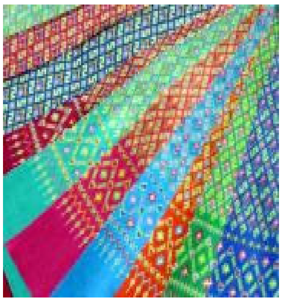
DETAILED PROJECT REPORT
ON
INSTALLATION OF FABRIC TEMPERATURE CONTROL SYSTEM IN STENTERS
(PALI TEXTILE CLUSTER)







ENERGY IS LIFE
BEE
CONSERVE IT

Bureau of Energy Efficiency

Prepared by

PCRA

पी. सी. आर. ए.

Reviewed By

ISTSL

INSTALLATION OF FABRIC TEMPERATURE CONTROL SYSTEM IN STENTERS

PALI TEXTILE CLUSTER

BEE, 2010

Detailed Project Report on Installation of Fabric Temperature Control System in Stenter

Textile SME Cluster, Pali, Rajasthan (India)

New Delhi: Bureau of Energy Efficiency;

Detail Project Report No.: **PAL/TXT/FTC/08**

For more information

Bureau of Energy Efficiency (BEE)

(Ministry of Power, Government of India)

4th Floor,Sewa Bhawan

R. K. Puram, New Delhi – 110066

Telephone +91-11-26179699

Fax+91-11-26178352

Websites: www.bee-india.nic.in

Email: jsood@beenet.in/

pktiwari@beenet.in

Acknowledgement

We sincerely appreciate the efforts of industry, energy auditors, equipment manufacturers, technology providers, consultants and other experts in the area of energy conservation for joining hands with Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India for preparing the Detailed Project Report (DPR) under BEE SME Program in SMEs clusters. We appreciate the support of suppliers/vendors for providing the adoptable energy efficient equipments/technical details to the SMEs.

We have received very encouraging feedback for the BEE SME Program in various SME Clusters. Therefore, it was decided to bring out the DPR for the benefits of SMEs. We sincerely thank the officials of BEE, Executing Agencies and ISTSL for all the support and cooperation extended for preparation of the DPR. We gracefully acknowledge the diligent efforts and commitments of all those who have contributed in preparation of the DPR.

CONTENTS

List of Annexures

List of Figures

List of Tables

List of Abbreviations

- BEE - Bureau of Energy Efficiency
- DPR - Detailed Project Report
- DSCR - Debt Service Coverage Ratio
- GHG - Green House Gases
- HP - Horse Power
- IBR - Indian Boiler Regulation
- IRR - Internal Rate of Return
- MoP - Ministry of Power
- MSME - Micro Small and Medium Enterprises
- NPV - Net Present Value
- ROI - Return On Investment
- SME - Small and Medium Enterprises
- TFH - Thermic Fluid Heater
- CERs - Certified Emission Reduction

EXECUTIVE SUMMARY

Pali has evolved as one of the most important production centers in the Textile Dyeing and Finishing sector despite there being nothing favorable for proliferation of a cluster. The place lacks all possible resources, from raw materials to fuels, Dyes & Chemicals and above all water which is the most important for processing of textiles. Today there are over 350 units in Pali alone and the production of all of these combined together crosses 5.5 million meter per day mark.

All the Industries in Pali cluster are in SME sector. These Industries process Manmade Fiber, Natural Fiber and blends. The units mainly process lower value clothes and the quality of fabric used is less than 100gm per RM. Few units have their own brand. Most of the units do job work for traders and the job works are also done process wise. Thus there are different units specializing in a particular process.

The process adopted by the units can be divided into three major classes –

a. Pre treatment

b. Dyeing and Printing

c. Finishing

The majority of units mainly do hand processing and a few (less than 20%) units do power processing. However, the output of the power process units far exceeds those of hand processing units.

Energy forms a major chunk of the processing cost with over 30% weightage in the cost basket. As per the preliminary and detailed energy audit findings, there exists potential of saving over 20% electricity and 30% fuel in the applications in power process industries with over all general pay back period of less than one year. Hand process industries are very less energy intensive, though, there also exists a saving potential of over 20%. The payback period in these industries is higher due to their working schedule and lower utilization of facilities.

The units in Pali cluster use disperse dyes for coloration of Polyester fabric or polyester contained in blends. Heat setting is necessary in these textiles and also finishing after Dyeing – Washing or Printing – Dye Fixation – Washing processes. Stenter is used for the two processes and this is very energy intensive process. Going by connected load and also by the absolute electricity consumption in textile dyeing and processing units, stenter happens to have a share upwards of 50%.

During Energy Audit, major flaws were observed in process control of Stenters. None of the units were found to be equipped with automatic process control facilities leading to large scale deviation from process parameters causing wastage of energy. The basic process parameters for the stenters are Residual Moisture, Humidity in Exhaust, Temperature of the fabric, Dwell Time for Heat Setting, Velocity of Air Jet etc. However, none of these are controlled and setting is done on manual estimation basis which has possibility of error.

Typically one stenter consumes between 40 to 55 kWh per hour electricity and 50 to 60 kg per hour RPC. The implementation of Fabric temperature control in stenter would help save 18150 kWh of electricity and 17.21 MT RPC per year.

This DPR highlights the details of the study conducted for assessing the potential for installation of fabric temperature control in Stenter, possible Energy saving, and its monetary benefit, availability of the technologies/design, local service providers, technical features & proposed equipment specifications, various barriers in implementation, environmental aspects, estimated GHG reductions, capital cost, financial analysis, and schedule of Project Implementation.

Total investment required and financial indicators calculated such as monetary saving, IRR, NPV, DSCR and ROI etc for proposed technology is furnished in Table below:

S.No	Particular	Unit	Value
1	Project cost	₹ (in Lakh)	2.20
2	Fuel Saving (RPC)	MT/year	17.21
3	Electricity saving	kWh	18150
4	Monetary benefit	₹ (in Lakh)	2.13
5	Debit equity ratio	Ratio	3:1
6	Simple payback period	years	1
7	NPV	₹ (in Lakh)	5.77
8	IRR	% age	76.35
9	ROI	% age	22.71
10	DSCR	ratio	2.77
11	CO_2 saving	MT	63
12	Process down time	Days	6

The projected profitability and cash flow statements indicate that the project implementation will be financially viable and technically feasible.

ABOUT BEE'S SME PROGRAM

Bureau of Energy Efficiency (BEE) is implementing a BEE-SME Programme to improve the energy performance in 25 selected SMEs clusters. Pali Textile Cluster is one of them. The BEE's SME Programme intends to enhance the energy efficiency awareness by funding/subsidizing need based studies in SME clusters and giving energy conservation recommendations. For addressing the specific problems of these SMEs and enhancing energy efficiency in the clusters, BEE will be focusing on energy efficiency, energy conservation and technology up gradation through studies and pilot projects in these SMEs clusters.

***Major activities in the BEE -SME program are furnished below*:**

Activity 1: Energy Use and Technology Audit

The energy use technology studies would provide information on technology status, best operating practices, gaps in skills and knowledge on energy conservation opportunities, energy saving potential and new energy efficient technologies, etc for each of the sub sector in SMEs.

Activity 2: Capacity Building of Stake Holders in Cluster on Energy Efficiency

In most of the cases SME entrepreneurs are dependent on the locally available technologies, service providers for various reasons. To address this issue BEE has also undertaken capacity building of local service providers and entrepreneurs/ managers of SMEs on energy efficiency improvement in their units as well as clusters. The local service providers will be trained in order to be able to provide the local services in setting of energy efficiency projects in the clusters

Activity 3: Implementation of Energy Efficiency Measures

To implement the technology up gradation projects in clusters, BEE has proposed to prepare the technology based detailed project reports (DPRs) for a minimum of five technologies in three capacities for each technology.

Activity 4: Facilitation of Innovative Financing Mechanisms for Implementation of Energy Efficiency Projects

The objective of this activity is to facilitate the uptake of energy efficiency measures through innovative financing mechanisms without creating market distortion.

1.0 INTRODUCTION

1.1 Brief Introduction about Cluster

Pali is the District Head Quarter of the Pali District situated at a distance of approx. 300 KMs from Jaipur and 70 KMs from Jodhpur. Pali can also be reached from Ahmedabad via Abu Road and has direct train connectivity to Ahmedabad and Mumbai. The nearest airport having commercial flights plying is at Jodhpur. The map depicting Pali district and its distances from various towns is produced below in fig. 1.

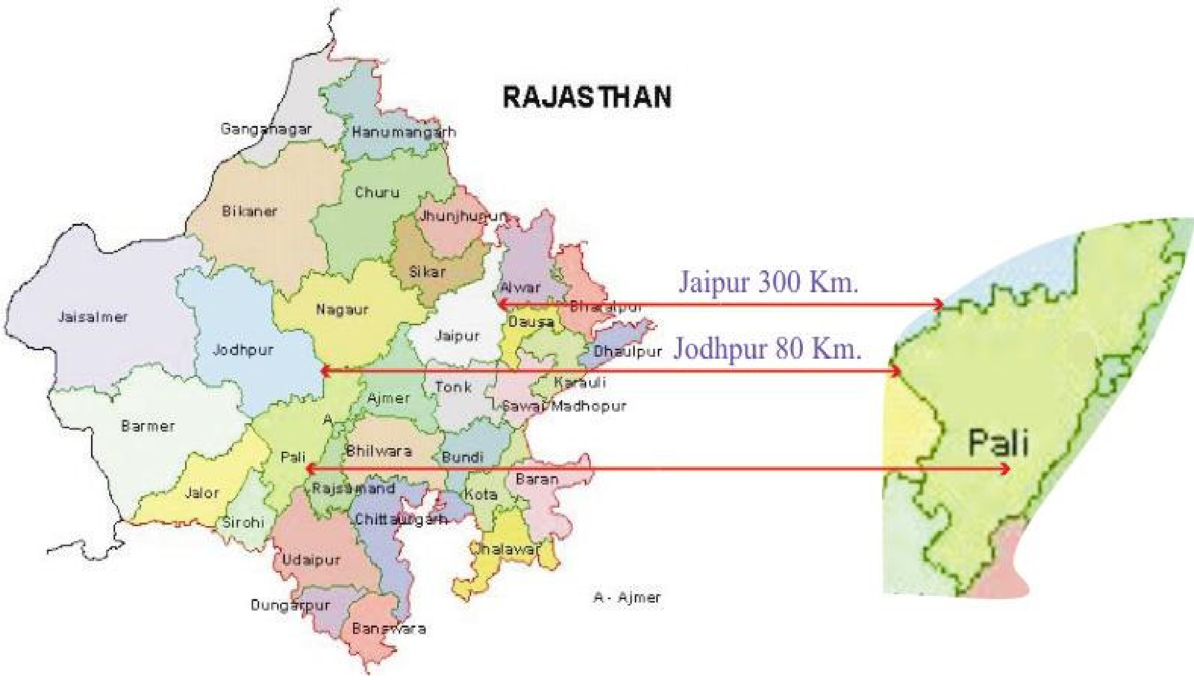


Fig. 1.1 – Pali – Geographical Map

Pali District is rich in minerals and the abundance of limestone deposits has made it home for 5 cement companies. There are several other SME units producing various lime based products. Despite there being non availability of requisite resources like raw material and consumables locally, a dense population of textiles dyeing and processing units has sprung up at Pali.

