DETAILED PROJECT REPORT
ON
PROVISION OF VFD IN THERMIC FLUID PUMP OF THERMOPAC
(PALI TEXTILE CLUSTER)

Bureau of Energy Efficiency

Prepared by

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PROVISION OF VFD IN THERMIC FLUID PUMP OF THERMOPAC

PALI TEXTILE CLUSTER

BEE, 2010

Detailed Project Report on Provision of Installation of VFD in Thermic Fluid Pump of Thermopac

Textile SME Cluster, Pali, Rajasthan (India)

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Detail Project Report No.: **PAL/TXT/TFP/13**

For more information

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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.

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List of Abbreviations

- BEE - Bureau of Energy Efficiency
- DPR - Detailed Project Report
- DSCR - Debt Service Coverage Ratio
- FD - Forced Draft
- 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
- 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%.

Typically the pump in Thermopac consumes approx 23 kWh of electricity and saving potential by the installation of Variable frequency derives (VFD) would be about 77578 kWh per year.

This DPR highlights the details of the study conducted for assessing the potential for installation of VFD in thermic fluid pump 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)	1.75
2	Electricity saving	kWh/year	77578
3	Monetary benefit	₹ (in Lakh)	3.57
4	Debit equity ratio	Ratio	3:1
5	Simple payback period	Months	6
6	NPV	₹ (in Lakh)	11.18
7	IRR	% age	152.14
8	ROI	% age	24.10
9	DSCR	ratio	7.96
10	CO_2 saving	MT	65
11	Process down time	Days	1-2

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.

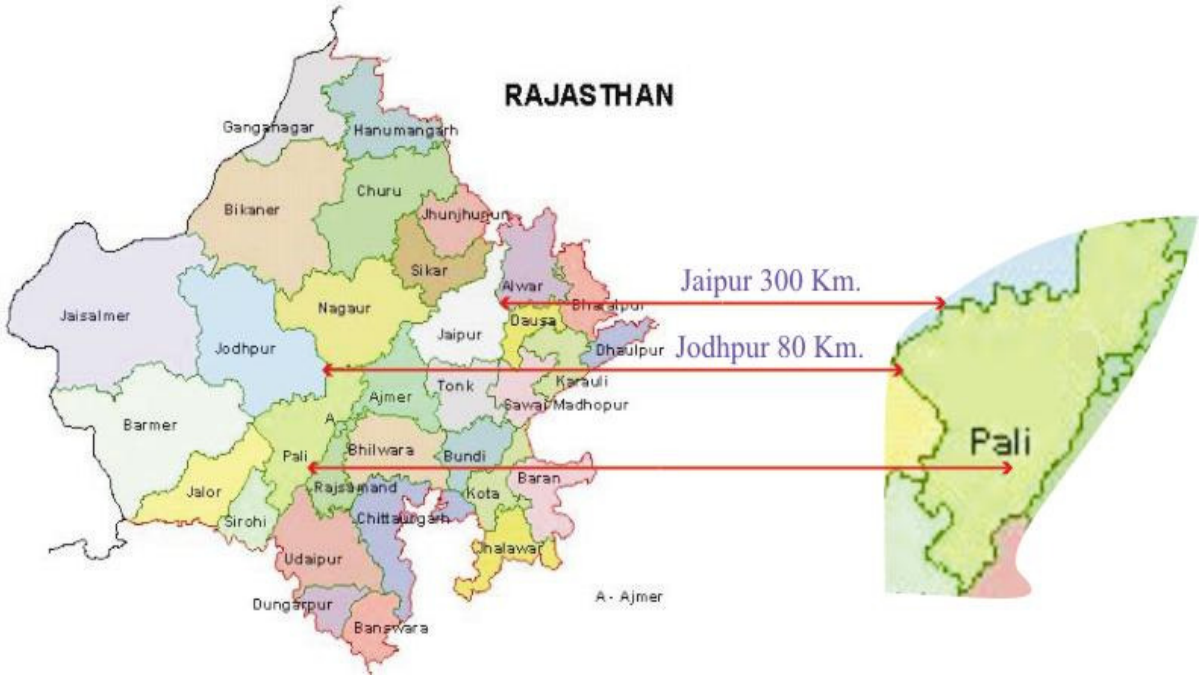

Fig. 1.1 – Pali – Geographical Map

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	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/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 color men (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 –

