DETAILED PROJECT REPORT
ON
PROVISION OF INSULATION IN STENTER MOTOR OPERATED VALVES
(PALI TEXTILE CLUSTER)

ENERGY IS LIFE

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PROVISION OF INSULATION IN STENTER MOTOR OPERATED VALVES

PALI TEXTILE CLUSTER

BEE, 2010

Detailed Project Report on Provision of Insulation in Stenter Motor Operated Valves

Textile SME Cluster, Pali, Rajasthan (India)

New Delhi: Bureau of Energy Efficiency;

Detail Project Report No.: **PAL/TXT/ISV/09**

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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
- CERs - Certified Emission Reduction
- DPR - Detailed Project Report
- DSCR - Debt Service Coverage Ratio
- GHG - Green House Gases
- HP - Horse Power
- IRR - Internal Rate of Return
- MoP - Ministry of Power
- MSME - Micro Small and Medium Enterprises
- NPV - Net Present Value
- ROI - Return On Investment
- RPC - Reliance Pet Coke
- SME - Small and Medium Enterprises
- MOV - Motor Operated valves

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 100 gm 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 payback 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, considerable length of pipeline in most of the units was found to be without insulation in both steam and hot thermic fluid line. However, the situation in case of valves and flanges was entirely different in as much as no valve had any insulation. The losses in case of valves in thermic fluid line are higher than that from valves in steam line due to higher temperature of upto 260°C in thermic fluid line Vs 140 °C in steam line.

Fuel saving in 5 chamber stenter and 3 other valves in the main hot thermic fluid header would be 9.95 MT RPC per year.

This DPR highlights the details of the study conducted for assessing the potential for insulation of stenters motor operated valves , 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, sensitivity analysis for three different scenarios 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)	1.37
2	Fuel Saving (RPC)	MT	9.95
3	Monetary benefit	₹ (in Lakh)	0.74
4	Debit equity ratio	Ratio	3:1
5	Simple payback period	Month	22
6	NPV	₹ (in Lakh)	1.37
7	IRR	% age	37.01
8	ROI	% age	26.64
9	DSCR	ratio	2.21
10	CO_2 saving	tonne	27
11	Process down time	Days	Nil

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 in Fig. 1 below:

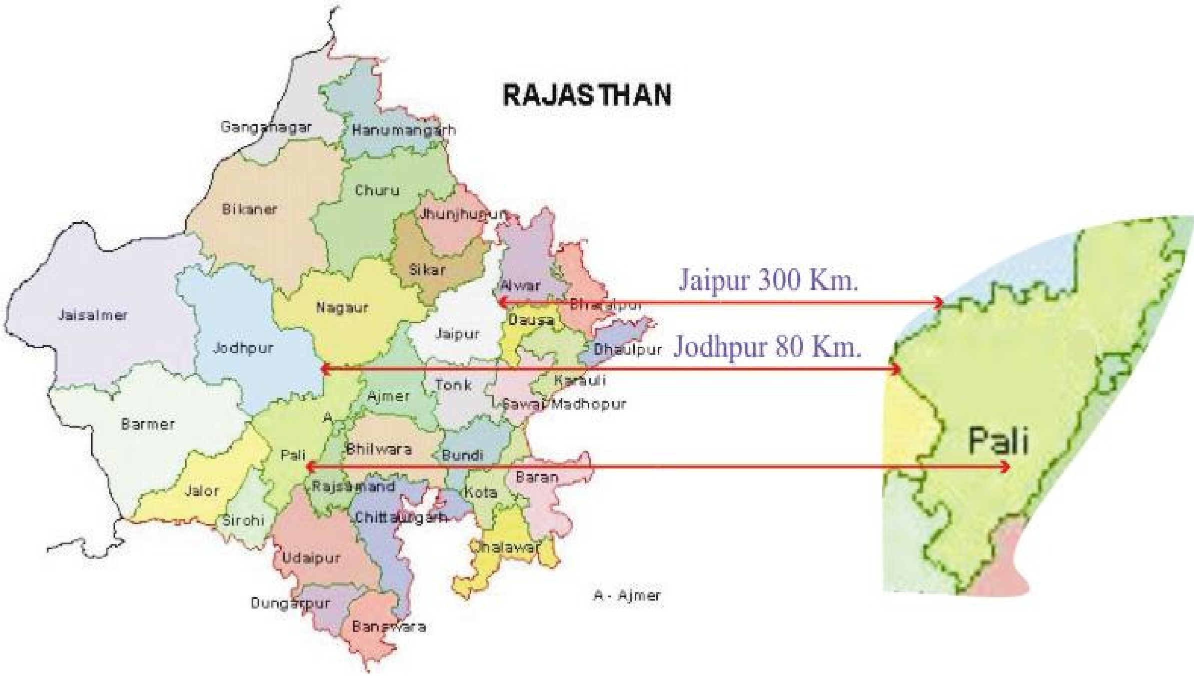


Fig. 1.1 – Pali – Geographical Map

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	2716l	25.6
3	Steam Coke	Tonne/year	2967	5
4	Lignite	MT/year	16635	15.7
5	Diesel	kilolitre/year	89.6	0.3
6	Residual Pet Coke	MT/Year	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 1,00,000 kWh to 3,00,000 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 Jigger 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 –