The Pali textile cluster is one of the biggest SME textile clusters in India having over 350 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. Some of the units hitherto functioning in residential colonies are in the process of shifting to a new Industrial Area named Punayata Road Induatrial Area. Over 150 industries are in the process of setting up their facilities in the Punayata Road Industrial area.

Balotra, Jodhpur and Bhilwara are other textile clusters in Rajasthan. These clusters work on more or less similar processes and use same machines, though their output differs. Details of energy consumption scenario at Pali textile cluster are furnished in Table 1.1 below:

Table1.1 Details of annual energy consumption scenario at Pali Textile Cluster

S. No	Type of Fuel	Unit	Value	% contribution (KLOE)
1	Electricity	MWh /year	51.3	16.6
2	Firewood	MT/year	27161	25.6
3	Steam Coke	Tonne/year	2967	5
4	Lignite	MT/year	16635	15.7
5	Diesel	Klitre/year	89.6	0.3
6	Residual Pet coke	Mt/Yr	11820	36.6

1.1.1 Energy usages pattern

Electrical energy Usage

The Cluster has two types of units – Hand Process and Power Process. Hand Process units mainly process cotton and consume very less electricity. These units consume electricity in the range of 4000 kWh to 5000 kWh per month. The hand process units outsource the finishing to other power process units. Power process units are energy intensive units and consume electricity in the range of 100000 kWh to 300000 kWh per month. Various Electricity consuming equipments in the hand process units are Fans, Tube Lights, and Computers etc. Power Process units have Stenter, Jet Dyeing Machine, Loop Agers, Boiler and Thermopac auxiliaries, Flat Bed Printing Machines etc. Stenter happens to be the biggest Electricity guzzler.

Thermal Energy Usage

Hand process units in the cluster are mainly involved in Table Printing, Kier Boiling and Jig dyeing. Heat for the process is obtained from direct burning of wood. Some units also have open type stenter wherein heating is done by directly burning wood beneath the clothes. Power Process units mainly use Thermal Energy Stenters, Kiers, Jet Dyeing Machines, Sanforizers, Loop Agers, Mercerisers, Scouring, Reduction and Clearance etc. These units use Residual Pet Coke, Lignite, Coal and Wood in Boilers and Thermopacs to make heat usable in machines. Typical Power Process Units use 100 MT to 300 MT RPC (85 MTOE to 256 MTOE) per month. The hand process units use 3 MT to 15 MT wood per month.

1.1.2 Classification of Units

The Textile units in the Pali Cluster can be categorized into two types based on availability of machinery in the units –

- Hand Process Units and
- Power Process Units

Pali Textile Cluster mainly consists of hand process units and over 250 out of a total population of 350 units are hand process units. These units are mainly owned by artisans or traditional colormen (Rangrej).

On the basis of type of cloth processed, the units can be classified as

- Cotton (Natural fiber) Processing Units
- Synthetic clothes (Manmade fibers) Processing Units

Based on output, the units can be classified as

- Dyeing Units
- Printing units
- Finishing Units

Scale of Operation

Most of the units in the Pali textile cluster are micro units. All the units are in Micro, Small or Medium sector with none of the units being in large scale sector.

Products Manufactured

Different types of products manufactured in Pali Textile Cluster. The marketed products are:

- Sarees (Lower Price Range)
- Rubia Blouse Clothes
- Lungies
- Turbans
- African Prints

1.1.3 Production process of Textile dyeing and finishing

The process adopted in Textile Dyeing and Finishing depends upon the fabric processed. The processes are different for Cotton, Polyester and Blended fabrics. The process flow chart for different processes depending upon fabric processed with location of stenter in the process are drawn below –