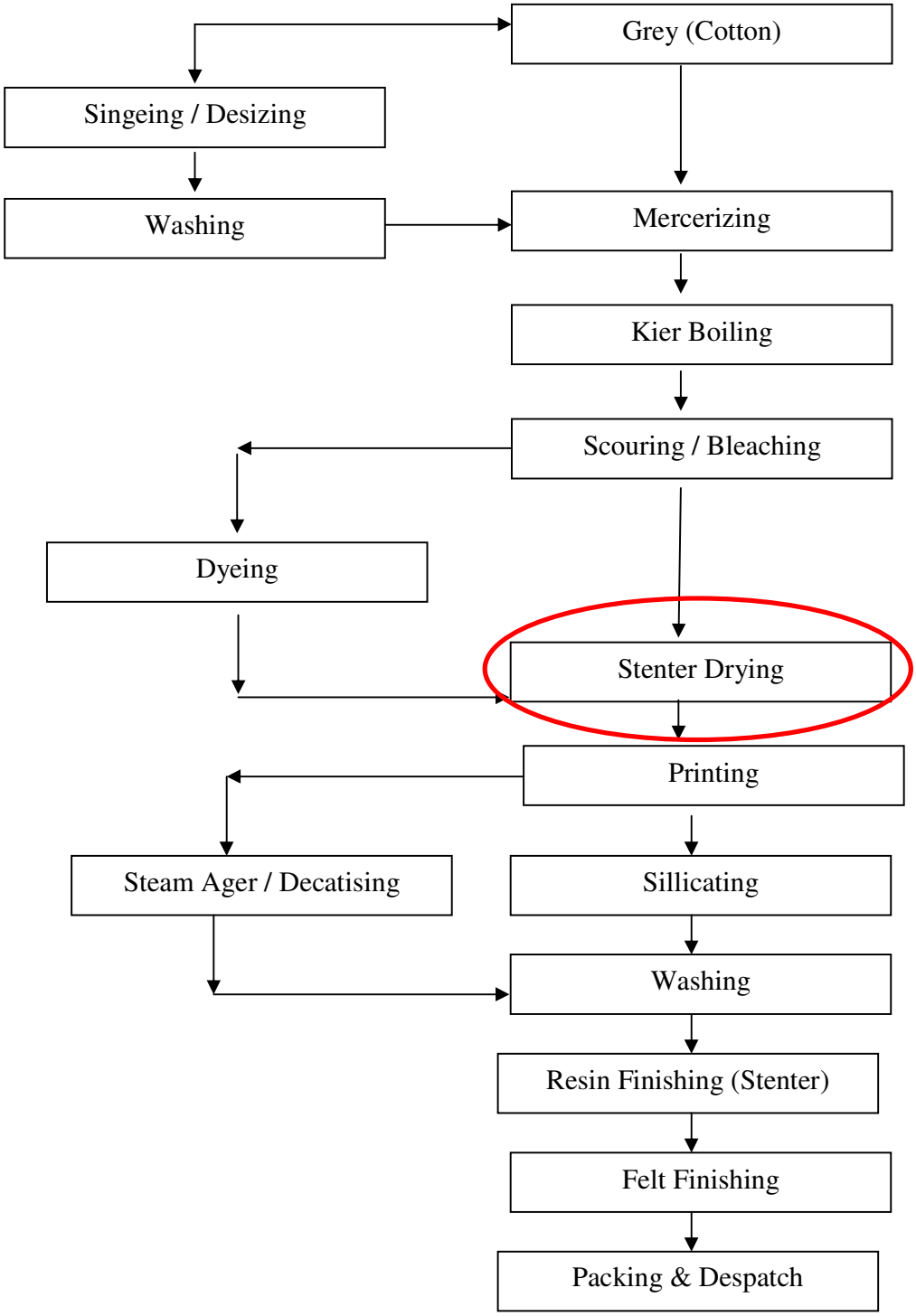

Fig. 1.2 – Process Flow Diagram of Cotton Dyeing and Printing

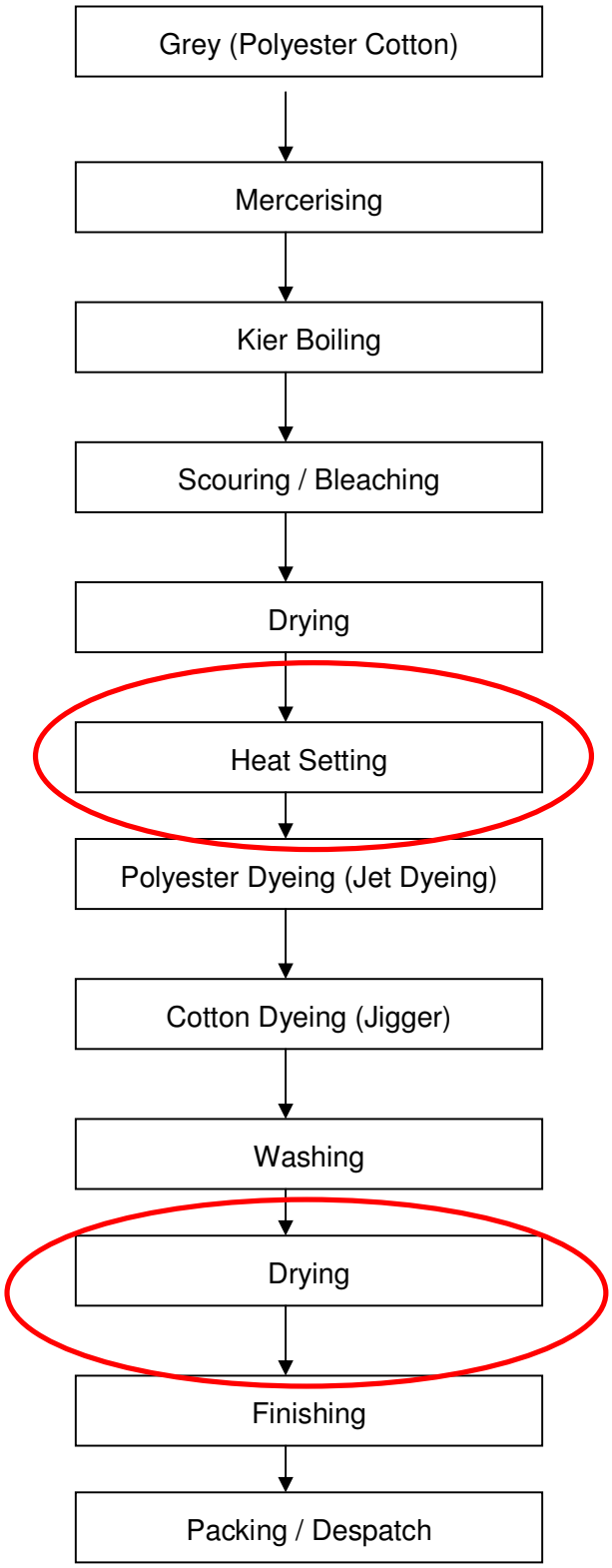

Fig. 1.3 – Process Flow Diagram of Polyester Cotton Dyeing and Finishing

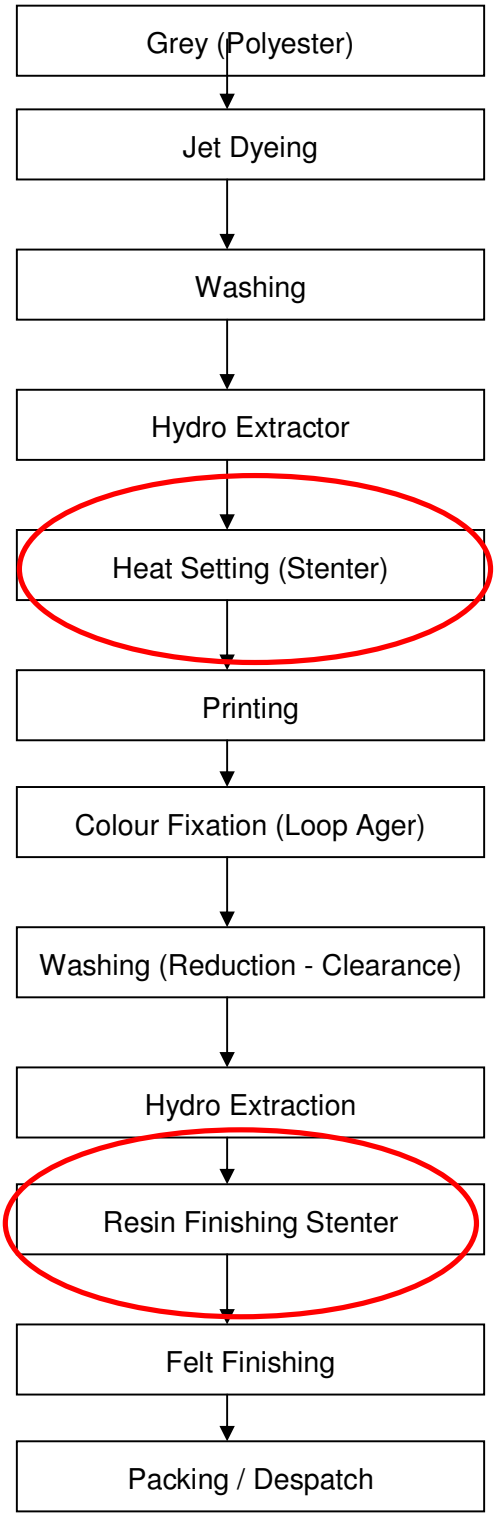

Fig. 1.4 – Process Flow Diagram of Polyester Printing and Finishing

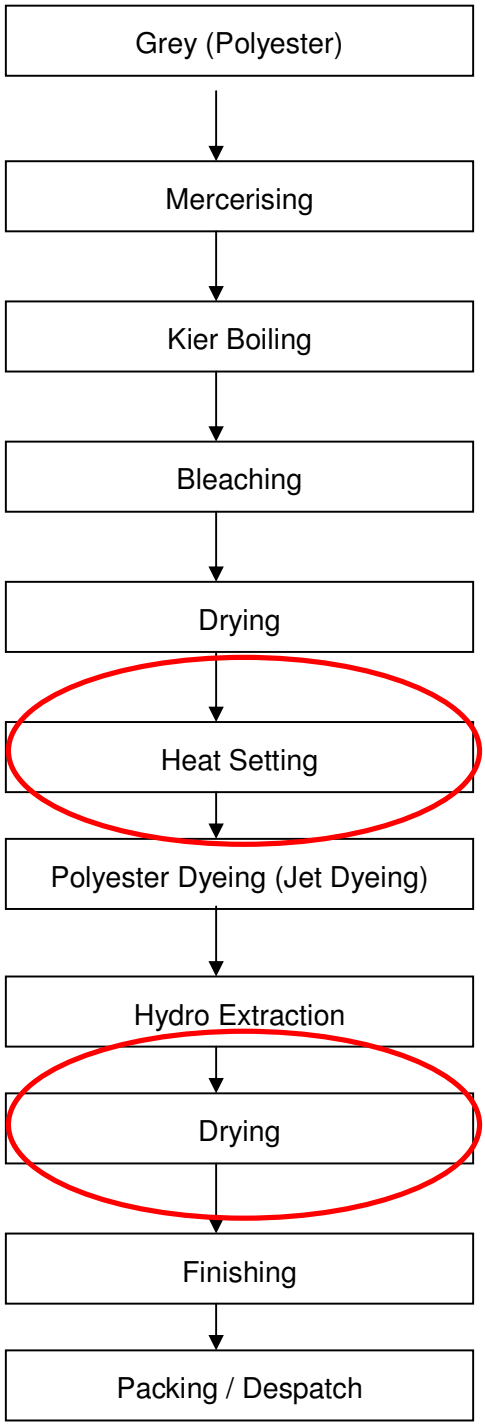

Fig. 1.5 – Process Flow Diagram of Polyester Cotton Dyeing and Finishing

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	**Small**	**Medium**	**Large**
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	Small	Medium	Large	Small	Medium	Large
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

Process of fabric dyeing and processing has been shown in Fig. 1.2 to 1.5. As is obvious, low temperature heating (Sub 100°C) is required in Scouring, Mercerising, bleaching, Jigger dyeing for cotton, Reduction and Clearance. Also, higher temperatures are required in Jet Dyeing, Dye fixation and calendaring / Felt finishing. Stentering requires very high temperatures to the tune of 180°C. Heat for getting this temperature is supplied from a Thermic Fluid Heater. Capacity of Thermopacs available in Pali Textile cluster ranges from 100000 kCal /hr to 2000000 kCal/hr.

The thermic fluid is circulated through cooling coils of the thermopac and also through the process equipment with the help a hot fluid pump. It is necessary for the health of the thermic fluid that it is always circulated at a design rate. Thus the pump always keeps working even when the Thermopac stops due to attainment of high temperature setting. Thus it is a 24 hour load and incidentally the Thermic Fluid Pump motor is the largest electrical load in textile dyeing processing industries in Pali.

Thermic Fluid Pump

Fig. 1.6 – Sketch of thermic fluid heater with Pump

1.3.2 Role in process

Temperature setting in a stenter chamber in Pali Cluster ranges from 180°C to 210°C. This temperature is achieved by circulating heated thermic fluid through heat exchangers and raising air temperature so that the desired temperature is achieved in the stenter. The set point for thermic fluid heater was observed to be from 235°C to 260°C.

The hot thermic fluid is pumped through the thermopac where it gets heated to a temperature falling in the preset load and unloads temperature levels. The hot thermic fluid then goes to the process, to the stenter to be precise where it heats air to be used for drying and finishing of fabrics.