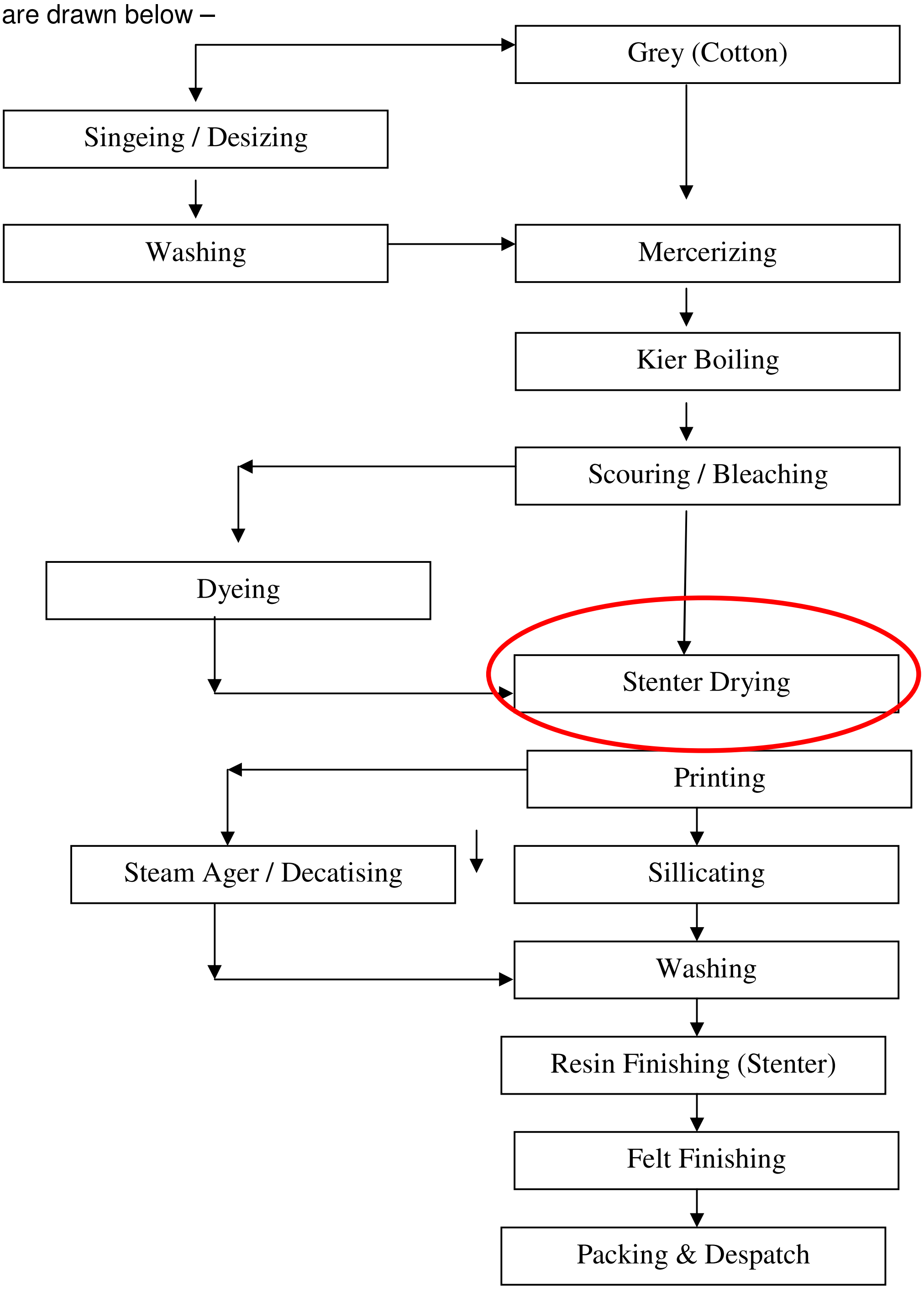


Fig. 1.2 – Process Flow Diagram of Cotton Dyeing and Printing

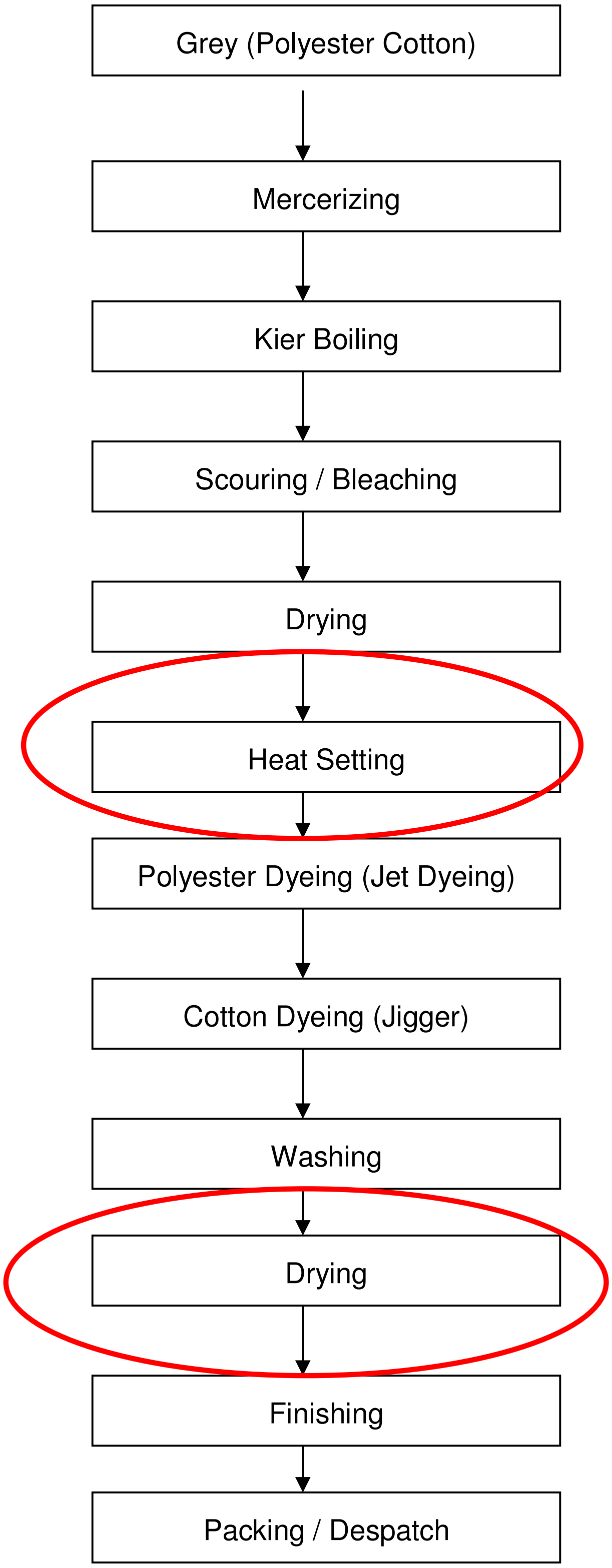


Fig. 1.3 – Process Flow Diagram of Polyester Cotton Dyeing and Finishing

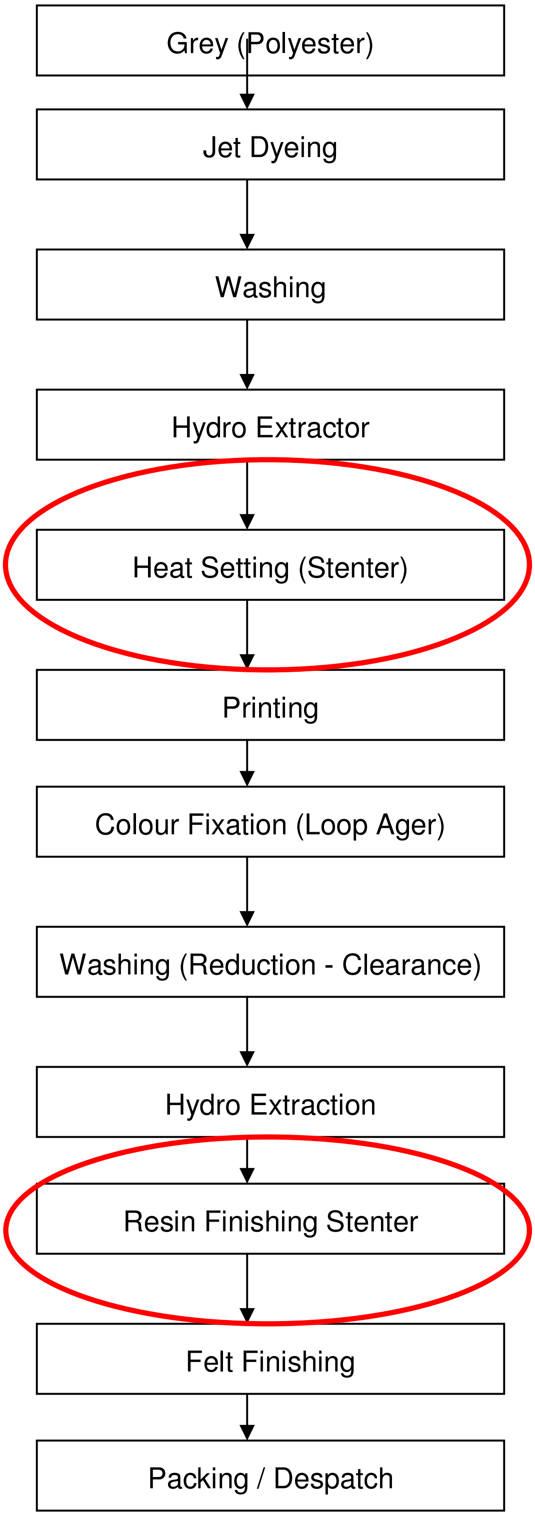


Fig. 1.4 – Process Flow Diagram of Polyester Printing and Finishing

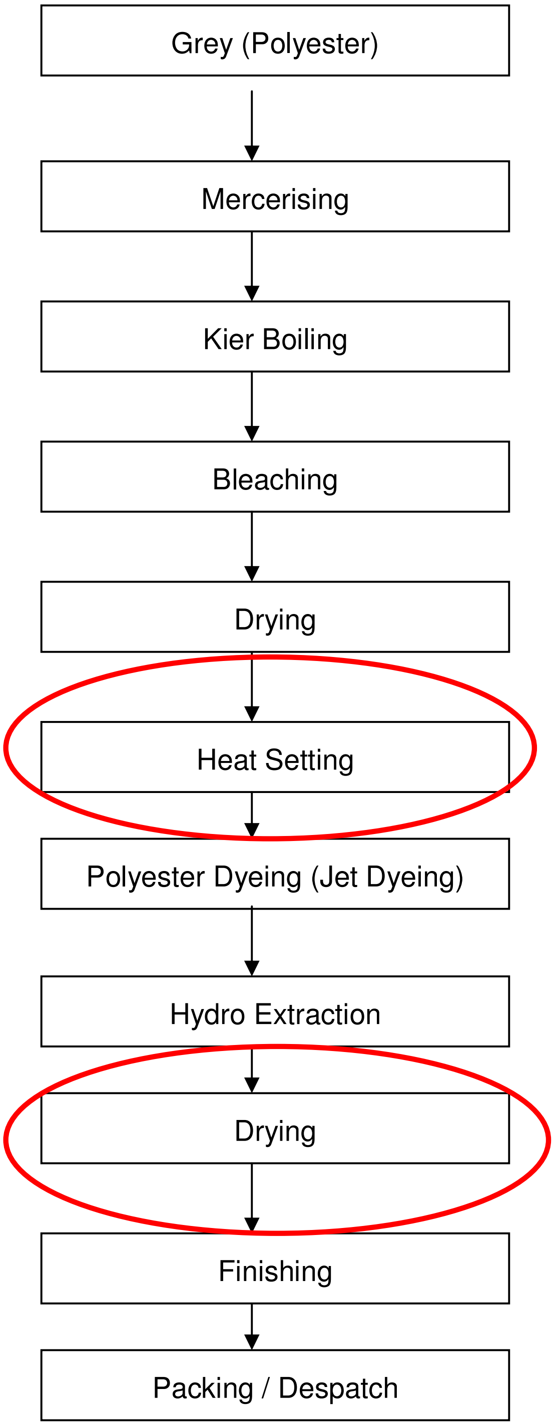


Fig. 1.5 – Process Flow Diagram of Polyester Dyeing and Finishing

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 .0- 16.0
21	Hank	Drying	4.5 - 6.5

SOURCE – CARBONTRUST UK

SEC at 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

Stenter happens to be the highest Energy Consuming machinery in a textile Dyeing and Processing unit and the temperature in the stenter again is the highest. Also there are minimum 3 other valves in the hot thermic fluid line without insulation. Thermal Energy required for stenters is supplied by thermopak. 