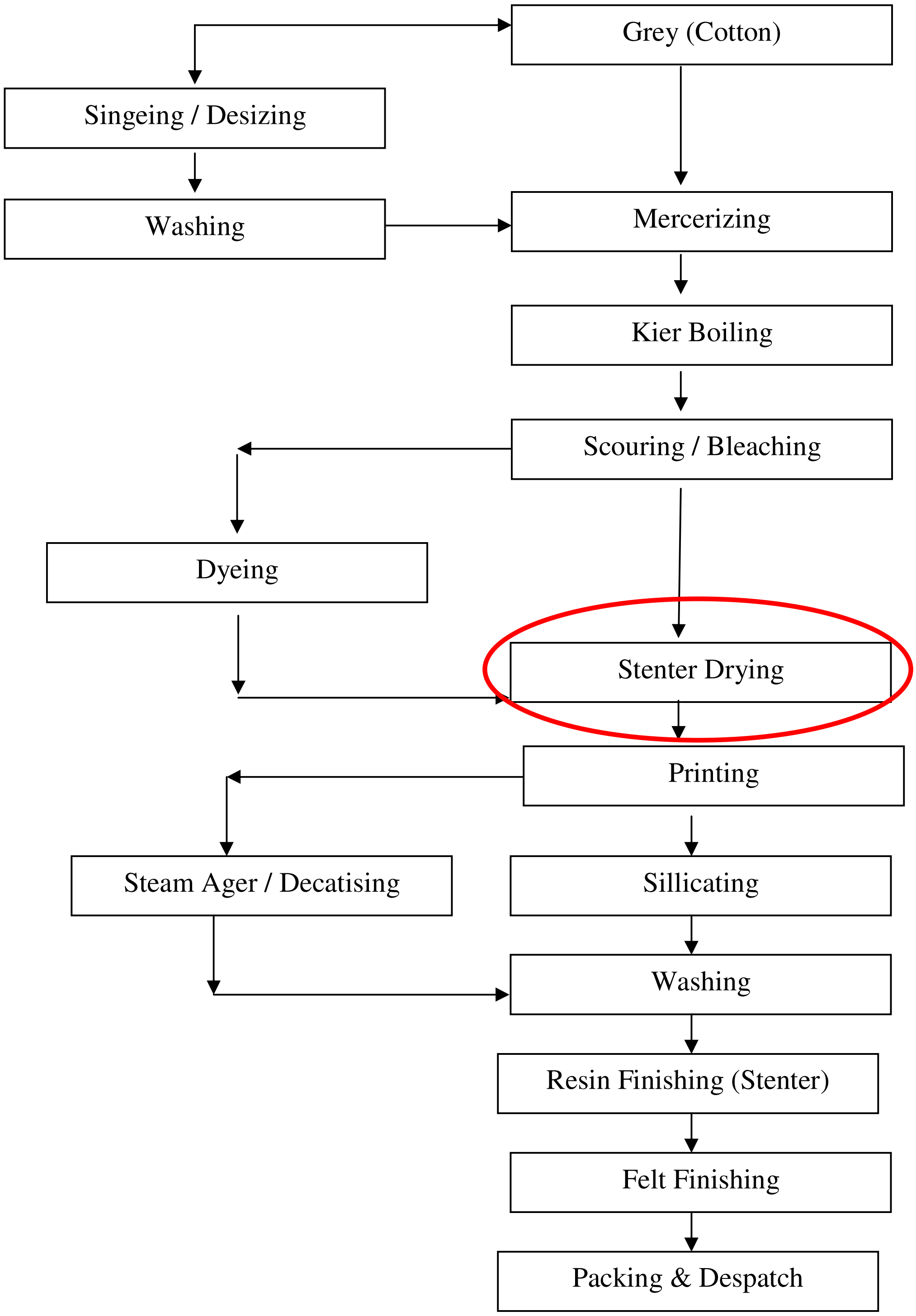


Fig. 1.2 – Process Flow Diagram of Cotton Dyeing and Printing

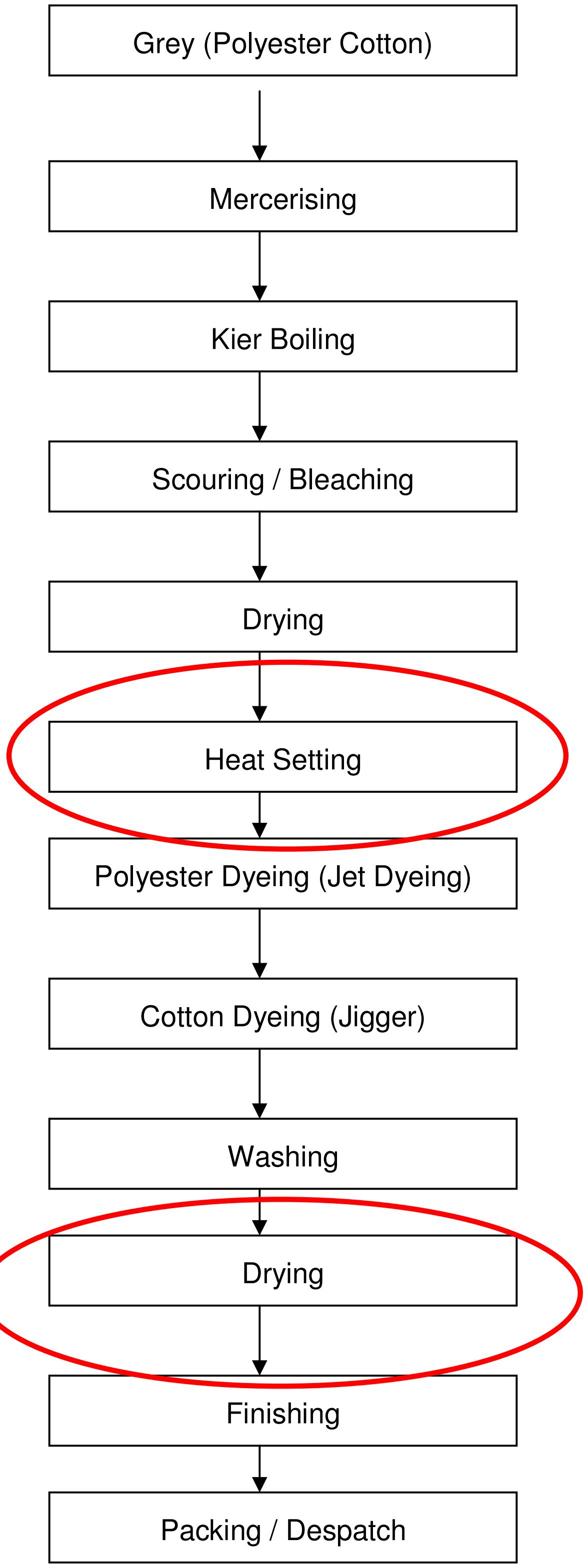


Fig. 1.3 – Process Flow Diagram of Polyester Cotton Dyeing and Finishing

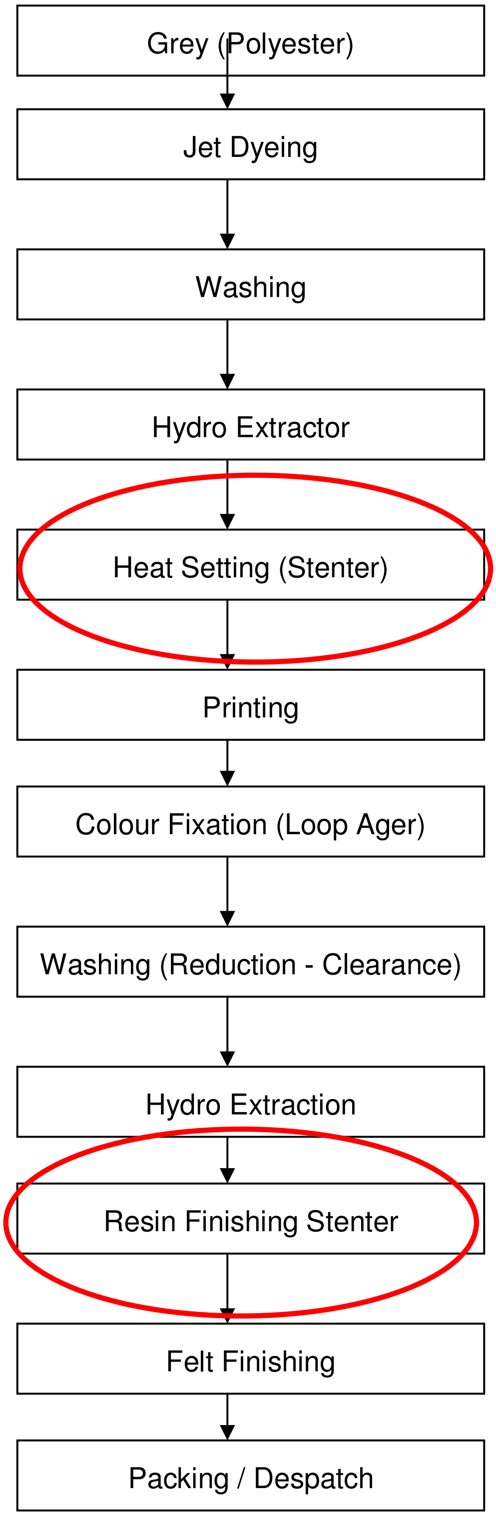


Fig. 1.4 – Process Flow Diagram of Polyester Printing and Finishing

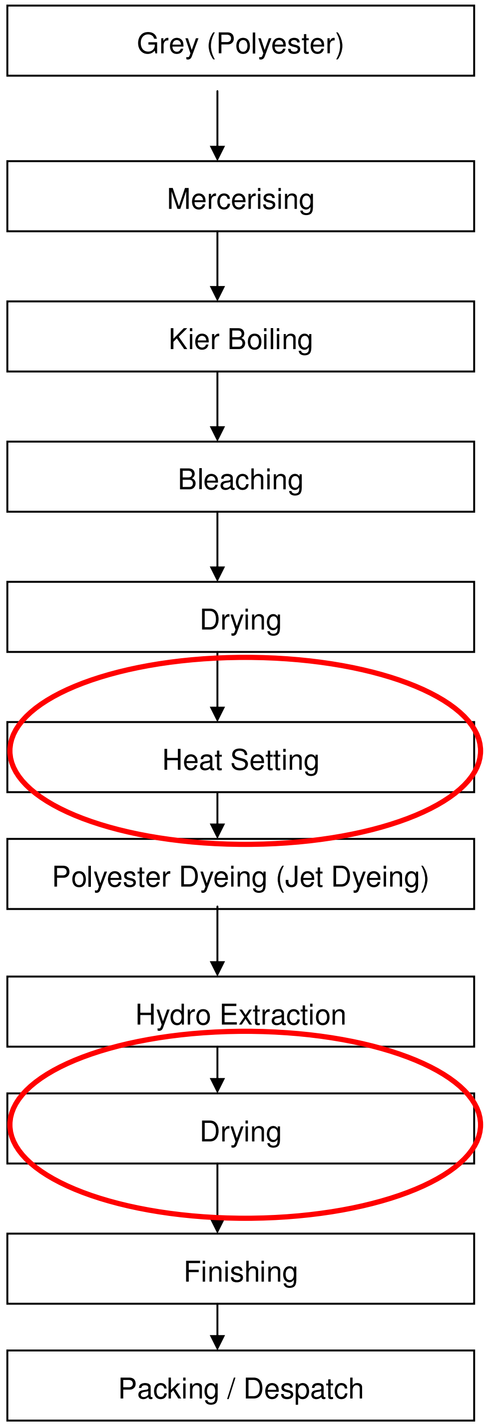


Fig. 1.5 – Process Flow Diagram of Polyester Cotton Dyeing and Finishing

1.2 Energy performance in existing situation

1.2.1 Average production

A typical unit works 5 days a week and the daily production of these units are in the following Table 1.2 below:

Table 1.2 Annual productions from a typical unit

Type of product	*Production (RM/Day)*		
Scale of Unit	**Micro**	**Small**	**Medium**
Finished Fabric	10000	30000	100000

1.2.2 Fuel consumption

Energy consumption both electrical and thermal by a typical textile dyeing and processing unit in Pali cluster is given in table 1.3 below:

Table 1.3 Annual energy consumption

Energy	*Electricity (kWh per year)*			*Thermal Energy (MTOE per year)*		
Scale of Unit	Micro	Small	Medium	Micro	Small	Medium
Consumption	48000	360000	2400000	30	100	300

1.2.3 Specific Energy Consumption (SEC)

The benchmark available for different processes in textile dyeing and processing industry in UK is given in Table 1.4 below:

Table 1.4 Specific Energy Consumption Values

S.No.	*Machine*	*Process*	*Energy Required (GJ/Te)*
1	Desizing Unit	Desizing	1.0-3.5
2	Kier	Scouring/Bleaching	6.0-7.5
3	J-Box	Scouring	6.5-10.0
4	Open Width range	Scouring/Bleaching	3.0-7.0
5	Low Energy Steam Purge	Scouring/Bleaching	1.5-5.0
6	Jig / Winch	Scouring	5.0-7.0

S.No.	Machine	Process	Energy Required (GJ/Te)
7	Jig / Winch	Bleaching	3.0-6.5
8	Jig	Dyeing	1.5-7.0
9	Winch	Dyeing	6.0-17.0
10	Jet	Dyeing	3.5-16.0
11	Beam	Dyeing	7.5-12.5
12	Pad / batch	Dyeing	1.5-4.5
13	Continuous / Thermosol	Dyeing	7.0-20.0
14	Rotary Screen	Printing	2.5-8.5
15	Steam Cylinders	Drying	2.5-4.5
16	Stenter	Drying	2.5-7.5
17	Stenter	Heat Setting	4.0-9.0
18	Package / Yarn	Preparation / Dyeing (Cotton)	5.0-18.0
19	Continuous Hank	Scouring	3.0-5.0
20	Hank	Dyeing	10-16.0
21	Hank	Drying	4.5-6.5

SOURCE – CARBONTRUST UK

SEC in Pali Cluster

For the units involved in Processing of Polyester and printing it to make Saree, the Specific Energy Consumption was observed and furnished in Table 1.5 below:

Table 1.5 Specific energy consumption

S.No	Particulars	SEC
1	Average Specific Electricity Consumption	1.2 kWh/kg (Best Observed Value – 0.95 kWh/kg)
2	Average Specific Thermal Energy Consumption	15000 kCal/kg (Best Observed Value – 10932 kCal/kg)

1.3 Identification of technology/equipment

1.3.1 Description of technology/ equipment

Pretreatment of textiles and also Dyeing, Printing, washing etc. involve use water which needs to be removed from fabric before undertaking final finishing or thermosol process or heat setting. Stenters are mainly used in textile finishing for heat-setting, drying, thermosol processes and finishing. Thus Stenter is one of the most common machinery found in a textile dyeing and finishing industry.

It can be roughly estimated that, in fabric finishing, each textile substrate is treated on average 2.5 times in a stenter. Pali has a population of more than 100 stenters installed in industries. The stenters available in Pali are both open and closed type. These stenters are used for assigning requisite finish, temperature stability and dye curing.

In Cotton Dyeing, stenter is used after pretreatment and dyeing as a finishing process. In Cotton Printing, Stenter is used before printing but after pretreatment. In case of Polyester or PC Dyeing, stenter is used twice, once for heat setting and then again for final finish. Similarly, in case of Polyester and PC Blend Printing, stenter is used twice, once for heat setting and then for final finishing after dye curing.

Stenter happens to be the largest Energy Consuming Machinery available in a textile Dyeing and Finishing Industry. For a 5 Chamber Stenter, the connected load is approx. 90 HP and the Thermal Energy Consumption rating is 4.0 lakh kCal per hour. The major Electrical Energy load happens to be that of 10 no. of fans provided for circulation of hot air having motor rating of 7.5 HP each.

Thermal Energy required for stenters is supplied by Thermopac. The hot thermal fluid at a temperature of 235°C to 300°C is pumped to the stenter with the help of a continuous running pump. The blowers blow air onto a grid of heat exchanger tubes containing hot thermic fluid which then is guided onto the fabric through nozzles. The blower motors are generally two speed motors for controlling speed of the blower. Some of the new Stenters have been provided with VFD for control of speed. Some units have installed VFD as retrofit to the stenter blower motors.

The temperature in each compartment is controlled in modern stenters with the help of a motor operated flow control valve which bypasses hot fluid if temperature in a chamber exceeds preset temperature. Varying the speed of the motor rotating the endless chain can also vary the speed of the fabric.

To give a –surely rough - assessment energy consumption of energetic optimized stenters is in the range of 3500-4500 kJ per kg of textile. However energy consumption depends strongly on the process that is carried out.

A typical stenter is depicted in the following photograph:-

Fig. 1.6 – Photograph of Stenter

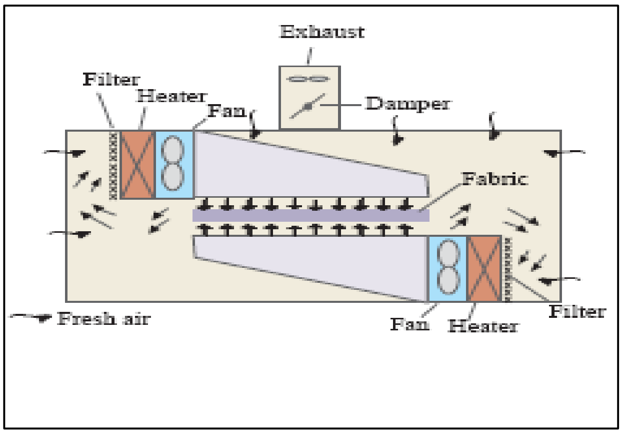


Fig. 1.7 – Schematic of air flow in stenter

1.3.2 Role in process

Textile stenters have two main purposes – convection drying so as to remove the moisture in the fabric and secondly to provide for fabric width control. During the previous stages of processing the fabric is subjected to length wise tension to varying degrees resulting in shrinkage in width. In the stenter, width control is achieved with the aid of a series of clips or pins mounted on a pair of endless chains. Apart from these functions, stenters are also used for the following purposes:

a. Dry-heating process like, heat setting of synthetic fabrics and their blends

b. Dry curing process namely, resin finishing with built-in catalysts

In Pali, Stenter is used for drying as well as finishing of Cotton and also for Heat Setting as well as Finishing of Polyester and PC Blend. Stenter is indispensable for Dyeing and Printing of polyester and Blends. Cotton fabric is processed on open stenter. Stenter is generally not used for Drying purpose as drying is done in open air by hanging the fabric in sun. Mechanical dewatering process is also used in case of Polyester and PC Blend. All the stenters are equipped with 3 bowl mangles for dewatering which is used if any chemical is applied with water as carrier.

Analysis of cost of ownership of stenter as per PLEVA given below reveals that there is a saving potential of 27% minimum.