1.3.3 Energy audit methodology

The following methodology was adopted to evaluate the performance of Stenters which is shown in Fig. 1.7 below:

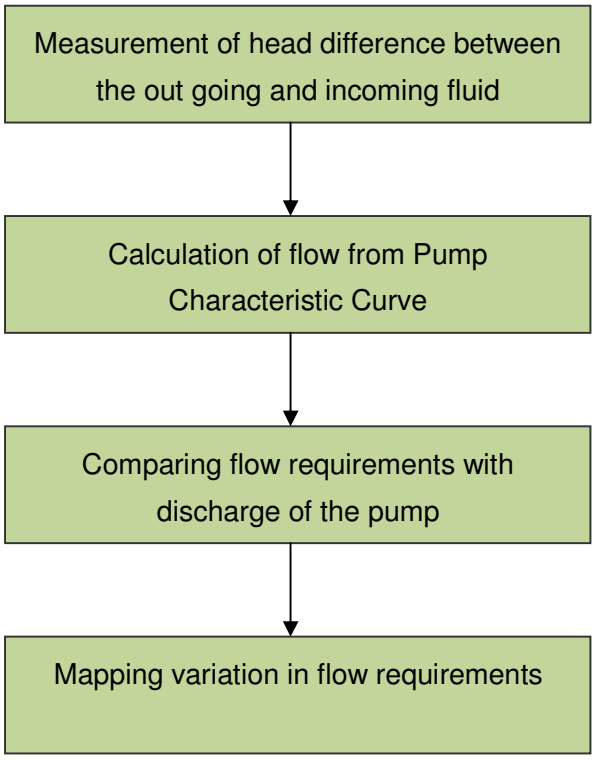

Fig. 1.7 Energy Audit methodologies

1.3.4 Design and operating parameters specification

VFDs have proven their worth in Energy Conservation especially in centrifugal machinery operating at varying load levels. Despite their internal consumption of upto 4%, the VFDs are very popular choice in Pumps, Blowers and other centrifugal applications serving variable demand due to their huge potential to save energy.

The system proposed is retro-fitment of a VFD armed with PLC based control gear to the Thermic Fluid Pump so as to modulate fluid flow such that the pump is tasked only as much as is required.

1.3.5 Operating efficiency analysis

The Thermopacs installed in Pali are of capacities of 10 lakh kCal/hr or 20 lakh kCal/hr. The heat produced in Thermopac is used in stenter having rated capacity of 4 lakh kCal/hr each operating at 3 lakh kCal per hour and also in Relax Dryer of Flat Bed Printing Machine having rated capacity of 1.2 lakh kCal per hour. It is obvious that the pump capacity is significantly higher than the requirement. Also, there are variations in loading by way of change in speed of these machines, stoppages, Change in heat requirements when supply to a chamber is stopped due to high temperature.

Obviously, the pump operates at less than rated efficiency in stable operation due to discharge being more than requirement. The efficiency of the pump further gets affected by variation in demand making the application ideal for retrofitting of VFD.

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:-

1. Kick Off Seminar to create awareness
2. Energy Audit (Detailed and Preliminary) in over 78 units
3. Capability building and involvement of institutional financers, local service providers and also domestic equipment manufacturers.
4. Design and distribution of dissemination material containing most of the measures.
5. Design and distribution of Cluster Manual containing technology gap assessment and cost benefit analysis of proposed Energy Conservation measures.
6. 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 already working in the cluster, though, a different application has found good support. But nowhere in Pali, VFD has not been installed on Thermic Fluid Pump.
- The benefit of the proposed system needs 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. ₹ 1.75 lakh investment per machine which can be done from internal resources.
- 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.
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- 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 to 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 capacity of Thermopak utilized in the Pali cluster is 10 lakh kCal/hr and 20 lakh kCal/hr normally, this capacity is at least 20 to 30% more than the requirements. The Thermic Fluid Pump is a fixed velocity pump which remains operating even if no heat load is there on the Thermopac because a minimum fixed circulation of thermic fluid has to be maintained through Thermopac heating coils failing which the Fluid would get overheated and would get disintegrated. But the minimum quantity of thermic fluid required to be circulated through Thermopac heating coils is much less than the flow of the pump. Also, the major load on Thermopac is that of stenters which has MOVs diverting flow based on temperature of individual chambers of the stenter.

The above description makes the pump a case for installation for ensuring:

1. Only required flow through the unit
2. Handling idling periods of stenter
3. Handling flow diversion by Stenter MOVs
4. Always ensuring minimum flow required by Thermopac

Presently, thermic fluid pump is the biggest load in a textile wet processing unit at Pali having rated power of 20 / 30 kW and drawn power of 16/23 kW.

Variable Frequency Drive

A variable frequency drive is an electronic controller that adjusts the speed of an electric motor by regulating the power being delivered. Variable-frequency drives provide continuous control, matching motor speed to the specific demands of the work being performed. Variable-frequency drives are an excellent choice for adjustable-speed drive users because they allow operators to fine-tune processes while reducing costs for energy and equipment maintenance.

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 Jaipur, 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 given in Table 2.1 below:

Table 2.1 Specific energy consumption

Particular	*Details*
Power	380-460 V, 3 Phase, 3 Wire, 50/60 Hz
Tolerance	Voltage +/- 10%, Frequency +/- 5%
Motor KW	45/55/75/90/110/132/160/200/250/315
Control Method	Space Vector PWM Method
Frequency range	0.1 Hz – 600 Hz
Voltage Boost	0 – 20 %
Over Load Capacity	105% continuous, 150% for 60 Seconds

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 unit consists of VFD, PLCs, sensors, 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 30 Thermopacs in Pali. Total potential for energy saving would be 21.47 lakh kWh 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

Nil

3.1.2 Electricity saving

The proposition would help save 77578 kWh of electricity per year in every Thermopac pump and details of electricity saving is shown in Annexure 4.

