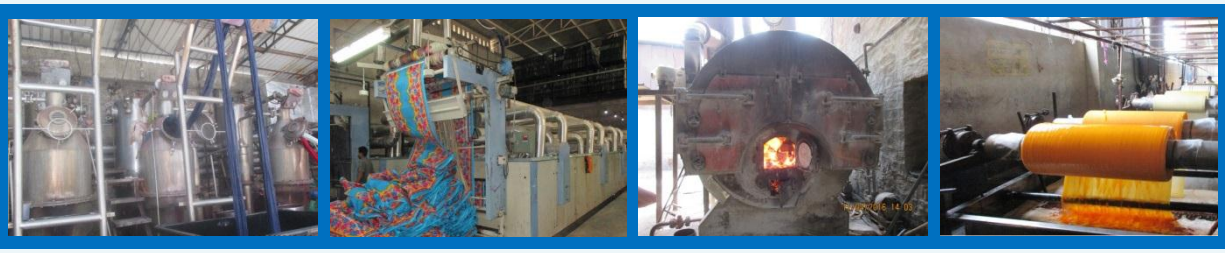
National Program

on

Energy Efficiency and Technology Up-gradation in SMEs

Pali Textile Cluster

Common Monitorable Parameters



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1.0 Brief about the Project

Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India, in association with Ministry of Micro, Small & Medium Enterprises (MSME), Government of India is implementing a national level program to support energy efficiency and technology up-gradation in five different MSME clusters, across the country. The Pali Textile Processing cluster is one such MSME clusters, wherein the project aims to bring down the energy demand of textile industries located at Pali, Rajasthan by supporting them to implement Energy Efficient Technologies. There are more than 400 Small and Medium Enterprise (SME) textile processing units operating in the various industrial pockets of Pali. BEE's National Program for SMEs for Pali Textile Cluster is also being supported by Rajasthan Textile and Hand Processors Association (RTHPA)

InsPIRE Network for Environment, New Delhi has been appointed as the executing agency to carry out the project activities in the cluster. The program started with the conduction of Walk through Energy Audits and organizing a pre-activity workshop for the textile unit owners located in Pali cluster. Major industrial bodies working for the development of industries in the cluster are MSME-DI Pali, Rajasthan Textile and Hand Processors Association (RTHPA); Central Tool Room, MSME, Pali.

Activities conducted / envisaged under the proposed energy efficiency study in the Pali textile cluster include the following:

- Walk-through Energy Audits (WTAs) in 5 Pali units
- Pre-activity Workshop
- Identification of 5 Energy Efficient Technologies viz. Air Pre heater, Economizer, Condensate recovery system, Float traps, VFD etc.
- Identification of Energy Efficient technology suppliers
- Signing of Memorandum of Understanding (MoU) with 20 Pali units
- Baseline energy audit in 11Textile units
- Post implementation energy audits in 5 numbers of implemented units.
- Development of technology specific AV- clips & case studies
- Preparation of Best Operating Practices (BOP) document for 5 energy-intensive technologies
- Preparation of document on common monitoring parameters and measuring instruments
- Supporting BEE in conducting Technology Workshops

2.0 Brief about the Cluster and Production Process

The Pali textile cluster is one of the biggest SME clusters in India having over 250 member industries. The units in the cluster are mainly located in two Industrial Areas namely Industrial Area Phase I & Phase II and Mandia Road Industrial Area.
The units are classified into two segments mainly:

1) Hand Process Units 2) Power Process Units.