Table 1.6 Life Cycle Cost Analysis of stenters

S.No.	*Cost Head*	*% age Weightage*
1	Machine Cost	16
2	Labor Cost	11
3	Heat energy	23
4	Electricity	12
5	Maintenance	6
6	Spare Parts	3
7	Others	2
8	Potential of Energy Savings	27

Energy Consumption details

Energy break up for Heat setting in a stenter is as given in Table 1.7below:

Table 1.7 Energy break up for Heat setting in a stenter

S.No.	Component	Energy Content (GJ/Te)	% age
1	Evaporation	0.20	4.30
2	Air Heating	3.55	76.2
3	Fabric	0.25	5.40
4	Case	0.23	4.90
5	Chain	0.10	2.10
6	Drive	0.33	7.10
7	Total	4.66	100

Energy break up for a typical stenter is shown in Table 1.8below:

Table 1.8 Energy break up for a typical stenter

S.No.	Component	Energy Content (GJ/Te)	% age
1	Evaporation	2.54	41.0
2	Air Heating	2.46	39.7
3	Fabric	0.29	4.6
4	Case	0.39	6.3
5	Chain	0.09	1.5
6	Drive	0.43	6.9
7	Total	6.20	100.0

As is obvious from above table, only 5.4% of heat given to stenter is utilized in heating the fabric in case of Heat Setting. Heat gained by fabric in any typical stenter operation is 4.6% only. It is further evident that approx. 95% stenters is used for the purpose of moisture evaporation, released to atmosphere or wasted.

Typical Sankey diagram for a stenter having no Energy Conservation Measures is as below:

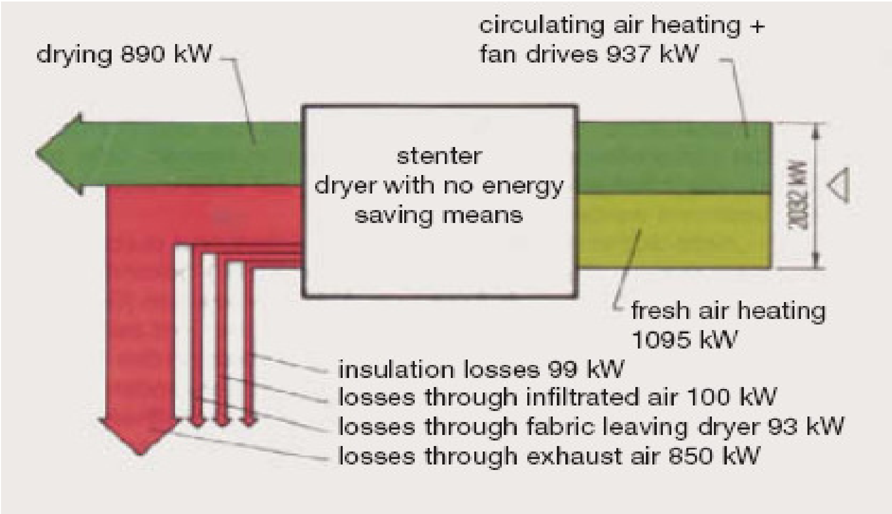


Fig. 1.8 – Sankey diagram for a stenter without Energy Conservation Measure

Typical Sankey Diagram for a stenter with Energy Conservation Measures is as below:

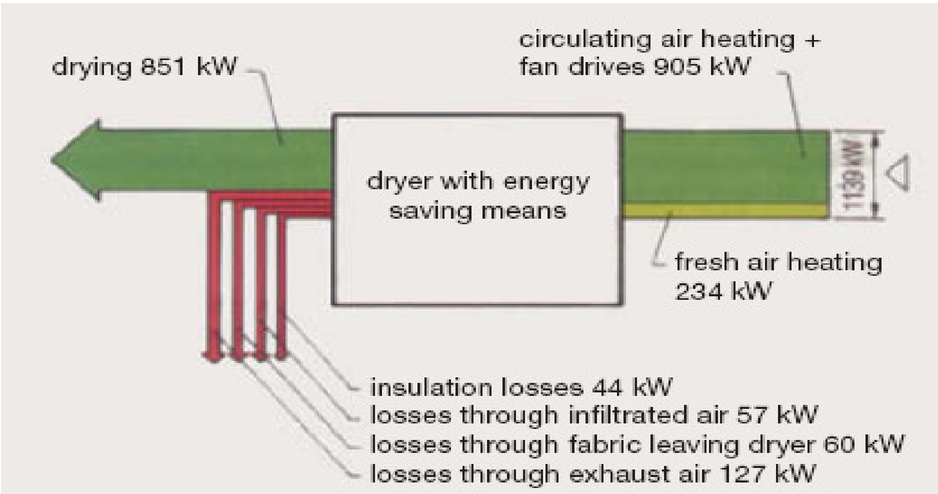


Fig. 1.9– Sankey diagram for a stenter with Energy Conservation Measure

1.3.3 Energy audit methodology

The following methodology was adopted to evaluate the performance of Stenters which is shown in Fig. 1.10.

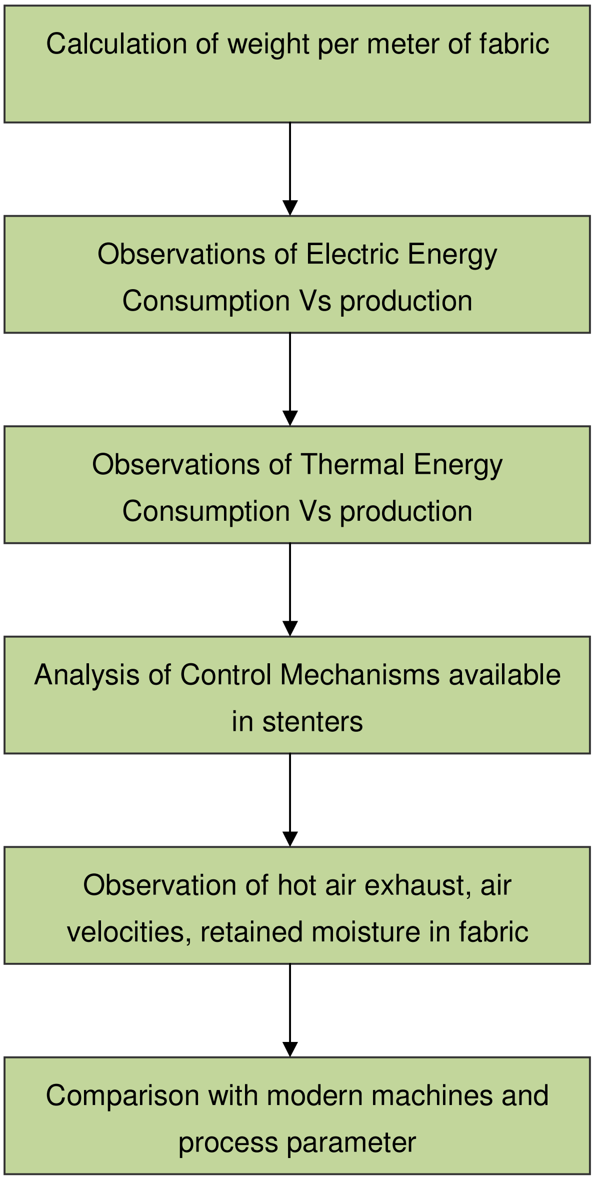


Fig. 1.10 Energy Audit methodologies

1.3.4 Design and operating parameters specification

Heat setting is an essential process in the pretreatment of man-made fibre which is also of importance in subsequent stages as intermediate setting or post-setting.

The basic functions of heat setting are as follows:

- Heating up the fibre with the evaporation of residual water and, with increasing material temperature, the "unblocking" of internal tensions and initiation of chain segment mobility.

- Presentation of the material to the setting medium either under tension or tension-free passage as desired.
- To subject the material to the setting medium for a specified period of time during which unstable crystallites melt and the polymer mass is partially re-crystallized so that crystallites are formed the thermal stability of which is dependent on the parameters of temperature, dwell time and fibre tension during their formation.
- On cooling, additional crystallization occurs in the crystallites of low stability and setting of the non crystalline regions of the fibre takes place under the state of tension at the time of falling below the glass transition temperature.

When the process is used to facilitate the next process it is called intermediate fixation; if it is a final operation for establishing the characteristics of the finished article, it can be called final set or final fixation.

Intermediate fixation operations mainly serve the following purposes:

1. Preshrinking of yarn (amongst other things) for removing the potential for shrinkage from subsequent piece goods processing and to reduce the shrinkage in a subsequent yarn dyeing process.
2. Equalisation of tension differences from the spinning process.
3. Stabilisation of a yarn twist, for better subsequent processing capability.
4. Fixation of dyes.
5. Development and fixation of yarn crimp or fibre crimp, which in respect of the crimp is a final setting, but which in respect of the piece goods is an intermediate fixation.

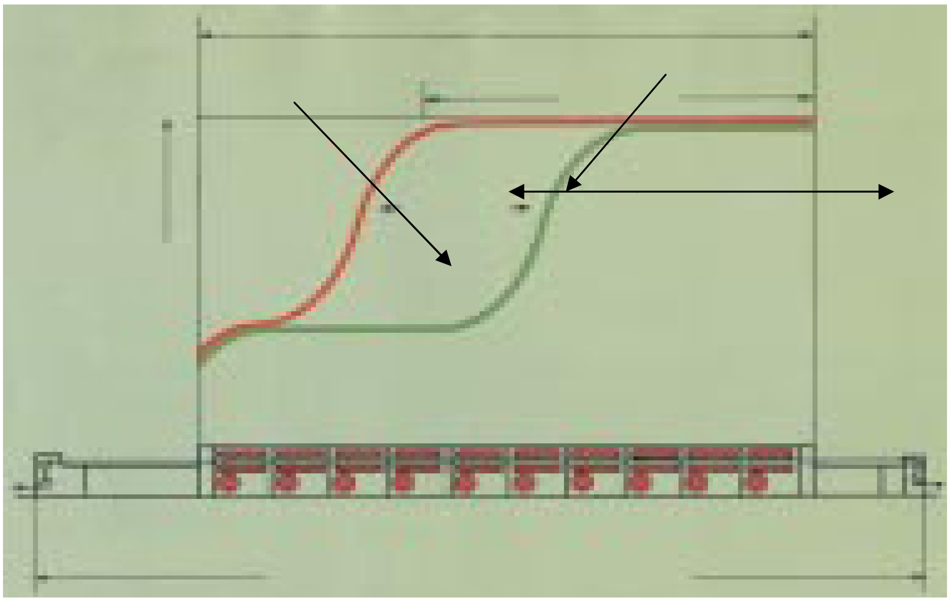
Final fixation is for the purpose of:

- shaping,
- stabilising a fabric against subsequent stress in wear and laundering,
- establishing the desired material appearance,
- reducing creasing,
- Influencing the handle of the goods.

The most important parameters of these functions are temperature, the given dimensions and the dwell time. A longer dwell time at the required temperature serves no useful purpose and therefore wastes energy. Heat setting processes within a temperature range of 130– 220°C are possible;

The temperature described as the "effective temperature" is that temperature which is necessary to cancel out the heat setting effect. Thus the heat setting temperature should be at least 25–30^{O}C (for polyester 30–40^{O}C) higher than temperatures to which the textile material will be subjected in subsequent processing or use.