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 in one Stenter would be ₹ 3.57 lakh per year. A Detail of monetary saving is furnished in Table 3.1 below:

Table 3.1 Details of monetary saving

S. No	Particular	Unit	value
1	Electricity consumption before installation of VFD	kWh/year	1,65,600
2	Electricity consumption after installation of VFD	kWh/year	84,787
3	Electricity consumption by VFD itself	kWh/year	3232
4	Electricity saving	kWh/year	77,578
5	Cost of electricity	₹/kWh	4.60
6	Monetary saving	₹/year	3,57,000

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

The fuel saving will have equivalent mitigation in terms of SPM and other pollutants otherwise likely to be released in the atmosphere.

3.4.2 Reduction in GHG emission

The equivalent saving in GHG emission for every Stenter would be 65 MT 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 one set of equipment is about ₹ 1.5 lakh which includes cost of VFD, Controller, panels and labour cost.

4.1.2 Erection, commissioning and other misc. cost

Erection & commissioning cost and other miscellaneous cost are about ₹ 0.25 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)	1.5
2	Erection & Commissioning cost	₹ (in Lakh)	0.25
3	**Total cost**	₹ (in Lakh)	1.75

4.2 Arrangements of funds

4.2.1 Entrepreneur's contribution

Entrepreneur will contribute 25% of the total project cost which is ₹ 0.44 lakh.

4.2.2 Loan amount.

Remaining 75% cost of the proposed project will be taken from the bank which is ₹ 1.31 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 ₹ 3.57 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 ₹ 1.75 lakh and monetary savings due to reduction in Electricity & Fuel consumption is ₹ 3.57 lakh hence, the simple payback period works out to be 6 months.

4.3.3 Net Present Value (NPV)

The Net present value of the investment at 10% works out to be ₹ 11.18 Lakh.

4.3.4 Internal rate of return (IRR)

The after tax Internal Rate of Return of the project works out to be 152.14%. 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 24.10%.

Details of financial indicators are shown in Table 4.2 below:

Table 4.2 Financial indicators of proposed technology

S.No.	*Particular*	*Unit*	*Value*
1	Simple payback period	Months	6
2	NPV	₹ (in lakh)	11.18
3	IRR	% age	152.14
4	ROI	% age	24.10
5	DSCR	ratio	7.96

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	145.08	10.55	24.04	7.58
Realistic	152.14	11.18	24.10	7.96
Optimistic	159.18	11.81	24.16	8.35

4.5 Procurement and Implementation Schedule

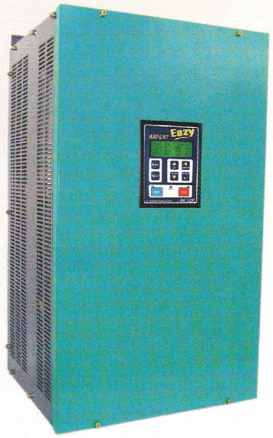
Total time period required for implementation of this technology is about 6 weeks and their details are given in Annexure 3.

ANNEXURE

Annexure -1: Information Brochure of equipment

The World's Most

Improved Efficiency, Higher Reliability & Unmatched Performance



- 5th Generation CSTBT IGBT - Highly Reliable
- Space Vector PWM Control Method
- LCD Display & Drive Support Software for PC
- In-built PID and mini PLC
- Speed Search & Power Loss Carry Through
- True overload and Ground Fault Protection
- Modbus-RTU Connectivity for Networking
- 8 Selectable Paramonitoring on Single Screen
- Fault History upto Last Ten Faults
- User Programmable 8 Analog & 15 Digital I/O's

Easy to Install & Wire

- The AXPERT-EAZY has been downsized considerably in comparison with conventional models to mimize the installation space.
- Well-defined terminations for power and control circuit allows user to easily install and wire the inverter. Use of connector with captive screws on the main control board facilitates single-handed installation.

Easy to Operate & Program

- Self-explanatory full parameter name is displayed on Digital Operation Panel for easy programming. This allows user to set parameters without refereeing to the manual in most cases...
- Navigation of parameters made easy with self-explanatory functional keys NORM, MODE, GROUP, UP & DOWN. RUN & STOP keys for easy operation in local mode.

Easy to Control

- Control is made easy with user programmable 8-Analog and 15-Digital I/Os, In-built MODBUS-RTU connectivity and PID Controller. The Digital Operation Panel can be extended to 100 meter for remote operation.

Easy to Economize

- Auxiliary Drive feature allows the user to control two different motors with single inverter in many applications.

Easy to Maintain

- One-touch fan replacement. The cooling fan, one of the common service parts can be easily removed for replacement.
- Total Conductive Time and Total Run Time provides the information about the inverter and machine usage for the monitoring of serviceable parts.

Easy to Protect

- The 32-bit High Speed Digital Signal Processor protects the inverter against the short circuit or ground fault conditions. User setable over load function protects the load against the over load conditions.
- Soft stall current limit reduces the output frequency if the output current exceeds the set level before the inverter trips. Input and Output Phase Loss to prevent loading on the other phases.