The typical process flow in a textile unit has been diagrammatically depicted below:

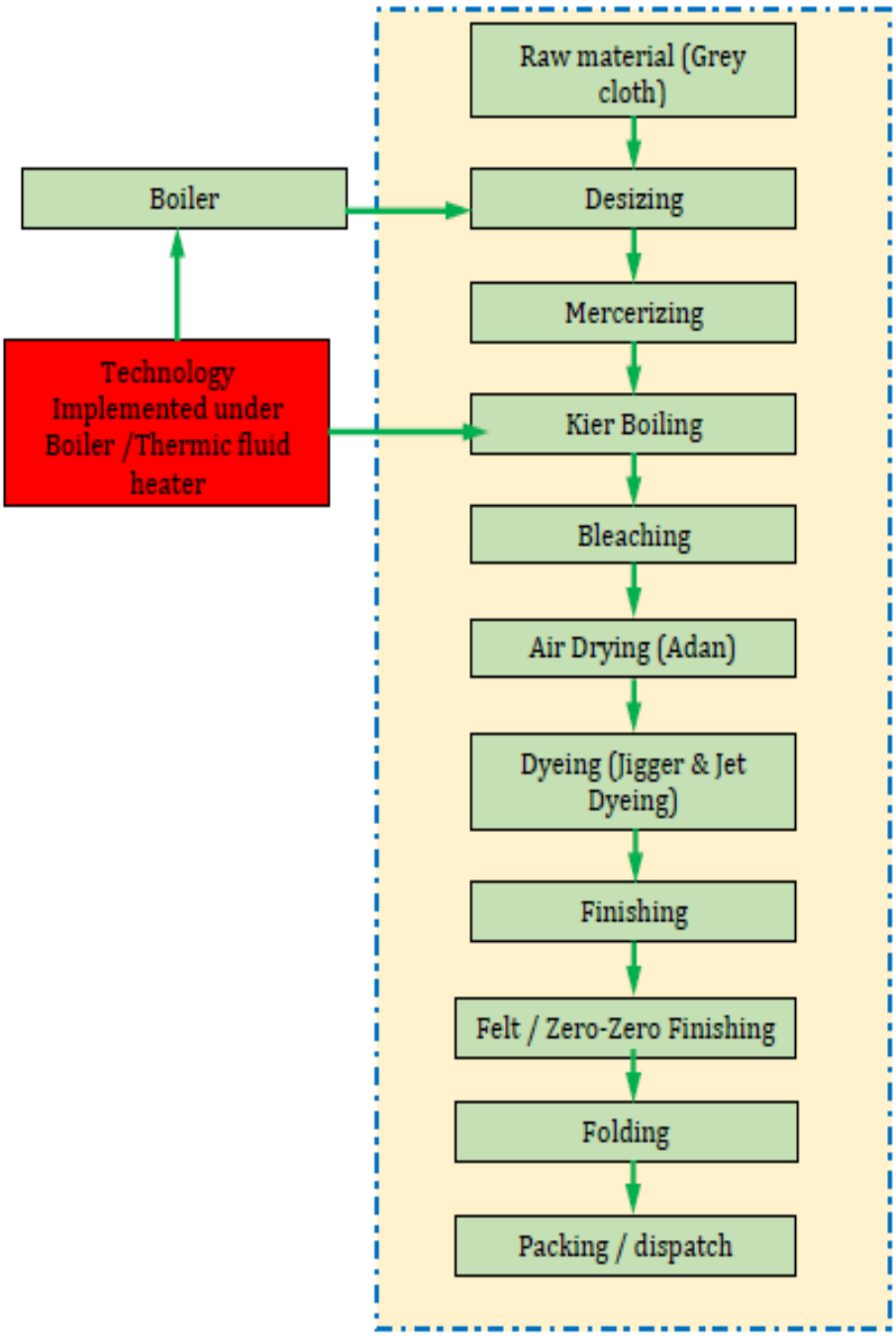

Figure 1.1: ***Process flow diagram for textile unit***

The typical flow of the textile process starts with the Desizing and Mercerizing of raw material. Subsequently, the fabric is fed into the Kier Boiler where scouring operations takes place, then the fabric undergoes bleaching followed by Air Drying (Adan). The next step is coloring of the fibre using jigger or jet dyeing method. This is followed by the finishing process where the material fabric undergoes pre-shrinking in a zero-zero machine. Although, this is a typical layout, other process improvement methods are used, as per requirement, by different units. The Fabric is now ready for dispatch