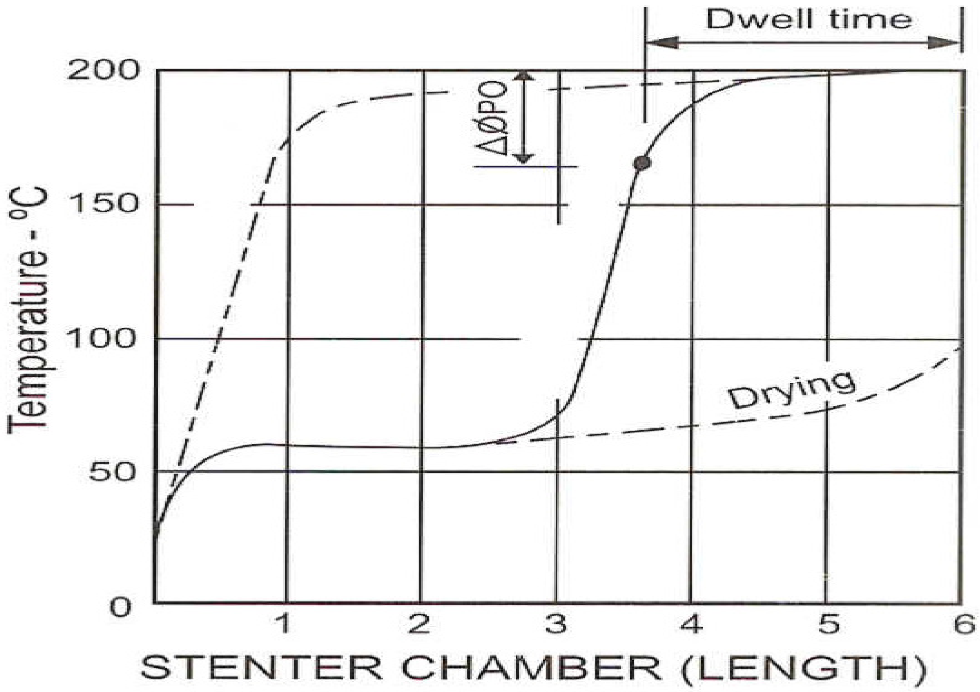
The typical heat setting process is shown below



1.3.5 Operating efficiency analysis

Presently, Pali units processing Polyester or Blended fabrics essentially do heat setting on stenter. Although Temperature and Dwell time is very critical for final quality of the fabrics in terms of coloration, colour fastness and dimensional stability, there is no precise control for the parameters resulting in loss of productivity and also inferior quality. As per the present system, it is the chamber temperature which is being monitored and controlled. It can very well be said that the two most critical parameters are not being ensured resulting in loss of productivity and also erosion in quality.

The situation becomes worse when fabrics of different blend ratios and different weight are processed under same temperature setting of various chambers of the stenter resulting in vitiation of the process parameters and hence delivery of poor quality at a very less productivity levels. A typical representation of the temperature profile of the fabric and also the dwell time is produced below:-



1.4 Barriers in adoption of proposed technology/equipment

BEE promoted SME programme has the unique distinction of addressing all the identifiable barriers in adoption of Energy Efficiency Improvement technologies in SME sectors. Following actions have been taken in Pali Textile Cluster to remove the barriers:-

- Kick off Seminar to create awareness
- Energy Audit (Detailed and Preliminary) in over 78 units
- Capability building and involvement of institutional financers, local service providers and also domestic equipment manufacturers.
- Design and distribution of dissemination material containing most of the measures.
- Design and distribution of Cluster Manual containing technology gap assessment and cost benefit analysis of proposed Energy Conservation measures.
- Involvement of Industry Association, Department of Industries and local administration.

However, for the sake of identifying possible barriers to adoption of the proposed technologies, the following may be considered.

1.4.1 Technological Barrier

- The proposed technology, being generic in nature, is readily available.
- Non-availability of technology or aversion to adoption for any other reason does not seem to be the case. The system is being offered by most of Stenter manufacturers. It is only lack of knowledge and comfort of proven guaranteed results that has been keeping the entrepreneurs away from adopting this technology.
- Stenter manufacturers are offering the proposed technology as a standard add on to new systems. Even agencies working in optimization and control system for textile sector offer the product. However, the proposition is not being presented with guaranteed cost benefit analysis to the entrepreneurs. The entrepreneurs are in Micro, Small and medium sector and they do not have trained or educated manpower.
- There is a severe paucity of quality technical consultants in the cluster. This also inhibits adoption of technology as there is nobody to convince the entrepreneurs.
- Non availability of local after sales service provider for the equipments is a major obstacle to adoption of any new and modern technology involving electronics.
- The majority of the textile unit owners / entrepreneurs do not have in-depth technical expertise nor do they have technically qualified manpower. This is a major barrier in acquiring knowledge about any innovation in the sector.
- The entrepreneurs in the MSME sector are averse to investment risks and tend to invest in proven technology only. Adoption of technology is higher in bigger units and these bigger units also become agents for demonstration and hence replication. Lack of any bigger unit in the cluster also is an impediment to adoption of newer technology.

1.4.2 Financial Barrier

- The applicability of the proposition is in power process units only. These units have very healthy financial position. Lack of finances is not the reason for non adoption of the proposed technology. However, availability of easy finances and also financial incentives would trigger and also accelerate adoption of the technology.
- Implementation of the proposed project activity requires approx. ₹ 2.20 lakh investment per machine and can be managed by loan only as internal accruals may not suffice. However, the units have upto 4 Stenter and hence investment of ₹ 8.8 lakh in one go would be a problem.

- The investment decisions normally favour creation of additional facility and investment for Energy Efficiency Improvement features last in the priority of entrepreneurs. Consequently, interventions like the one undertaken by BEE are necessary for promoting adoption of technologies.
- The subjective approach of the banks in deciding on grant of loans to entrepreneurs and also lack of pre declared formalities required for availing loan is the biggest impediment. On adherence to a time bound dispensation of the loan application is also an obstacle as the a new document is asked for ever time the entrepreneur visits the bank and the bank would refuse in the last moment citing untenable reason leaving the entrepreneur in the lurch. Facilitating delivery of finances is more important than packaging the finances.
- Most of the units in Pali textile cluster are debt free enterprises and the situation is ideal for any bank or financial institution to do advances. With end to economic slow down within sight, the demands are likely to pick up and the units would require scaling up their operations and also perking up their facility to meet enhanced demand. The inherent benefit of increase in profitability by precise process control is also up for taking.

1.4.3 Skilled manpower

The cluster very badly needs skilled manpower. There is no trained Dye Master, no trained electrician, no trained boiler operator or no trained maintenance man. The existing manpower has grown by on the job learning and has learnt the traditional methods of dyeing and processing. Propagation of learning of new technology is absolutely necessary.

1.4.4 Other barrier (If any)

Creation of Energy Champions is necessary to trigger large-scale adoption of proposed technologies. This is possible by sponsoring adoption of such technologies through financial help and also mitigation of investment risks through a mechanism that guarantees the savings. An ESCO can as well be involved in the process.

2.0 PROPOSED EQUIPMENT

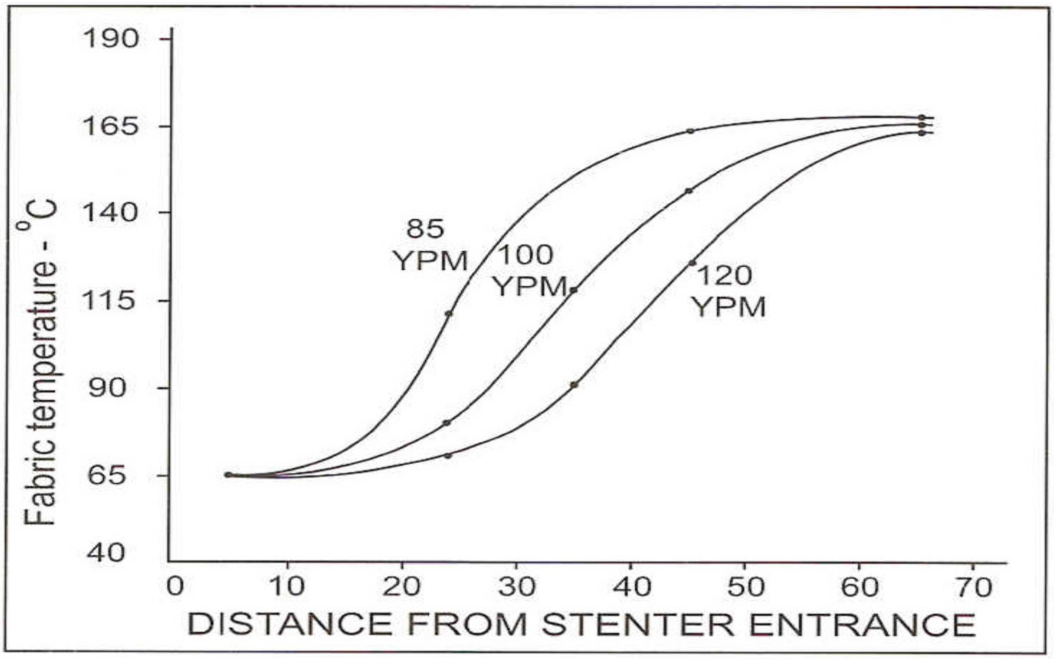
2.1 Detailed description of technology proposed

Background

The proposed system consists of several non contact types infra red temperature sensors fitted in the roof along the length of the stenter in the latter part of the stenter. The sensors find exactly where the required temperature is achieved and signal is consequently given to the VFD of the main chain motor to either increase or decrease speed so that the minimum dwell time is ensured. A typical system is depicted below:

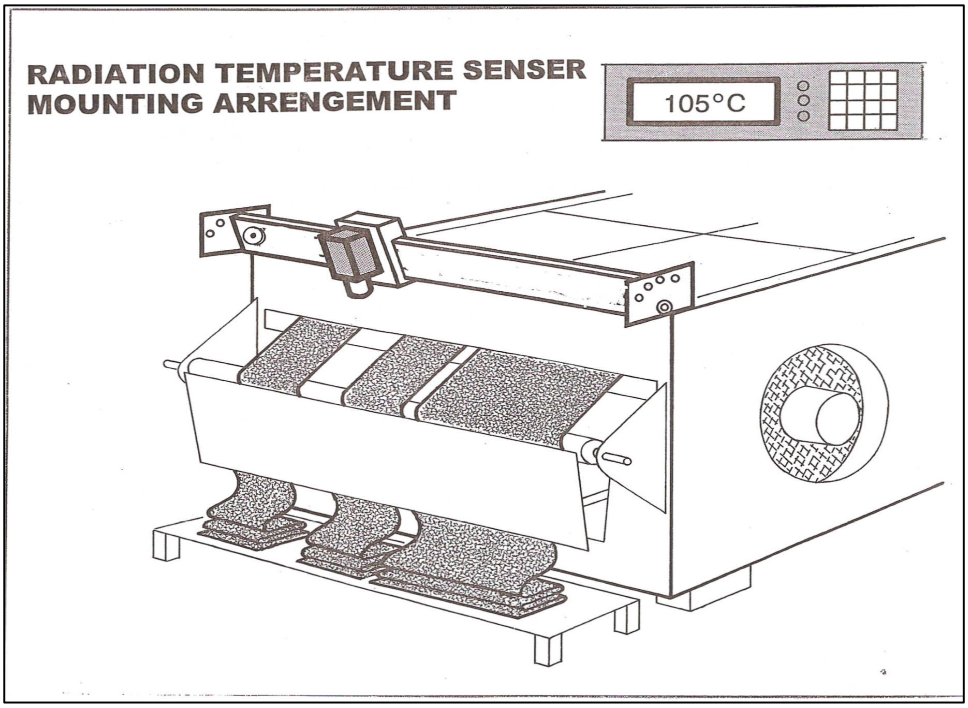
By installing the proposed system, the precise temperature required for heat setting is achieved and also the requisite dwell time is ensured, thus ensuring maximum possible output and also ensuring the best possible quality in terms of intended characteristics out of the heat setting process.