STANDARD SPECIFICATIONS

Power		380~460Vac, 3-Phase, 3-Wire, 50/ 60 Hz									
Tolerance		Voltage tolerance: +/-10%, Frequency tolerance: +/-5%									
AMT □□□		045	055	075	090	110	132	160	200	250	315
Rated Amp		84	100	135	160	200	235	285	360	450	530
Motor kW		45	55	75	90	110	132	160	200	250	315
Control Functions	Control Method	Space Vector PWM Control									
	Frequency Range	0.1~600Hz Constant or Variable Torque									
	Output Frequency Resolution	0.1Hz (Digital), Max Frequency/ 4096 (Analog)									
	Output Frequency Stability	0.01% (0~50 degree centigrade)									
	V/ Hz Characteristics	2-Preprogrammed patterns, 1-Custom 3-point setting pattern									
	Voltage Boost	0~20%									
	Acceleration/ Deceleration Time	0.1~1200 Seconds (2 Ranges)									
	Switching Frequency	2~10kHz selectable with 1kHz resolution									
	Overload Capacity	105% continuous, 150% Overload for 60 seconds at every 10 minutes									
Operation Specifications	Catch On Fly	When enabled, rotating motor can be started at any moment									
	Power Loss Carry Through	Up to 5 seconds for smooth operation of the system during power loss									
	DC Braking	DC Braking start frequency 0.1~50 Hz, Time: 0~25 seconds, Brake current: 15 to150%									
	Frequency Setting Input	Digital Input: Digital Operation Panel (Local) or Serial RS485									
		Potentiometer: 2 k Ohm									
		FSV: 0~5Vdc or 0~10Vdc (or Inverse)									
		FSI: 0~20mA or 4~20mA (or Inverse)									
	Torque Setting Input	Digital Input: Digital Operation Panel (Local) or Serial RS485									
		Potentiometer: 2 k Ohm									
		FSV: 0~5Vdc or 0~10Vdc (or Inverse)									
		FSI: 0~20mA or 4~20mA (or Inverse)									
	Programmable Analog Inputs	VIN: 0~10Vdc (or Inverse)									
		IIN: 0~20mA or 4~20mA (or Inverse)									
	Input Commands	Run, Stop, Reverse, Jog, Preset input-0, 1 & 2, Frequency Increase/ Frequency Decrease for static potentiometer, Run command with maintained / momentary facility, Ramp select, Aux drive select, Emergency stop, Fault reset, Ext Fault, Terminal select, Ref select 0 & 1.									
	Digital Inputs / Digital outputs	2-Fixed inputs for Run and Stop, 6-Programmable Sequence Inputs, 4-Programmable Sequence Outputs									
	Potential Free Contacts	2-Programmable relays: 1-NO, 1-NC for 2A @ 240Vac									
		1-Fault relay: 1-NO, 1-NC for 2A @ 240Vac									
	Programmable Analog Outputs	2-Programmable analog voltage outputs VO1 & VO2: 0~10Vdc									
		2-Programmable analog current outputs IO1 & IO2: 4~20mA									
	Network connectivity	RS-485 for PC Interface with Modbus-RTU protocol									
	Auto Restart	Adjustable up to 5 times for ten faults									
	Slip Compensation	0~5Hz									
	Skip Frequency	3-steps with 0~10Hz									
	Multi Step Frequency	8-steps									
	Sequence input	Sink/ Source selectable throw jumper									

Display	Display and Keypad module	20-Character, 4-Line LCD panel, 8-Key keypad, 3-Status indicating LED for Run, Stop and Fault
Protective Specifications	Protective Function	Current Limit, Over current fault, Timed over current fault, Load side short circuit fault, Under current fault, Over voltage fault, Under voltage fault, Temperature fault, Input / Output phase loss fault, Ground fault, External fault, Charging fault, Current sensor fail fault, EEPROM Fault, 4~20mA reference missing fault, Auto tuning fault, Emergency stop, Communication loss, Input phase reverse fault.
	Smooth Operation	Speed Search, Auto Restart and Power Loss Carry Through functions
	Fault history	Last ten faults with status and operational parameters like output frequency, output current, dc bus voltage and heat sink temperature.
	Electronic thermal overload	150% Overload for 60 Seconds
Environment	Installation location	Indoor
	Ambient temperature	0 to 50 degree centigrade
	Storage temperature	-20 to 70 degree centigrade
	Altitude (above sea level)	3300ft without derating, above 3300ft derate 5% per 1000ft
	Humidity	0~95% maximum non-condensing
	Enclosure	IP00

Annexure -2: Detailed financial analysis

Assumption

Name of the Technology	**VFD in thermic fluid heater**		
Rated Capacity	**NA**		
Details	***Unit***	***Value***	***Basis***
Installed Capacity			
No of working days	Days	300	
No of Shifts per day	Shifts	3	
Capacity Utilization Factor	%age		
Proposed Investment			
Equipment cost	₹ (in lakh)	1.50	
Erection and Commissioning	₹ (in lakh)	0.25	
Other cost	₹ (in lakh)	0.00	
Total Investment	₹ (in lakh)	1.75	
Financing pattern			
Own Funds (Equity)	₹ (in lakh)	0.44	
Loan Funds (Term Loan)	₹ (in lakh)	1.31	
Loan Tenure	years	5	Assumed
Moratorium Period	Months	6	Assumed
Repayment Period	Months	66.00	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	kWh/year	77587	
Cost	₹/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	1.31	0.06	1.25	0.15
2	1.25	0.12	1.13	0.12
3	1.13	0.16	0.97	0.11
4	0.97	0.24	0.73	0.09
5	0.73	0.48	0.25	0.05
6	0.25	0.25	0.00	0.01
		1.31		

WDV Depreciation

(₹ in lakh)

Particulars / years	***1***	***2***
Plant and Machinery		
Cost	1.75	0.35
Depreciation	1.40	0.28
WDV	0.35	0.07

Projected Profitability

(₹ in lakh)

Particulars / Years	1	2	3	4	5	6	7	8
Revenue through Savings								
Fuel savings	3.57	3.57	3.57	3.57	3.57	3.57	3.57	3.57
Total Revenue (A)	3.57	3.57	3.57	3.57	3.57	3.57	3.57	3.57
Expenses								
O & M Expenses	0.07	0.07	0.08	0.08	0.09	0.09	0.09	0.10
Total Expenses (B)	0.07	0.07	0.08	0.08	0.09	0.09	0.09	0.10
PBDIT (A)-(B)	3.50	3.50	3.49	3.49	3.48	3.48	3.48	3.47
Interest	0.15	0.12	0.11	0.09	0.05	-	-	-
PBDT	3.35	3.38	3.38	3.40	3.43	3.48	3.48	3.47
Depreciation	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
PBT	3.25	3.28	3.29	3.31	3.34	3.39	3.38	3.38
Income tax	0.66	1.05	1.15	1.16	1.17	1.18	1.18	1.18
Profit after tax (PAT)	2.59	2.23	2.14	2.15	2.17	2.20	2.20	2.20

Computation of Tax

(₹ in lakh)

Particulars / Years	1	2	3	4	5	6	7	8
Profit before tax	3.25	3.28	3.29	3.31	3.34	3.39	3.38	3.38
Add: Book depreciation	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Less: WDV depreciation	1.40	0.28	-	-	-	-	-	-
Taxable profit	1.95	3.10	3.38	3.40	3.43	3.48	3.48	3.47
Income Tax	0.66	1.05	1.15	1.16	1.17	1.18	1.18	1.18

