	5000XA	400V	400V	59 HP	59 HP	

मीटर नं.	मीटर प्रकार	मीटर की स्थिति	वर्तमान पठन	गत पठन	उपभोग	गुणांक	ट्रा. हा.	कुल उपभोग/डिमांड
77947	KWH		50008	47829	2179	1/1		2179
	KVAH		69842	66745	3097			3097
	KVA		25.280		25.280			25.280

पॉवर फैक्टर	औसत मासिक उपभोग (यू.नि.प.)	सेवा क्रमांक	टी.पी. सील नम्बर	डिफर्ड पेमेन्ट स्कीम कोड	डिफर्ड पेमेन्ट स्कीम राशि	मीटरिंग टाइप	बिलिंग की स्थिति	बिलिंग टिप्पणी	मीटर स्वामित्व	कुल उपभोग/डिमांड
0.703	2587		25564				REGULAR			2179

क्रम सं.	विवरण	बिल राशि (रू.)	क्रम सं.	विवरण	बिल राशि (रू.)
1.	विद्युत खर्च	13618.75	17.	जल संरक्षण उपकर	217.90
2.	स्थाई शुल्क	4130.00	18.	नगरीय उपकर	326.8
3.	न्यूनतम राशि का अन्तर		19.	शहरी निकाय शुल्क	
4.	रिबेट्स (-) वोल्टेज		20.	अन्य	1214.48
5.	लोअर/पिरियड		21.	अन्य देय/जमा कोड निगम राशि	
6.	ग्रामीण रियायत		22.	अन्य देय/जमा कोड विद्युत शुल्क	
7.	अन्य		23.	अन्य देय/जमा कोड जल संरक्षण उपकर	
8.	डिमांड सरचार्ज		24.	अन्य देय/जमा कोड नगरीय उपकर	
9.	पावर फैक्टर सरचार्ज (+) प्रोत्साहन (-)	2682.89	25.	अन्य देय/जमा कोड शहरी निकाय शुल्क	
10.	शंट कपेसिटर चार्जेज (3%)		26.	अन्य देय/जमा कोड अन्य	
11.	अनाधिकृत उपभोग राशि		27.	समायोजित राशि (कोड)	
12.	सी.टी./पी.टी./मीटर किराया	100.00	28.	पिछले बिल तक बकाया राशि	
13.	ट्रांसफार्मर किराया		29.	स्थगित बकाया राशि (चालू माह)	
14.	निगम राशि (क्रम सं. 1 से 13 का योग)	20531.64	30.	नियत तिथि तक देय कुल राशि (क्रम सं.14 से 28 तक का योग)	23162
15.	राज्य सरकार द्वारा वहन राशि		31.	विलम्ब भुगतान सरचार्ज	434.92
16.	विद्युत शुल्क वर्तमान उपभोग पर	871.60	32.	नियत तिथि पश्चात् देय कुल राशि (क्रम सं. 30 से 31 तक का योग)	23597

PAID 3204220230309 Rs 23162.00

पिछले छः बिलिंग माह में अंकित उपभोग	Mar15	Feb15	Jan15	Dec14	Nov14	Oct14
माह उपभोग (यूनिट)	1712	2100	2251	2082	2556	2033

मोहर सहायक अभियन्ता

बार कोड

जोधपुर विद्युत वितरण निगम लिमिटेड

विद्युत उपभोग विपत्र (कार्यालय प्रति.)

KNO: 320422000677
3204220880051
बिल क्रमांक

				भुगतान प्राप्ति की मोहर हेतु स्थान
बिल माह	Apr/2015	वर्तमान खाता संख्या	0591/0210	
उपखण्ड का नाम	AEN(CSD-2,Pali)	नियत भुगतान तिथि	24-04-2015	
उपखण्ड का कोड	3204220	नियत भुगतान तिथि तक देय राशि	23162	
उपभोक्ता का नाम	राजु कुमार टैक्स टेल	नियत भुगतान तिथि पश्चात देय राशि	23597	

बार कोड