The graphs depicting temperature profiles at various speeds of the fabric Vs the distance is depicted below. It is obvious that the required temperature can be achieved at the same point in the stenter even though the speeds of the fabric is different indicating that based on dwell time requirements, speed of the fabric can be set.



Description of equipment

The equipment consists of 4 no. infra red radiation sensors to sense the temperature coupled with analog display integrated with also panel PC with software so as to regulate the speed the fabric through VFD of the chain motor.



2.1.1 Equipment specification

A complete brochure of the equipment is placed at Annexure 1.

2.1.2 Suitability over existing equipment

The proposed system can be retrofitted to existing Stenters Machine with minimal modification to existing Machinery.

2.1.3 Superiority over existing equipment

The system would improve precision of control on the existing process and hence would yield better results on productivity as well as quality fronts.

2.1.4 Availability of equipment

The system can be delivered within 3 to 4 weeks of placement of order through manufacturers in Ahmedabad.

2.1.5 Source of equipment

This technology has already been implemented in one of the textile process house at Pali and the results have been as per projections. Brochure from the same vendor has been enclosed. The equipment is readily available indigenously without any complications related to patent or copyright.

2.1.6 Technical specification of equipment

Technical specification of proposed technology is attached in Annexure 1 & in Annexure 7.

2.1.7 Terms and conditions in sales of equipment

No specific terms and conditions are attached to sale of the equipment.

2.1.8 Process down time during implementation

The proposed system can be retrofitted to existing Stenters Machine with minimal modification to existing Machinery and would requires shut down of approximately one week.

2.2 Life cycle assessment and risks analysis

The unit consists of Sensors, VFD, PLCs, connections, contactors etc. There are no moving parts and hence deterioration is not a problem. However, bad power quality may lead to failure of the system. Being an electronic device, no problem is anticipated and the unit would go on working perpetually if better ambient is made available.

2.3 Suitable Unit for Implementation of Proposed Technology

The proposed system can be implemented in over 25 no. out of 100 no. of Stenters. Total potential for energy saving would be 4.43 lakh kWh and 430 MT RPC per year if the proposition is implemented in all the machines.

3.0 ECONOMIC BENEFITS FROM PROPOSED EQUIPMENT

3.1 Technical benefit

3.1.1 Fuel saving

The proposition would help save 17.21 MT RPC fuel per year in every stenter. Further, details of fuel saving are given in Annexure 4.

3.1.2 Electricity saving

Proposed technology not only helps in saving of RPC consumption but also about 18150 kWh of electricity saving is envisaged out of implementation of the proposed system. Details of electricity saving is given in Annexure 4.

3.1.3 Improvement in product quality

The system comes with precision process control protocol and is aimed at ensuring process parameters needed for a very critical product feature in the textile dyeing and finishing process. Consequently, the product quality is expected to improve tremendously.

3.1.4 Increase in production

The Precise process control will result in minimum productivity improvement of 5% on hourly basis.

3.1.5 Reduction in raw material

Raw material consumption is same even after the implementation of proposed technology.

3.1.6 Reduction in other losses

None

3.2 Monetary benefits

The monetary saving arising out of implementation of proposed technology in one Stenter would be ₹ 2.12 lakh per year. Detail of monetary saving is given in Annexure 4.

3.3 Social benefits

3.3.1 Improvement in working environment in the plant

Proposed equipment reduces the GHG emission by reducing in electricity as well as fuel consumption.

3.3.2 Improvement in workers skill

Not contributing to any improvement in skill sets of workers. However, the automation would eliminate human intervention in precision control of process thereby reducing workload of the frontline workers. No retrenchment of labor is envisaged because of implementation of the proposed system.

3.4 Environmental benefits

3.4.1 Reduction in effluent generation

None

3.4.2 Reduction in GHG emission

The equivalent saving in GHG emission for every Stenter would be 63 MT per year as per UNEP GHG Calculator.

3.4.3 Reduction in other emissions like SO_X

NIL

4.0 INSTALLATION OF PROPOSED EQUIPMENT

4.1 Cost of equipment implementation

4.1.1 Equipments cost

Cost of one set of equipment is about ₹ 2.1 lakh (1.8 lakh + Excise +Taxes and Cartage) as per the quotation from M/s SEMITRONICS attached as Annexure 7.

4.1.2 Erection, commissioning and other misc. cost

Erection & commissioning cost is about ₹ 0.1 lakh. A detail of project installation cost is given in Table 4.1 below:

Table 4.1 Details of proposed equipment installation cost

S.No	Particular	Unit	cost
1	Equipment cost	₹ (in Lakh)	2.1
2	Erection & Commissioning cost	₹ (in Lakh)	0.1
3	Interest during implementation	₹ (in Lakh)	Nil
4	Other misc. cost	₹ (in Lakh)	Nil
5	**Total cost**	₹ (in Lakh)	**2.20**

4.2 Arrangements of funds

4.2.1 Entrepreneur's contribution

Entrepreneur will contribute 25% of the total project cost which is ₹ 0.55 lakh.

4.2.2 Loan amount.

Remaining 75% cost of the proposed project will be taken from the bank which is ₹ 1.65 Lakh.

4.2.3 Terms & conditions of loan

The interest rate is considered at 10% which is SIDBI's rate of interest for energy efficient projects. The loan tenure is 5 years excluding initial moratorium period is 6 months from the date of first disbursement of loan.

4.3 Financial indicators

4.3.1 Cash flow analysis

Profitability and cash flow statements have been worked out for a period of 8 years. The financials have been worked out on the basis of certain reasonable assumptions, which are outlined below. The cost of equipment considered is inclusive of hot water storage tanks also.

The project is expected to achieve monetary savings of ₹ 2.13 lakh per annum.

- The Operation and Maintenance cost is estimated at 4% of cost of total project with 5% increase in every year as escalations.
- Interest on term loan is estimated at 10%.
- Depreciation is provided as per the rates provided in the companies act.

Based on the above assumptions, profitability and cash flow statements have been prepared and calculated in Annexure-2.

4.3.2 Simple payback period

The total project cost of the proposed technology is ₹ 2.21 lakh and monetary savings due to reduction in Electricity & Fuel consumption is ₹ 2.13 lakh hence, the simple payback period works out to be around 12 months.

4.3.3 Net Present Value (NPV)

The Net present value of the investment at 10% works out to be ₹ 5.77 Lakh.

4.3.4 Internal rate of return (IRR)

The after tax Internal Rate of Return of the project works out to be 76.35%. Thus the project is financially viable.

4.3.5 Return on investment (ROI)

The average return on investment of the project activity works out at 22.71%.

Details of financial indicators are furnished in Table 4.2 below:

Table 4.2 Financial indicators of proposed technology

S.No.	Particular	Unit	Value
1	Simple payback period	Months	12
2	NPV	₹ (in lakh)	5.77
3	IRR	% age	76.35
4	ROI	% age	22.71
5	DSCR	ratio	2.77

4.4 Sensitivity analysis

A sensitivity analysis has been carried out to ascertain how the project financials would behave in different situations like when there is an increase in fuel savings or decrease in fuel savings. For the purpose of sensitive analysis, two following scenarios has been considered

- Optimistic scenario (Increase in fuel savings by 5%)
- Pessimistic scenario (Decrease in fuel savings by 5%)

In each scenario, other inputs are assumed as a constant. The financial indicators in each of the above situation are indicated along with standard indicators.

Table 4.3 Sensitivity analysis in different scenario

Scenario	IRR (% age)	NPV (₹ in lakh)	ROI (% age)	DSCR
Pessimistic	71.90	5.37	22.68	2.62
Realistic	76.35	5.77	22.71	2.77
Optimistic	80.81	6.18	22.74	2.91

4.5 Procurement and Implementation Schedule

Total time period required for implementation of this technology is about 6 weeks and their details are given in Annexure 3.

Annexure -1: Information Brochure of equipment

SEMITRONIK

FABRIC TEMPERATURE PROFILE SYSTEM

FOR HEAT-SETTING STENTER MACHINE

Up to now heat setting processes relied on laboratory findings, which were transferred to production conditions. This method has serious disadvantages, particularly when larger fabric runs are involved. For example 'over' and undersetting is possible, because the borderline from drying to heat-setting conditions is not identical with laboratory test result, the reason being that with large fabric runs, variations in the operating conditions in a dryer can have far-reaching effects.
A serious dissipation of energy has to be tolerated in order to have adequate safety margins at the expense of economy. The usual practice of following for a safety margin when establishing the contact time, means more energy consumption and less efficiency.
Semitronik's Automatic Heat-setting Control System optimizes your drying and heat-setting processes by measuring the fabric temperature in the stenter and automatically controlling the fabric running speed.

OPERATING PRINCIPLES

The fabric temperature is measured through Infra-red non-contact temperature sensor, which works on the principle of heat radiation.
The sensor is mounted on the top of the stenter chamber pointing towards the fabric in process.
The entire process data acquired is displayed on:

- In the form of a bar graph.
- The pre-set value.
- Fabric temperatures in the various zones.
- The machine speed.

THE FUNCTION

Speed of the stenter is controlled automatically ensuring fabric heat-set at desired temperature and with required dwell time.
The system also makes possible to identify the transition point from drying to heat-setting and appropriate utilization of this knowledge brings you following advantages:

- Increase production output.
- Improved consistent quality.
- Minimisation of energy consumption.
- Reduces the production cost.
- Simplifies the operation.

TECHNICAL DETAILS

- Infra-red pyrometers can withstand temperature of 0-250°C.
- Sensor has accuracy of ± 1°C.
- System generates proportionate output in forms of 4-20mA to control fabric speed.
- PC-based display and control unit with Stenter Monitoring System (Optional).

MODEL AVAILABLE

Suitable for any make stenter machine.

MODEL FTP-501

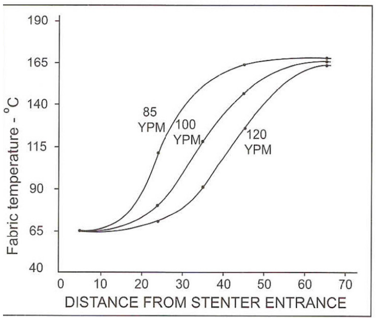
For measurement of temperature of running fabric and with automatic control for speed of the stenter machine with dwell time controller.
Dimensions: 170 X 325 X 300 mm

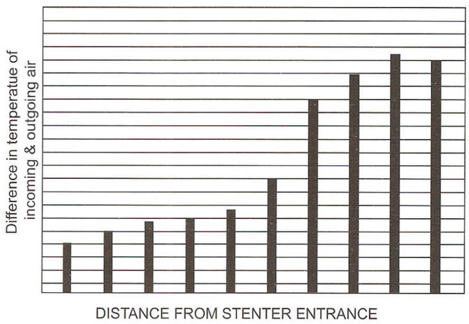
COST EFFECTIVE PROCESSING WITH EQUIPMENTS TAILORED TO YOUR NEEDS

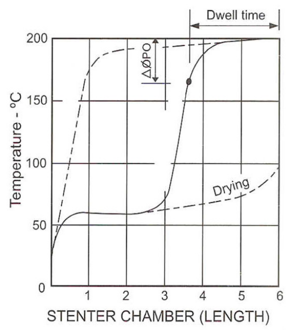
In the textile finishing industry too, works economy aspects are steadily gaining significance.
Automated process sequence are controlled by constant monitoring of all important measurable variable i.e.