Projected Balance Sheet

Particulars / Years	1	2	3	4	5	6	7	8
Liabilities								
Share Capital (D)	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44
Reserves & Surplus (E)	2.59	4.82	6.97	9.12	11.29	13.49	15.70	17.90
Term Loans (F)	1.25	1.13	0.97	0.73	0.25	0.00	0.00	0.00
Total Liabilities D)+(E)+(F)	4.28	6.39	8.38	10.29	11.98	13.93	16.14	18.34

Assets	1	2	3	4	5	6	7	8
Gross Fixed Assets	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Less: Accm. Depreciation	0.09	0.18	0.28	0.37	0.46	0.55	0.65	0.74
Net Fixed Assets	1.66	1.57	1.47	1.38	1.29	1.20	1.10	1.01
Cash & Bank Balance	2.63	4.83	6.90	8.91	10.69	12.74	15.03	17.32
TOTAL ASSETS	4.28	6.39	8.38	10.29	11.98	13.93	16.14	18.34
Net Worth	3.03	5.26	7.40	9.56	11.73	13.93	16.13	18.33
Dept equity ratio	2.86	2.59	2.22	1.67	0.58	0.01	0.01	0.01

Projected Cash Flow:

Particulars / Years	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Sources									
Share Capital	0.44	-	-	-	-	-	-	-	-
Term Loan	1.31								
Profit After tax		2.59	2.23	2.14	2.15	2.17	2.20	2.20	2.20
Depreciation		0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Total Sources	1.75	2.69	2.32	2.23	2.24	2.27	2.30	2.29	2.29
Application									
Capital Expenditure	1.75								
Repayment of Loan	-	0.06	0.12	0.16	0.24	0.48	0.25	-	-
Total Application	1.75	0.06	0.12	0.16	0.24	0.48	0.25	-	-
Net Surplus	-	2.63	2.20	2.07	2.00	1.79	2.05	2.29	2.29
Add: Opening Balance	-	-	2.63	4.83	6.90	8.91	10.69	12.74	15.03
Closing Balance	-	2.63	4.83	6.90	8.91	10.69	12.74	15.03	17.32

Calculation of Internal Rate of Return

(₹ in lakh)

Particulars / year	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Profit after Tax		2.59	2.23	2.14	2.15	2.17	2.20	2.20	2.20
Depreciation		0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Interest on Term Loan		0.15	0.12	0.11	0.09	0.05	-	-	-
Salvage/Realizable value	(1.75)	-	-	-	-	-	-	-	-
Cash outflow	(1.75)	2.84	2.44	2.34	2.33	2.32	2.30	2.29	2.29
Net Cash flow		2.59	2.23	2.14	2.15	2.17	2.20	2.20	2.20
IRR	152.14								

NPV	11.18

Break Even Point

(₹ in lakh)

Particulars / Years	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Variable Expenses								
Oper. & Maintenance Exp (75%)	0.05	0.06	0.06	0.06	0.06	0.07	0.07	0.07
Sub Total (G)	0.05	0.06	0.06	0.06	0.06	0.07	0.07	0.07
Fixed Expenses								
Oper. & Maintenance Exp (25%)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Interest on Term Loan	0.15	0.12	0.11	0.09	0.05	0.00	0.00	0.00
Depreciation *(H)*	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Sub Total (I)	0.26	0.23	0.22	0.20	0.17	0.11	0.12	0.12
Sales (J)	3.57	3.57	3.57	3.57	3.57	3.57	3.57	3.57
Contribution (K)	3.52	3.51	3.51	3.51	3.50	3.50	3.50	3.49
Break Even Point (L= G/I)	7.46%	6.56%	6.24%	5.71%	4.73%	3.28%	3.31%	3.35%
Cash Break Even {(I)-(H)}	4.83%	3.93%	3.61%	3.08%	2.10%	0.64%	0.67%	0.70%
Break Even Sales (J)*(L)	0.27	0.23	0.22	0.20	0.17	0.12	0.12	0.12

Return on Investment **(₹ in lakh)**

Particulars / Years	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*Total*
Net Profit Before Taxes	3.25	3.28	3.29	3.31	3.34	3.39	3.38	3.38	16.80
Net Worth	3.03	5.26	7.40	9.56	11.73	13.93	16.13	18.33	69.68
									24.01%

Debt Service Coverage Ratio

Particulars / Years	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*Total*
Cash Inflow									
Profit after Tax	2.59	2.23	2.14	2.15	2.17	2.20	2.20	2.20	13.49
Depreciation	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.55
Interest on Term Loan	0.15	0.12	0.11	0.09	0.05	0.00	0.00	0.00	0.52
TOTAL (M)	2.84	2.44	2.34	2.33	2.32	2.30	2.29	2.29	14.57

DEBT

Interest on Term Loan	0.15	0.12	0.11	0.09	0.05	0.00	0.00	0.00	0.52
Repayment of Term Loan	0.06	0.12	0.16	0.24	0.48	0.25	0.00	0.00	1.31
Total (N)	0.21	0.24	0.27	0.33	0.53	0.25	0.00	0.00	1.83
	13.36	10.19	8.76	7.12	4.35	9.19	-	-	7.96
Average DSCR (M/N)	7.96								