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. To give a –surely rough - assessment energy consumption of energetic optimized stenters is in the range of 3500-4500 kJ/kg of textile. However energy consumption depends strongly on the process that is carried out. The temperature in each compartment is controlled in modern stenters with the help of a motor operated flow control valve (MOV) which bypasses hot fluid if temperature in a chamber exceeds preset temperature. A stenter has 5 chambers in it and each chamber has 3 valves which have no insulation. Given the temperature of about 250°C in the thermic fluid line, heat loss is higher and hence gives opportunity for saving useful heat by provision of removable insulation jackets.

A typical stenter is depicted in the following photograph:-

Fig. 1.6 Photograph of Stenter

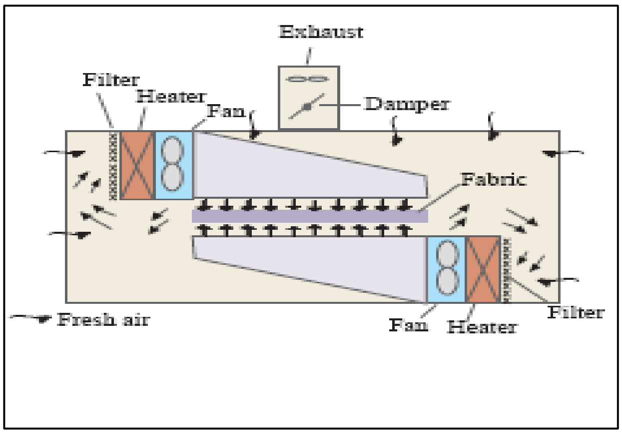


Fig. 1.7 Schematic of air flow in stenter

The arrangement of MOVs with two gate valves in 4" header jn a stenter at Pali is depicted in the following photograph.

Fig. 1.8 Arrangement of MOVs

1.3.2 Role in process

MOV is an important control system in stenters as the temperature is very important parameter in the processes conducted in stenter and its control not only has ramification on the energy consumption but also on product quality as well as productivity. For example, stenter is used for heat setting requiring heating of the fabric to over 170°C and then maintaining it for a specified period of time so as to achieve dimensional stability. If the temperature achieved is less than 170°C, dimensional stability will not be achieved. Similarly, if temperature achieved is more than this, consumption of energy will increase.

It was observed that the header size carrying heated thermic fluid was 4" and the all valves are uninsulated. It was further observed that each cluster of flow control valves contains 3 valves on 4" line and 5 Chambers means 15 uninsulated valves. Also, there are minimum 3 more valves in the main header of the thermic fluid line which are not insulated. Total heat loss from these valves is very high.

1.3.3 Energy audit methodology

The following methodology was adopted to evaluate the performance of Stenters which is shown in Fig. 1.9 below:

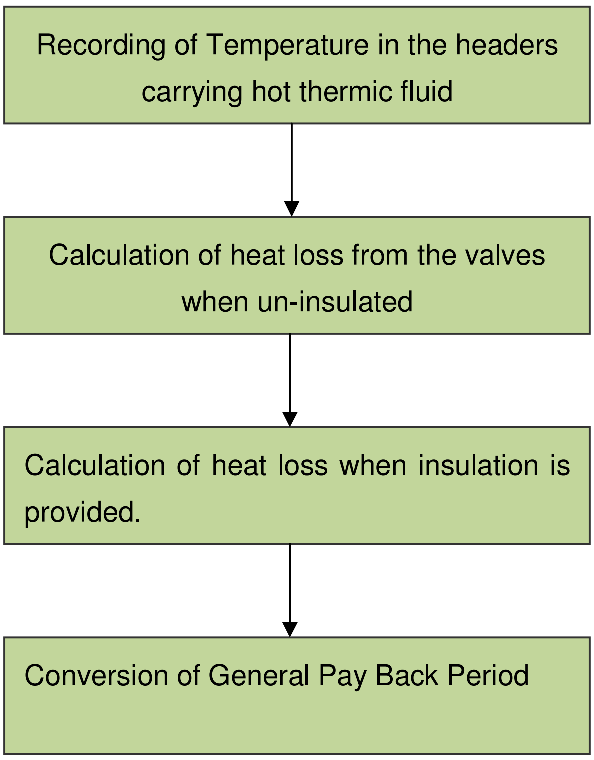


Fig. 1.9 Energy Audit methodologies

1.3.4 Design and operating parameters specification

In headers conducting hot fluid, Pipes are generally provided with insulation but the fittings like valves, flanges, strainers etc are left uninsulated for operational convenience. Furthermore, dring maintenance, the insulation that covers pipes, valves, and fittings is often damaged or removed and not replaced. Pipes, valves, and fittings that are not insulated can be safety hazards and sources of heat loss. Removable and reusable insulating pads are available to cover almost any surface. The pads are made of a noncombustible inside cover, insulation material, and a noncombustible outside cover that resists tears and abrasion. Material used in the pads resists oil and water and has been designed for temperatures of up to 1600°F. Wire laced through grommets or straps with buckles hold the pads in place.

Reusable insulating pads are commonly used in industrial facilities for insulating flanges, valves, expansion joints, heat exchangers, pumps, turbines, tanks, and other irregular surfaces. The pads are flexible and vibration resistant and can be used with equipment that is horizontally or vertically mounted or that is difficult to access.

Any high-temperature piping or equipment should be insulated to reduce heat loss, reduce emissions, and improve safety. As a general rule, any surface that reaches temperatures greater than 120°F should be insulated to protect personnel. Insulating pads can be easily removed for periodic inspection or maintenance, and replaced as needed. Insulating pads can also contain built-in acoustical barriers to help control noise.

Heat loss from uninsulated surfaces is very common way of loss of useful energy and the quantum of such loss is tremendous. Moreover, provision of correct insulation on hot surfaces happens to be the most economically viable option for Energy Conservation and the savings are very favourable due to very low cost of implementation vis-à-vis savings. 15 valves in each stenters and 3 valves in the main thermic fluid header are completely uninsulated and insulation jackets customized to the requirements can be provided.

1.3.5 Operating parameter & efficiency analysis

Every stenter in Pali has 15 un-insulated valves which carry hot thermic fluid at 235°C to 255°C. This means that energy equivalent to the heat loss from these valves is being wasted and hence there is enough room for saving this heat by provision of removable insulation jackets. Table depicting avoidable losses from such valves by providing removable insulation jackets is produced below –

Energy Savings[a] from Installing Removable Insulated Valve Covers (Btu/hour)						
Operating Temperature, °F	Valve Size (inches)					
	3	4	6	8	10	12
200	800	1,090	1,560	2,200	2,900	3,300
300	1,710	2,300	3,300	4,800	6,200	7,200
400	2,900	3,400	5,800	8,300	10,800	12,500
500	4,500	6,200	9,000	13,000	16,900	19,700
600	6,700	9,100	13,300	19,200	25,200	29,300

[a] Based on installation of a 1-inch thick insulating pad on an ANSI 150-pound class flanged valve with an ambient temperature of 65°F and zero wind speed.

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 intervention is generic in nature and is being adopted elsewhere in India. However, its application in Pali cluster would be a first and hence incentive is needed for adoption and popularization of the proposition.
- The benefits of the proposed system need to be established and demonstrated among the entrepreneurs so as to gain their confidence. It is only lack of knowledge

and comfort of proven guaranteed results that has been keeping the entrepreneurs away from adopting this technology.

- 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. ₹ 1.37 Lakh and can be managed by internal accruals.
- 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

Provision of removable insulation jackets has turned out to be the best solution for saving heat loss from exposed surfaces with flexibility of frequent operability and also maintainability. Technical details of the equipment are provided in the annexure.

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 Thermopac with literally no modification and no downtime.

2.1.3 Superiority over existing equipment

The system would stop loss of electricity by way of enhanced consumption in Thermic Fluid Pump. This saving ultimately transpires to saving in equivalent amount of primary fuel.

2.1.4 Availability of equipment

The system can be delivered within 3 to 4 weeks of placement of order through suppliers in Japiur, Ahmedabad or Delhi.

2.1.5 Source of equipment

The proposed equipment is available from indigenous reliable manufacturers and the performance as well as results is known.

2.1.6 Technical specification of equipment

Technical specification of proposed technology is attached at Annexure 1.

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

Installation of the proposed system would need no major physical modification consequently, no down time is needed for making the system operational.

2.2 Life cycle assessment and risks analysis

The proposed system consists of very rugged insulation material provided with equally durable jackets. There are no moving parts and hence the insulation jackets would last indefinitely unless damaged physically.

2.3 Suitable Unit for Implementation of Proposed Technology

The proposed system can be implemented in over 30 no thermopaks in Pali. Total potential for energy saving would be 298.5 MT RPC.

3.0 ECONOMIC BENEFITS FROM PROPOSED EQUIPMENT

3.1 Technical benefit

3.1.1 Fuel saving

The proposition would help save 9.95 MT RPC per year in every Thermopak pump.

3.1.2 Electricity saving

Nil

3.1.3 Improvement in product quality

None

3.1.4 Increase in production

None

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 would be ₹ 0.74 lakh per year. Details of saving calculation are 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 electricity 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 Thermopac would be 27.3 CO_2 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 equipment is about ₹ 1.12 lakh based on the availability of the best system in the market.

4.1.2 Erection, commissioning and other misc. cost

Erection & commissioning cost is ₹ 0.25 lakh and miscellaneous cost.