- Production speed
- Time record
- Working temperature
- % of over / underfeed or / shrinkage / elongation or no. of / pick / course cm or inch.
- Exhaust moisture contents
- Production
- Energy consumed
- Fabric temperature
- Fabric width control

Those governs the process, as well as process optimisation and documentation of the process cycle, alleviate the work load for the operatives and factory management, increase the operational reliability and optimise quality and efficiency.
'SEMITRONIK' offer interesting solutions for optimisation of all process sequences.







For further details, contact

SEMITRONIK

Since our policy is of continuous development and improvement, we reserve the right to supply product which may differ from those illustrated & described in this publication.

Head Office
17 CD, Archana Ind. Estate,
Rakhial Road,
Ahmedabad-380 023 - India.
Tel.: +91 79 22741011,
22742480, 22774977, 65221995.
Fax: +91 79 22741793, 22779198.
E-mail: semiahd@satyam.net.in

Mumbai Office
1A, Abhishek CHS Ltd.,
G. D. Ambekar Marg,
Dadar (E),
Mumbai-400 014 - India.
Tel.: +91 22 24147788, 32957649.
Fax: +91 22 24130266.

Surat Office
407, Trade Centre,
Ring Road,
Surat-395 002 - India.
Tel.: +91 261 2354847.
Fax: +91 261 2324746.

Website: www.semitronik.com

exel@hathway.com SEMI/20L/8-07

ENERGY IS LIFE
BEE
CONSERVE IT

Annexure -2: Detailed financial analysis

Assumption

Name of the Technology	Fabric Temperature Control		
Rated Capacity	NA		
Details	**Unit**	**Value**	**Basis**
Installed Capacity			
No of working days	Days	300	
No of Shifts per day	Shifts	3	(Assumed)
Capacity Utilization Factor	%age		
Proposed Investment			
Equipment cost	₹ (in lakh)	2.21	
Erection and Commissioning	₹ (in lakh)	0.01	
Other cost	₹ (in lakh)	0.00	
Total Investment	₹ (in lakh)	2.20	
Financing pattern			
Own Funds (Equity)	₹ (in lakh)	0.55	
Loan Funds (Term Loan)	₹ (in lakh)	1.65	
Loan Tenure	years	5	Assumed
Moratorium Period	Months	6	Assumed
Repayment Period	Months	66	Assumed
Interest Rate	%age	10.00%	SIDBI Lending rate
Estimation of Costs			
O & M Costs	% on Plant & Equip	4	Feasibility Study
Annual Escalation	%age	5	Feasibility Study
Estimation of Revenue			
Fuel saving(RPC)	Tons/year	17.21	
Cost	₹/tons	7500	
Electricity saving	kWh	18150	
Cost of fuel	₹/kWh	4.6	
St. line Depn.	%age	5.28	Indian Companies Act
IT Depreciation	%age	80.00	Income Tax Rules
Income Tax	%age	33.99	Income Tax

Estimation of Interest on Term Loan

₹ (in lakh)

Years	Opening Balance	Repayment	Closing Balance	Interest
1	1.65	0.06	1.59	0.19
2	1.59	0.12	1.47	0.15
3	1.47	0.19	1.28	0.14
4	1.28	0.38	0.90	0.12
5	0.90	0.60	0.30	0.06
6	0.30	0.30	0.00	0.01
		1.65		

WDV Depreciation

₹ (in lakh)

Particulars / years	1	2
Plant and Machinery		
Cost	2.20	0.44
Depreciation	1.76	0.35
WDV	0.44	0.09

Projected Profitability

₹ (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8
Fuel savings	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13
Total Revenue (A)	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13
Expenses								
O & M Expenses	0.09	0.09	0.10	0.10	0.11	0.11	0.12	0.12
Total Expenses (B)	0.09	0.09	0.10	0.10	0.11	0.11	0.12	0.12
PBDIT (A)-(B)	2.04	2.03	2.03	2.02	2.02	2.01	2.01	2.00
Interest	0.19	0.15	0.14	0.12	0.06	0.01	-	-
PBDT	1.85	1.88	1.89	1.91	1.95	2.00	2.01	2.00
Depreciation	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
PBT	1.73	1.76	1.77	1.79	1.84	1.89	1.89	1.89
Income tax	-	0.52	0.64	0.65	0.66	0.68	0.68	0.68
Profit after tax (PAT)	1.73	1.24	1.13	1.14	1.17	1.21	1.21	1.21

Computation of Tax

₹ (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8
rofit before tax	1.73	1.76	1.77	1.79	1.84	1.89	1.89	1.89
Add: Book depreciation	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Less: WDV depreciation	1.76	0.35	-	-	-	-	-	-
Taxable profit	0.09	1.53	1.89	1.91	1.95	2.00	2.01	2.00
Income Tax	-	0.52	0.64	0.65	0.66	0.68	0.68	0.68

Projected Balance Sheet

₹ (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8
Liabilities								
Share Capital (D)	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Reserves & Surplus (E)	1.73	2.97	4.10	5.25	6.42	7.63	8.84	10.04
Term Loans (F)	1.59	1.47	1.28	0.90	0.30	0.00	0.00	0.00
Total Liabilities (D)+(E)+(F)	3.87	4.99	5.93	6.70	7.27	8.18	9.39	10.59

Assets	1	2	3	4	5	6	7	8
Gross Fixed Assets	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20
Less Accm. Depreciation	0.12	0.23	0.35	0.46	0.58	0.70	0.81	0.93
Net Fixed Assets	2.08	1.97	1.85	1.74	1.62	1.50	1.39	1.27
Cash & Bank Balance	1.79	3.03	4.08	4.96	5.65	6.68	8.00	9.32
TOTAL ASSETS	3.87	4.99	5.93	6.70	7.27	8.18	9.39	10.59
Net Worth	2.28	3.52	4.65	5.80	6.97	8.18	9.39	10.59
Debt Equity Ratio	2.89	2.67	2.33	1.64	0.55	0.00	0.00	0.00

Projected Cash Flow

₹ (in lakh)

Particulars / Years	0	1	2	3	4	5	6	7	8
Sources									
Share Capital	0.55	-	-	-	-	-	-	-	-
Term Loan	1.65								
Profit After tax		1.73	1.24	1.13	1.14	1.17	1.21	1.21	1.21
Depreciation		0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Total Sources	2.20	1.85	1.36	1.25	1.26	1.29	1.32	1.33	1.32
Application									
Capital Expenditure	2.20								
Repayment Of Loan	-	0.06	0.12	0.19	0.38	0.60	0.30	-	-
Total Application	2.20	0.06	0.12	0.19	0.38	0.60	0.30	-	-
Net Surplus	-	1.79	1.24	1.06	0.88	0.69	1.02	1.33	1.32
Add: Opening Balance	-	-	1.79	3.03	4.08	4.96	5.65	6.68	8.00
Closing Balance	-	1.79	3.03	4.08	4.96	5.65	6.68	8.00	9.32

IRR

₹ (in lakh)

Particulars / months	0	1	2	3	4	5	6	7	8
Profit after Tax		1.73	1.24	1.13	1.14	1.17	1.21	1.21	1.21
Depreciation		0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Interest on Term Loan		0.19	0.15	0.14	0.12	0.06	0.01	-	-
Cash outflow	(2.20)	-	-	-	-	-	-	-	-
Net Cash flow	(2.20)	2.04	1.51	1.39	1.38	1.35	1.33	1.33	1.32
IRR	76.35%								

NPV	5.77

Break Even Point

₹ (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8
Variable Expenses								
Oper. & Maintenance Exp (75%)	0.07	0.07	0.07	0.08	0.08	0.08	0.09	0.09
Sub Total(G)	0.07	0.07	0.07	0.08	0.08	0.08	0.09	0.09
Fixed Expenses								
Oper. & Maintenance Exp (25%)	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03
Interest on Term Loan	0.19	0.15	0.14	0.12	0.06	0.01	0.00	0.00
Depreciation (H)	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Sub Total (I)	0.33	0.29	0.28	0.26	0.21	0.15	0.15	0.15
Sales (J)	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13
Contribution (K)	2.06	2.06	2.05	2.05	2.05	2.04	2.04	2.03
Break Even Point (L= G/I)	16.02%	14.24%	13.65%	12.54%	10.10%	7.50%	7.15%	7.24%
Cash Break Even {(I)-(H)}	10.38%	8.59%	7.99%	6.87%	4.42%	1.81%	1.45%	1.52%
Break Even Sales (J)*(L)	0.34	0.30	0.29	0.27	0.21	0.16	0.15	0.15

Return on Investment

₹ (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8	Total
Net Profit Before Taxes	1.73	1.76	1.77	1.79	1.84	1.89	1.89	1.89	9.30
Net Worth	2.28	3.52	4.65	5.80	6.97	8.18	9.39	10.59	40.93
									22.71%

Debt Service Coverage Ratio

₹ (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8	Total
Cash Inflow									
Profit after Tax	1.73	1.24	1.13	1.14	1.17	1.21	1.21	1.21	3.52
Depreciation	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.35
Interest on Term Loan	0.19	0.15	0.14	0.12	0.06	0.01	0.00	0.00	0.19
Total (M)	2.04	1.51	1.39	1.38	1.35	1.33	1.33	1.32	4.06

DEBT

Interest on Term Loan	0.19	0.15	0.14	0.12	0.06	0.01	0.00	0.00	0.19
Repayment of Term Loan	0.06	0.12	0.19	0.38	0.60	0.30	0.00	0.00	1.28
Total (N)	0.25	0.27	0.33	0.50	0.66	0.31	0.00	0.00	1.47
	8.09	5.53	4.20	2.78	2.04	4.31	-	-	2.77
Average DSCR (M/N)	2.77								

Annexure -3: Details of procurement and implementation

S. No.	Activities	Weeks					
		1	2	3	4	5	6
1	Order Placement						
2	Fabrication & Transportation.						
3	Installation and commissioning						

Break up for process down time

S. No.	Activities	Days		
		2	4	6
1	Cooling down the stenter			
2	Installation of camera			
3	Commissioning and tuning, monitoring and control			