3.0 Common Monitorable Parameters

The project envisaged listing of common regularly monitorable parameters at the process level which have impact on energy performance, and listing of appropriate instrumentation for the same. These monitorable parameters are considered basic necessity for controlling a unit's energy performance and maintaining overall efficiency. The methodology adopted for identification of the common monitorable parameter for the cluster is as follows:

- Detailed energy audits in selected units were carried out to comprehend the detailed process being adopted in the textile units and identify scope for energy saving potential.
- Along the same lines, mainly energy consuming process wise common monitorable parameters were identified. These common monitorable parameters have direct relationship with the energy performance of the unit. The values of these common monitorable parameters indicate the health and predict the behavior of any process.
- Instruments to measure these common monitorable parameters were identified subsequently. While developing the common monitorable parameter, the existing operating conditions and limitations of the units were considered.
- The suggested measures and instruments follow a set of basic necessity which every unit should follow. However, depending of development of the unit, the scope of monitoring parameters may to be extended in order to ensure a meticulous control of all performance related parameter of the unit.

The key process involved in a typical textile unit are desizing and mercerizing of raw material. Subsequently, the fabric is fed into the Kier Boiler where scouring operations takes place, then the fabric undergoes bleaching followed by Air Drying (Adan). The next step is coloring of the fibre using jigger or jet dyeing method. This is followed by the finishing process where the material fabric undergoes pre-shrinking in a zero-zero machine. Although, this is a typical layout, other process improvement methods are used, as per requirement, by different units. The Fabric is now ready for dispatch. The key process involved in the textile units are:

- Producing steam for processing of fibre using boiler
- Scouring & coloring using jiggers or jet dyeing machines
- Pre shirking the garment using zero- zero machine

The parameters listed under subsequent sections of the document highlights the key performance parameter which needs to be regularly monitored by the shop-floor and supervisory level. These parameters have direct relation with the unit's energy consumption. In order to be energy efficient, each unit should have a regular monitoring system. The ranges provided against each parameter provide a guideline to the operator / supervisor to follow consistent plant performance criteria.

4.0 Common Monitorable Parameter: Boiler

Packaged steam boiler is used to generate wet steam required for the process in textile units. Steam is used at a working pressure of 4-5 kg/cm2. Generally pet-coke is used as the fuel for the steam boiler. The heating chamber consists of a fluidized bed of coke wherein air is supplied from bottom. The heat generated by combustion of coke 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 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.

In conventional system, the feed water to the boiler is fed at ambient temperature (35^0C) while the stack temperature goes as high as 240 ^{0}C.

The flue gas temperature leaving at 240^0C from the boiler can be recovered using an economizer. This can further be utilized to pre-heat the boiler feed water. A temperature difference of 120^0C is sufficient to rise the boiler feed water temperature by 60-65^0C. The increase in boiler feed water temperature can lead to substantial increase in boiler efficiency thus leading to reduction in specific fuel consumption.

The key parameter to be monitored during the boiler operation is monitoring the flue gas temperature and the inlet of the pre heated water temperature.

Parameter	**Temperature of flue gas (for Boiler)**
Criticality	To assess the flue gas temperature leaving at 240^0C from the boiler
Frequency of monitoring (suggested)	During each operational cycle
Measuring Instruments	Pyrometer
Range	350~700^0C

Parameter	**Inlet water temperature (for Boiler)**
Criticality	To assess the flue gas temperature leaving at 240^0C from the boiler
Frequency of monitoring (suggested)	During each operational cycle
Measuring Instruments	Temperature gauge
Range	60-70 ^{0}C

A sample log-book template for melting process is presented below:

Parameter	Temperature of flue gas (°C)	Water temperature (°C)	Pet coke consumption kgs	Supervisor Signature	Remarks
Range	350~700°C	60-70 °C			
Date / Time					

4.1 List of local suppliers

The following section provides details of local suppliers for digital Non-contact Optical Pyrometer and Ammeter/Clamp Meter that can be used for measuring Metal Pieces temperature and current in Induction Furnace:

Equipment Name / Reference	Application	Tentative Cost	Supplier
Digital Non-contact Optical Pyrometer	Measurement of flue gas temperature Temperature Range: 350°C - 700°C	INR 30,000 – 50,000	**Tempsens Instruments (i) Pvt Ltd** B-188 A, Road No.5 , Mia Udaipur, Rajasthan- 313003, India Phone : +91-294-3057700 Fax : +91-294-3057750 E-mail : info@tempsens.com Website: www.tempsens.com
			Toshniwal Industries Private Limited Industrial Estate, Makhupura, Rajasthan-305002, India Phone +91-145-6601111
			Babita Electronics Address: 75-A, Gurudwara road, suraj pole, Pali, Rajasthan Cell :+91- 9983410222/ +91-9214024937
Temperature Gauge	60-70 °C	INR 1500-2000 /piece	**Pioneer Industrial Instruments** Regd Office And Factory, Sr No 82/4, M No 1129, NDA Road, Kalupur, Ahmedabad – 380001 Cell:+91-8879157395
			Care Process Instruments No 6, 2nd Floor, Shree Hari Complex, Vatva GIDC, Ahmedabad - 382445, Near Kamal Estate, Phase 1 +91-79-40081550 +91-79-40083469

5.0 Common Monitorable Parameter: Mercerized machine/washing range

In most of the textile units washing range for washing of printed fabrics. This washing operation is done in high temperature, with recommended range between 60-80°C. However, the process is manually controlled presently with no control on temperature of water for washing.

In order to maintain the correct temperature profile in the washing 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 washing range and

control the flow of steam by a pneumatically operated valve. This will be lead to optimum utilization of steam in the washing range thus leading to a substantial energy savings.

The following sections summarize the criticality, frequency of monitoring, instruments to be used and reference range for monitoring:

Parameter	Temperature
Criticality	Excess temperature causes energy wastage and lesser temperature will reduce the quality of material
Frequency of monitoring suggested)	Automatic
Measuring Instruments	Automatic temperature control system
Range	70°c to 100 °c

A sample log-book template for Re-heating Furnace is presented below:

Parameter	Temperature (°C)	Supervisor signature	Remarks
Range	70°c to 100 °c		
Date / Time			

5.1 List of local suppliers:

The following section provides details of local suppliers for thermocouple for measuring furnace temperature:

Equipment Name / Reference	Application	Tentative Cost	Supplier
Automatic temperature control system	Measurement of different zones in machine	INR 15,000 per piece	**Micon Automation Systems Private Limited** Address: A-814, Siddhi Vinayak Towers, Off S. G. Road Behind DCP Office, Makarba Ahmedabad – 380051 +91-8079452461
			Electrocom Technology India Limited Address: 505, Sukhsagar Complex, Nr. Hotel Fortune Landmark, Ashram Road, Ahmedabad - 380013. +91-79-27562400 (Multiline) +91-79-64505103
			Micro Systems & Controls 140A, Santoshpur Avenue, Kolkata 700075, West Bengal, India Ph: +91-33-24163135 /+91-33-24168933 Mobile:+91-09830058416

6.0 Common Monitorial Parameter: Jiggers

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.

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.

The following section describes the monitoring, measuring instruments to be used for measurement of temperature in jiggers:

Parameter	**Temperature**
Criticality	Excess temperature causes energy wastage and lesser temperature will reduce the quality of material
Frequency of monitoring suggested)	Automatic
Measuring Instruments	Automatic temperature control system
Range	70^{o}c to 100 ^{o}c

A sample log-book template for Re-heating Furnace is presented below:

Parameter	**Temperature (^{0}C)**	**Supervisor signature**	**Remarks**
Range	70^{o}c to 100 ^{o}c		
Date / Time			

6.1 List of local suppliers:

The following section provides details of local suppliers for thermocouple for measuring furnace temperature:

Equipment Name / Reference	**Application**	**Tentative Cost**	**Supplier**
Automatic	Measurement	INR 15,000	**Micon Automation Systems Private**