Table 4.1 Details of proposed equipment installation cost

S.No	Particular	Unit	cost
1	Equipment cost	₹ (in Lakh)	1.12
2	Erection & Commissioning cost	₹ (in Lakh)	0.25
5	Total cost	₹ (in Lakh)	1.37

4.2 Arrangements of funds

4.2.1 Entrepreneur's contribution

Entrepreneur will contribute 25% of the total project cost which is 0.34 lakh.

4.2.2 Loan amount.

Remaining 75% cost of the proposed project will be taken from the bank which is 1.03 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 ₹ 0.75 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-3.

4.3.2 Simple payback period

The total project cost of the proposed technology is ₹ 1.37 lakh and monetary savings due to reduction in Electricity & Fuel consumption is 0.75 lakh hence, the simple payback period works out to be around 22 months.

4.3.3 Net Present Value (NPV)

The Net present value of the investment at 10% works out to be ₹ 1.37 Lakh.

4.3.4 Internal rate of return (IRR)

The after tax Internal Rate of Return of the project works out to be 37.01%. 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 26.64%.

Table 4.2 Financial indicators of proposed technology

S.No.	*Particular*	*Unit*	*Value*
1	Simple payback period	Months	22
2	NPV	₹ (in lakh)	1.37
3	IRR	% age	37.01
4	ROI	% age	26.64
5	DSCR	ratio	2.21

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	34.39	1.23	26.42	2.09
Realistic	37.01	1.37	26.64	2.21
Optimistic	39.61	1.52	26.84	2.32

4.5 Procurement and Implementation Schedule

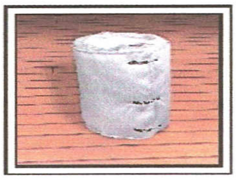
Total time period required for implementation of this technology is about 6 weeks and their details are given in Annexure 3.

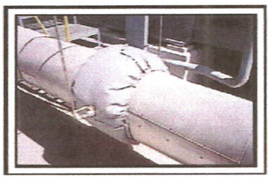
ANNEXURE

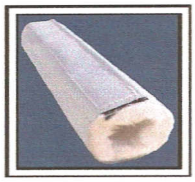
Annexure -1: Information Brochure of equipment

NATARAJ INSULATION

603, Silver Cascade, Bagikhana Road,
Vadodara 390 001. Tel.: 0265 301 3303
Telefax : 0265 - 2431491
E-@ :natarajinsulation@gmail.com/hotmail.com/yahoo.com







REMOVABLE / REUSABLE INSULATION COVERS

Typical industrial uses for removable insulation blankets are for Pipes, Barrels, Steam traps, heat exchangers, flex , valves, flanges, elbows and strainers.

Removable/Reusable blankets are used on those parts of the hot piping on process and steam lines where Maintenance and Inspection accessibility is necessary which the permanent insulators leave open and become the source of MAJOR ENERGY LOSS.

Once we understand your particular situation we will recommend a solution to provide:

Personnel Protection
- Asbestos Free
- Non Flammable
- Reduces Ambient Temperatures
- Insulation jackets can reduce temperatures as high as 600°C to acceptable Safety Levels for personnel protection.

Energy Savings
- Removable blankets reduce heat loss in areas that have been uneconomical to insulate with conventional insulation.
- Removable blankets are custom designed to wrap snugly around even the most complicated fittings and irregular surfaces.

Maintenance and Inspection Savings
specifically designed for maintenance and inspection. Our blankets can be removed and re-installed in minutes, even with inexperienced personnel. As they are reusable there is no need for new insulation every time.

OUTER AND INNER FABRIC: Impregnated fiberglass, 8 oz/square yard.Warp:17,Weft:14,Tensile strength 17 Kg/cm.

INSULATION: FIBREGLASS-MAT. 2" needled fiberglass mattress K-factor of 0.39 @ 300°F.

Contact for any enquiry: +9198250 40131 OR +9198250 37317.

EVERYTHING FOR THERMAL INSULATION. natarajinsulation@gmail.com

Elements of a Typical Blanket:

1. Envelope made of silicon, Teflon or fiberglass flame and temperature resistant cloth.

2. Fiberglass mat insulation

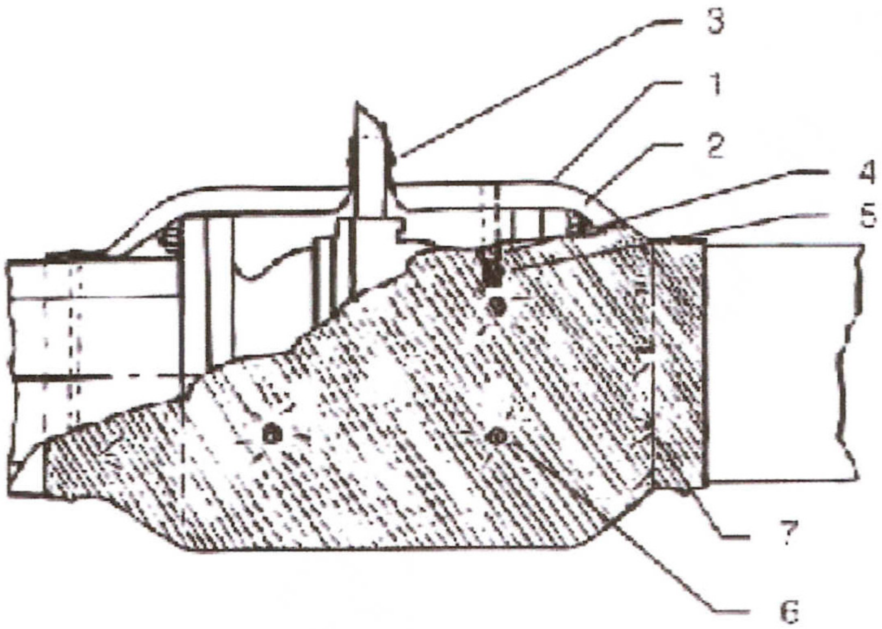
3. Nonflammable string

4. Stainless steel "D" ring

5. Nonflammable strap

6. Washer and pin

7. Kevlar or Nomex nonflammable thread



Annexure -2: Detailed financial analysis

Assumption

Name of the Technology	INSULATION IN STENTER MOV		
Rated Capacity	NA		
Details	Unit	Value	Basis
Installed Capacity			
No of working days	Days		
No of Shifts per day	Shifts		(Assumed)
Capacity Utilization Factor	%age		
Proposed Investment			
Equipment cost	₹ (in lakh)	1.12	
Civil works, Erection and Commisioning	₹ (in lakh)	0.25	
Total Investment	₹ (in lakh)	1.37	
Financing pattern			
Own Funds (Equity)	₹ (in lakh)	0.34	Feasibility Study
Loan Funds (Term Loan)	₹ (in lakh)	1.03	Feasibility Study
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	4.00	Feasibility Study
Annual Escalation	%age	5.00	Feasibility Study
Estimation of Revenue			
Electricity Saving	Tons/year	9.95	
Cost	₹/tons	7500	
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	1.03	0.06	0.97	0.12
2	0.97	0.12	0.85	0.09
3	0.85	0.18	0.67	0.08
4	0.67	0.24	0.43	0.06
5	0.43	0.32	0.11	0.03
6	0.11	0.11	0.00	0.00
		1.03		

WDV Depreciation

₹ (in lakh)

Particulars / years	1	2
Plant and Machinery		
Cost	1.37	0.27
Depreciation	1.10	0.22
WDV	0.27	0.05

Projected Profitability

₹ (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8
Fuel savings	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Total Revenue (A)	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Expenses								
O & M Expenses	0.05	0.06	0.06	0.06	0.07	0.07	0.07	0.08
Total Expenses (B)	0.05	0.06	0.06	0.06	0.07	0.07	0.07	0.08
PBDIT (A)-(B)	0.69	0.69	0.69	0.68	0.68	0.68	0.67	0.67
Interest	0.12	0.09	0.08	0.06	0.03	0.00	-	-
PBDT	0.57	0.60	0.61	0.63	0.65	0.67	0.67	0.67
Depreciation	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
PBT	0.50	0.53	0.54	0.55	0.58	0.60	0.60	0.60
Income tax	-	0.13	0.21	0.21	0.22	0.23	0.23	0.23
Profit after tax (PAT)	0.50	0.40	0.33	0.34	0.36	0.37	0.37	0.37

Computation of Tax

₹ (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8
rofit before tax	0.50	0.53	0.54	0.55	0.58	0.60	0.60	0.60
Add: Book depreciation	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Less: WDV depreciation	1.10	0.22	-	-	-	-	-	-
Taxable profit	(0.52)	0.38	0.61	0.63	0.65	0.67	0.67	0.67
Income Tax	-	0.13	0.21	0.21	0.22	0.23	0.23	0.23

Projected Balance Sheet

₹ (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8
Liabilities								
Share Capital (D)	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Reserves & Surplus (E)	0.50	0.90	1.23	1.57	1.92	2.29	2.67	3.04
Term Loans (F)	0.97	0.85	0.67	0.43	0.11	0.00	0.00	0.00
Total Liabilities (D)+(E)+(F)	1.81	2.09	2.24	2.34	2.37	2.63	3.01	3.38

Assets	1	2	3	4	5	6	7	8
Gross Fixed Assets	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
Less Accm. Depreciation	0.07	0.14	0.22	0.29	0.36	0.43	0.51	0.58
Net Fixed Assets	1.30	1.23	1.15	1.08	1.01	0.94	0.86	0.79
Cash & Bank Balance	0.51	0.86	1.08	1.26	1.36	1.70	2.14	2.58
TOTAL ASSETS	1.81	2.09	2.24	2.34	2.37	2.63	3.01	3.38
Net Worth	0.84	1.24	1.57	1.91	2.27	2.64	3.01	3.38
Debt Equity Ratio	2.82	2.47	1.95	1.25	0.31	-0.01	-0.01	-0.01

Projected Cash Flow

₹ (in lakh)

Particulars / Years	0	1	2	3	4	5	6	7	8
Sources									
Share Capital	0.34	-	-	-	-	-	-	-	-
Term Loan	1.03								
Profit After tax		0.50	0.40	0.33	0.34	0.36	0.37	0.37	0.37
Depreciation		0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Total Sources	1.37	0.57	0.47	0.40	0.41	0.43	0.44	0.44	0.44
Application									
Capital Expenditure	1.37								
Repayment Of Loan	-	0.06	0.12	0.18	0.24	0.32	0.11	-	-
Total Application	1.37	0.06	0.12	0.18	0.24	0.32	0.11	-	-
Net Surplus	-	0.51	0.35	0.22	0.17	0.11	0.33	0.44	0.44
Add: Opening Balance	-	-	0.51	0.86	1.08	1.26	1.36	1.70	2.14
Closing Balance	-	0.51	0.86	1.08	1.26	1.36	1.70	2.14	2.58

IRR

₹ (in lakh)