Annexure 4: Detailed equipment assessment report

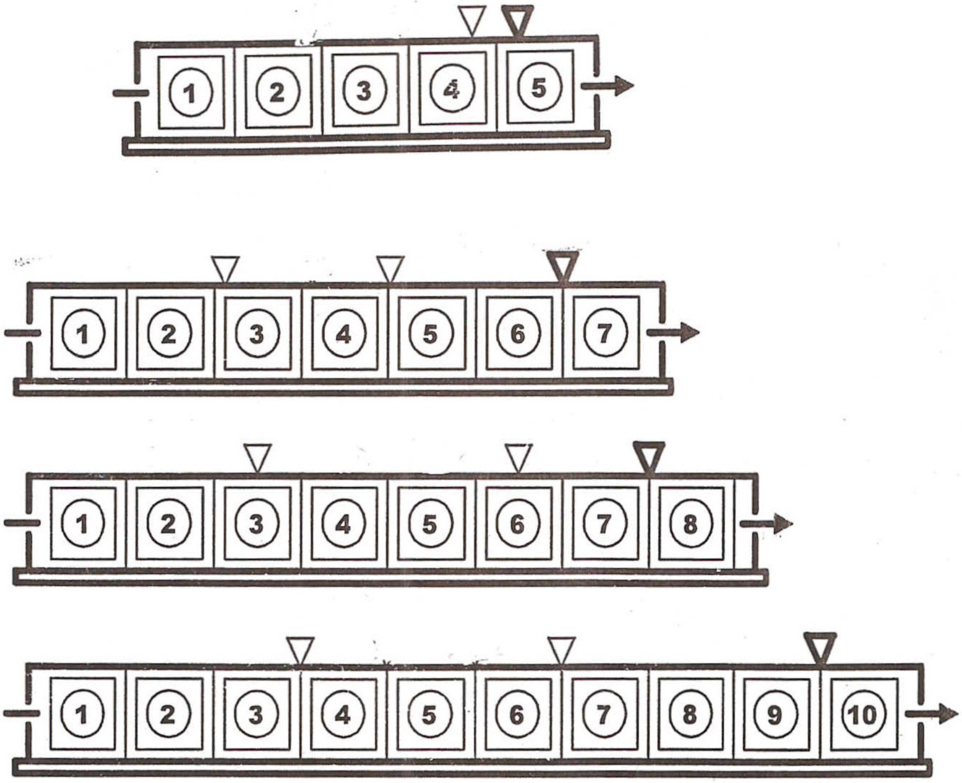
Calculation of Energy Saving from installation of fabric temperature control in stenter

As per the claims of the manufacturer, the system results in increase of speed of stenter by at least 5% over present speed of 60 meter per minute also quality is improve tremendously due to better control of temperature		
S.No.	**Particular**	**Detail**
1	Total operating hour in a day	22
2	Total operating days in a year	300
3	Present speed of stenter	60 mtr/min
4	Present daily processing of Cloth	79200 mtr
5	Proposed speed of stenter	63 mtr/min
6	Proposed daily processing of cloth after installation of propose technology	83160 mtr
7	Daily increase in production	3960 mtr
Electricity Saving		
8	Electricity load	55 kW
9	Daily electricity consumption	1210 kWh
10	Daily electricity saving	60.50 kWh
11	Annual electricity saving	18150 kWh
12	Cost of electricity	₹ 4.6/kWh
13	Annual Monetary saving due to saving of electricity	₹ 83490
Fuel Saving (RPC)		
14	Heat energy consumption	3,00,000 kCal/hr
15	Efficiency	70 %
16	GCV of fuel	8200 kCal/kg
17	Present Fuel consumption @ 60 mtr/min	52.2 kg/hr
18	Fuel saving due to increase in production	17.21 MT/year
19	Monetary saving due to increase in production	₹ 1,29,075
20	Total monetary benefit due to installation of proposed technology	₹ 2,12,235
21	Total investment required	₹ 2,20,000
22	Simple payback period	12 months

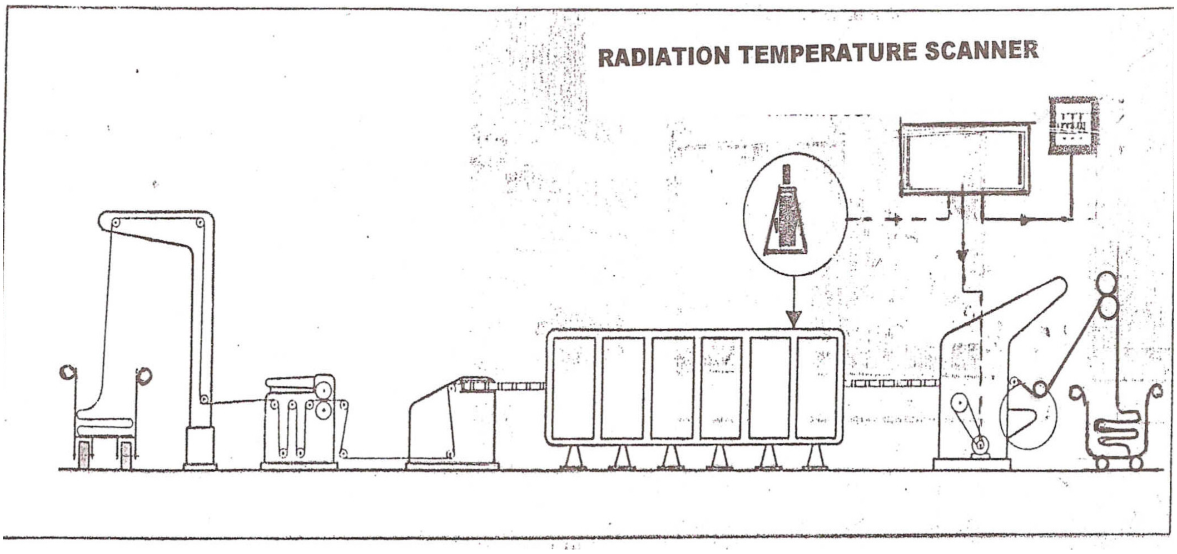
Annexure -5: Details of equipment service providers

S.No.	Technology	Name of Service Provider	Address	Contact Person and No.
1.	Fabric temperature control	M/s SEMITRONICS	17 CD, Archana Industrial Estate, Rakhial Road, Ahmedabad 079-22741011	Mr. Parthav Shah
2	Fabric temperature control	M/s Montforts Germany through agent M/s ATE India Ltd.	Delhi Ofice	
3	Fabric temperature control	**M/s PLEVA**	PLEVA GmbH Rudolf-Diesel-Strasse 2 D-72186 Empfingen-Germany Tel.: (+49) (0) 74 85 10 04 Fax: (+49) (0) 74 85 10 09 E-mail: info@pleva-controls.de www.pleva-controls.de	

Annexure - 6Typical arrangement drawings for proposed system



LOCATION OF NO. OF RADIATION TEMPERATURE MEASURING SENSERS



Annexure – 7 Quotation for Proposed Technology

9227575707

SEMITRONIK INSTRUMENTS

August 7, 2009

The Petroleum Conservation Research Association
(under Ministry of Petroleum & Natural Gas, Govt. of India)
G-2, Shantiniketan Apartment
291, Adarsh Nagar
Jaipur

Dear Sir, **Kind attn : Mr. Suman Kumar (Joint Director)**

Ref : Your email dated 2/8/09
Sub : 1. Fabric Temperature indicator and controller for heat setting application.
2. Oxygen % Monitoring and controlling system for Boiler.

We acknowledge with thanks the receipt of your email as referred above and have noted the contents thereof.

Accordingly we are pleased to give our technical as well as commercial offer as below:

Technical Specifications:-

1. **Fabric Temperature Indicator and controller** – It is a unique way to measure the temperature of the fabric using non-contact type infrared sensors. These sensors are mounted on the top of the chambers and the length of the fabric is scanned continuously and the data is logged. A desired fabric temperature and dwell time for a particular lot can be set and accordingly control action is provided to make sure the temperature is reached and the dwell time is attained. The system helps maintain uniform quality of the fabric across its length and makes sure the machine runs at the most optimum speed, saving time and energy.

The complete system is subject to the following scope of supply:

Hardware System: -

- **Infrared Sensors** - housed in a sturdy stainless steel body, hermetically sealed and IP65 standard.
- **Analogue and Digital I/O Board** to scan and control the speed of the machine based on difference in set and actual value.
- **Panel PC** – a specially designed industrial computer to withstand heat, dust and vibrations. It has a small form factor so that it can be easily deployed into a control panel. It is provided with touch screen functionality for ease of use.

Software System: -

- **PLC Software** - interfaced with the analogue and digital I/O boards to read the speed of the machine on input and output end, fabric temperature and control the speed based on desired dwell time. The user interface is designed to ease of operator interaction with a touch screen.

System Output: -

- Relay output to control the machine speed.
- 4 -20 ma with galvanic isolation for PLCs and A.C.Drives.

MUMBAI OFFICE : 1A, Abhishek Co-Op. Soc. Ltd. G.D. Ambekar Marg, Dadar (CRly.) Mumbai-400 014. (India) TEL.: 24147788, 32957649 FAX : (022) 24130266
SURAT OFFICE : 407, Trade Centre, Behind Reshamwala Market, Ring Road, Surat - 395 002. (India) TEL.: 2354847 FAX : (0261) 2324746 (R) 2680026, 7438600

2. **Oxygen % monitoring & controlling system (Combustion Air Trimming (CAT) Control System)** to trim the combustion air by controlling the speed of the ID / FD fan for the elimination of wastage of *Thermal as well as Electrical energy on the boiler / thermic fluid heaters. The* complete system is subject to the following scope of supply :

a. Oxygen measuring sensor, zirconium (ZrO_2) housed in a sturdy stainless steel body with the self heating arrangement. The sensor measures the % oxygen of the exhaust air in the chimney.
b. Intelligent Control Circuit module with display of actual Oxygen %. The control module within the system automatically controls the RPM of ID/FD fans with due interlock.
c. AC Drive for ID/FD fans (Optional)

Price details:-

Sr no	Item description	Price per unit (Rs.)
1.	Fabric Temperature Indicator and controller complete set with 4 sensors	**1,80,000/-**
2.	*Oxygen % Indicator and controller (i.e. Combustion* Air Trimming Control system, measuring on-line oxygen in the fuel gas) Model OMC/101	**1,95,000/-**

The above prices are Net, Ex.works - Ahmedabad subject to packing / forwarding @ 3.5% and taxes, excise etc. will be charged extra as applicable at the time of delivery.

Delivery : within 3/4 weeks from the date of receipt of order
Payment : 30% advance along with order and balance against proforma invoice
Erection : Kindly note all required information pertaining to erection & commissioning will be supplied along with unit. However, if services of our engineer are required, same will be at extra.

For your reference, sending herewith following :

1. Technical catalog of above systems
2. Installation drawing
3. Economics' involved in installation of the system

Etc. etc.

In case any more information is required, kindly feel free to contact us.

Thanking you in anticipation,

(N.J.Shah)

encl : as above

ks

Bureau of Energy Efficiency (BEE)
(Ministry of Power, Government of India)
4th Floor, Sewa Bhawan, R. K. Puram, New Delhi – 110066
Ph.: +91 – 11 – 26179699 (5 Lines), Fax: +91 – 11 – 26178352
Websites: www.bee-india.nic.in, www.energymanagertraining.com

Petroleum conservation Research Association

(Under Ministry of Petroleum and Natural Gas)
Sanrakshan Bhawan, 10 Bhikaji Cama Place, New Delhi-66
Ph. : +91-11- 26198856, Fax : +91-11-26109668
Website: www.pcra.org

India SME Technology Services Ltd
DFC Building, Plot No.37-38,
D-Block, Pankha Road,
Institutional Area, Janakpuri, New Delhi-110058
Tel: +91-11-28525534, Fax: +91-11-28525535
Website: www.techsmall.com