Equipment Name / Reference	Application	Tentative Cost	Supplier
temperature control system	of different zones in machine	per piece	**Limited** Address: A-814, Siddhi Vinayak Towers, Off S. G. Road Behind DCP Office, Makarba Ahmedabad – 380051 +91-8079452461
			Electrocom Technology India Limited Address: 505, Sukhsagar Complex, Nr. Hotel Fortune Landmark, Ashram Road, Ahmedabad - 380013. +91-79-27562400 (Multiline) +91-79-64505103
			Micro Systems & Controls 140A, Santoshpur Avenue, Kolkata 700075, West Bengal, India Ph: +91-33-24163135 /+91-33-24168933 Mobile:+91-09830058416

7.0 Common Monitorial Parameter: Motors

A typical textile unit consists of several motors of different size and capacity installed in different areas. Most of the motors are in the range of 5 to 7.5 HP and operated depending on requirements. During the energy audits, it was observed that most of these motors are overloaded. Overloading can lead to overheating of the motors and may lead to its failure. It was recommended to replace these undersized motors with motors according to load requirement and they may be air-cooled. It was further suggested to install capacitor banks across motors having low power factor. In order to maintain the optimum efficiency of the motor, it is important to regularly monitor its key parameters.

Parameter	Voltage
Criticality	Operation of a motor on a continuous basis at either the high extreme or the low extreme voltage will shorten the life of the motor.
Frequency of monitoring (suggested)	Daily
Measuring Instruments	Voltmeter
Range	±5% of rated voltage

Parameter	Current
Criticality	The problem of over current has many symptoms and can eventually lead to permanent damage to the motor or electrical device. A few of the symptoms of over current in a motor are shorts, blown fuses and unintended switching on and off of the motor
Frequency of monitoring (suggested)	Daily
Measuring Instruments	Ammeter
Range	±5% of rated current

Parameter	Speed

Criticality	Running a motor above its rated speed can damage the motor permanently.
Frequency of monitoring (suggested)	Daily
Measuring Instruments	Tachometer
Range	As per manufacturer's recommendation

Parameter	**Power Factor**
Criticality	Since reactive power does not perform any work, PF indicates the percentage of useful energy from the total energy — and is best when it's as close to unity as possible. Low PF can contribute to low efficiency, higher losses, and unnecessary electric utility charges.
Frequency of monitoring (suggested)	Daily
Measuring Instruments	Clamp Meter

A sample log-book template for monitoring motor performance is presented below:

Parameter	**Voltage (volt)**	**Current (amp)**	**Power factor**	**Supervisor Signature**	**Remarks**
Range	±5% of rated voltage	±5% of rated current	Close to unity		
Date /Time					

7.1 List of local suppliers

The following section provides details of local suppliers for Ammeter / Clamp Meter for measuring parameters of motor:

Equipment Name / Reference	**Application**	**Tentative Cost**	**Supplier**
	Measurement of current drawn	INR 2500-3000 /piece	**Babita Electronics** Address :75-A, Gurudwara road, suraj pole, Pali +91-9983410222/9214024937
			Maa Shree Yadey Electrical Address: 22S, Nakora Market, Mandia Road, Pali Tel: +91-**9829973510**
			Puran Electric Address: Shop No. 4, Mandia road, Guldai Marg, Near OBC Bank, Pali Tel: +91- 9414122287

Common Moniterable Parameter – Pali Textile Cluster

Daily Monitoring Report Format

Name of unit: **Day:** **Date:**

SN	Process	Parameter	UoM	Value	Ref. Range	Supervisors Signature	Remarks
1	Boiler	Flue gas Temperature	^{0}C		350°C - 700°C		
		Inlet water Temperature	^{0}C		60-70 ^{0}C		
2	Mercerized machine/washing range	Temperature	^{0}C		60-80 ^{0}C		
3	Jiggers	Temperature	^{0}C		60-80 ^{0}C		
4	Auxiliaries-Motors	Voltage	volt		±5% of rated voltage		
		Current	amp		±5% of rated current		
		Power factor	-		Close to unity		