Particulars / months	0	1	2	3	4	5	6	7	8
Profit after Tax		0.50	0.40	0.33	0.34	0.36	0.37	0.37	0.37
Depreciation		0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Interest on Term Loan		0.12	0.09	0.08	0.06	0.03	0.00	-	-
Cash outflow	(1.37)	-	-	-	-	-	-	-	-
Net Cash flow	(1.37)	0.69	0.56	0.48	0.47	0.46	0.45	0.44	0.44
IRR	37.01%								

NPV	1.37

Break Even Point

₹ (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8
Variable Expenses								
Oper. & Maintenance Exp (75%)	0.04	0.04	0.05	0.05	0.05	0.05	0.06	0.06
Sub Total*(G)*	0.04	0.04	0.05	0.05	0.05	0.05	0.06	0.06
Fixed Expenses								
Oper. & Maintenance Exp (25%)	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
Interest on Term Loan	0.12	0.09	0.08	0.06	0.03	0.00	0.00	0.00
Depreciation *(H)*	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Sub Total (I)	0.20	0.18	0.17	0.14	0.12	0.09	0.09	0.09
Sales (J)	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Contribution (K)	0.71	0.70	0.70	0.70	0.70	0.69	0.69	0.69
Break Even Point (L= G/I)	29.07%	25.32%	23.61%	20.61%	17.22%	13.42%	13.12%	13.31%
Cash Break Even {(I)-(H)}	18.81%	15.03%	13.29%	10.26%	6.83%	3.00%	2.66%	2.80%
Break Even Sales (J)*(L)	0.22	0.19	0.18	0.15	0.13	0.10	0.10	0.10

Return on Investment

₹ (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8	Total
Net Profit Before Taxes	0.50	0.53	0.54	0.55	0.58	0.60	0.60	0.60	4.49
Net Worth	0.84	1.24	1.57	1.91	2.27	2.64	3.01	3.38	16.85
									26.64%

Debt Service Coverage Ratio

₹ (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8	Total
Cash Inflow									
Profit after Tax	0.50	0.40	0.33	0.34	0.36	0.37	0.37	0.37	2.29
Depreciation	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.43
Interest on Term Loan	0.12	0.09	0.08	0.06	0.03	0.00	0.00	0.00	0.38
Total (M)	0.69	0.56	0.48	0.47	0.46	0.45	0.44	0.44	3.11

DEBT

Interest on Term Loan	0.12	0.09	0.08	0.06	0.03	0.00	0.00	0.00	0.38
Repayment of Term Loan	0.06	0.12	0.18	0.24	0.32	0.11	0.00	0.00	1.03
Total (N)	0.18	0.21	0.26	0.30	0.35	0.11	0.00	0.00	1.41
	0.12	0.09	0.08	0.06	0.03	0.00	0.00	0.00	0.38
Average DSCR (M/N)	2.21								

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						

Annexure 4: Detailed equipment assessment report

Calculation of Energy Saving Potential

Savings potential		
Particulars	***Value***	***Unit***
Heat loss per hour from every valve	kCal/hr	378
Heat loss per year from 18 valves, 350 days, 24 hours per day	kCal/hr	18X1500X350X24= 57153600
Considering Thermopac Efficiency to be 70% and CV of RPC to be 8200 kCal/Kg, equivalent saving per year	MT RPC	9.95
Monetary Equivalent of savings @ Rs.7500/- per MT	₹	74625
Cost of providing 18 insulation jackets @ ₹ 6250/- per jacket + Installation charges	₹	137000
Simple Pay Back Period	Months	19.3

Annexure -5: Details of equipment service providers

S.No.	Technology	Name of Service Provider	Address	Contact Person and No.
1.	Removable Insulation Jackets	Natraj Insulation	603, Silver Cascade, Bagi Khana Road, Vadodara 390001	Mr. Parag Pandit 0265-3013303
2	Removable Insulation Jackets	M/s Thermax		
3	Removable Insulation Jackets	N/s Forbes Marshall		

Annexure – 6 Quotation for Proposed Technology

Messaging Service from
National Informatics Centre

Welcome Kumar Suman

Home | Profile | IM | FM | Log Out | Help

Last login on Dec 12, 2010 3:52:17 PM from 59.95.179.127

Mail | Calendar | Address Book | Options | Current Folder: Inbox

Compose | Printable

kumars@pcra.org
- Inbox (64)
- Drafts
- ProbablySpam (1)
- SentMail
- TrashCan (7)
- Manage Folders

Previous | Message 17 of 419 |

Delete | Reply | Reply All | Forward | Forward Inline | Add Addresses | Close | Move message to folder:

Subject	Quotation for Removable Insulation Jacket.
From	PARAG PANDIT <natarajinsulation@gmail.com>
Date	Tuesday, December 7, 2010 11:51 am
To	Kumar Suman <kumars@pcra.org>
Attachments	REMOVABLE REUSABLE INSULATION COVER.doc

Dear Mr. Kumar,

Please find the details of Removable type Insulation Jackets in an attached fi

- The cost for 4" Valve Jacket will be Rs.6250.00.
- The cost for plain jacket will be Rs.7980.00 per sq. mtr.

The details of material content is given in an attched file.

The cost is FOR Baroda-Gujarat. Taxes extra as applicable.
Payment: Against Proforma Invoice.
Delivery: 2 weeks on receipt of Payment.

Assuring you of the Best services.

Feel free to call me for any quaries.

Regards,

Paraag Pandit
Mbl: +919825040131

ıttps://mail.nic.in/uwc/webmail/en-us/mail.html?lang=en-us&laurel=on&cal=1 12/12/2010

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