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

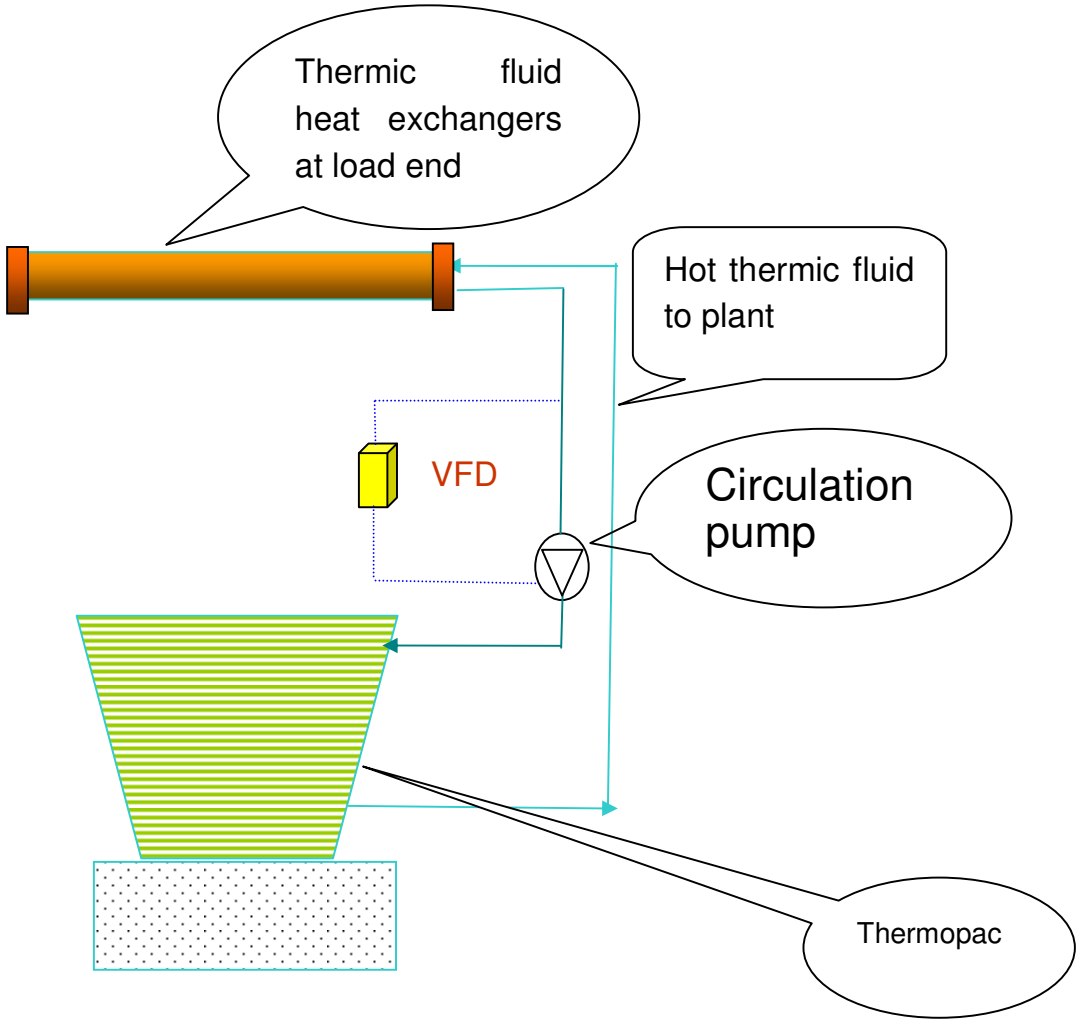
Calculation of Energy Saving Potential from installation of VFD in thermic fluid pump of Thermopac

Savings of Electricity by installing VFD in Thermic Fluid Pump			
Particulars		***Unit***	***Value***
1	Flow of pump before installation of VFD (Rated Flow)	M^3/hr	120.00
2	Flow of pump after installation of VFD (proposed flow)	M^3/hr	96.00
3	Ratio of rated flow (present flow) to proposed Flow	ratio	1.25
4	Power drawn by thermic fluid pump	kW	23
5	Present power consumption	kWh/year	1,65,600
6	Saving in Power of Thermic Fluid Pump based on Affinity Law	kWh/year	80812
7	Self electricity Consumption	%age	4
8	Self electricity Consumption	kWh/year	3232
9	Net electricity Savings	kWh/year	77578
10	Cost of electricity	₹/kWh	4.6
11	Monetary Equivalent	₹ (In lakh)/year	3.57
12	Investment	₹ (In lakh)	1.75
13	General Pay Back Period	Months	5

Annexure -5: Details of equipment service providers

S.No.	*Technology*	*Name of Service Provider*	*Address*	*Contact Person and No.*
1.	Installation of VFD in Thermic Fluid Pump	M/s SEMITRONICS	17 CD, Archana Industrial Estate, Rakhial Road, Ahmedabad 079-22741011	Mr. Parthav Shah
2	Installation of VFD in Thermic Fluid Pump	M/s Danfoss		
3	Installation of VFD in Thermic Fluid Pump	M/s Amtech Electronics (India) Ltd.	E-6, GIDC Electronics Zone, Gandhinagar 079-23289111	Sh. Mehul Thakar

Annexure - 6Typical arrangement drawings for proposed system



Proposed system

Annexure – 7 Quotation for Proposed Technology

AMTECH ELECTRONICS

AMTECH
ELECTRONICS (INDIA) LTD.
MOTION CONTROL SYSTEM
E-6, GIDC ELECTRONICS ZONE
GANDHINAGAR - 382 028 (INDIA).
PHONE : +91-079-23289101,23289102,23289103
FAX : +91-079-23289111
GRAM : AXPERT
E-mail : info@amtechelectronics.com
WeB : www.amtechelectronics.com

AEIL/VV/PP/Q-1174/10-11
Date: 17th Dec-2010

To,
M/s PCRA
Jaipur
Mob: 9214043746
E-mail: kumars@pcra.org

Kind Attn: Shri Suman Kumar

Sub: Offer for 30KW AC VFD Module for Thermic Fluid Pump

Ref: Your mail inquiry dated: 13/12/2010

Dear Sir,

We acknowledge with thanks for the receipt of your enquiry regarding requirement of AC Variable frequency drive suitable for 415V, 3Phase 50 Hz Induction motor. Herewith please receive our most competitive offer for the same as under

QUOTATION

Sr. No	Description	QTY	Unit Price (In Rs.)	Disc.	Total Disc. Amount (In Rs.)
01	**AXPERT VT240S AC Variable frequency drive - 415V, 3Phase, 50 Hz** **Model: -** AXPERT VT240S 030H **Rating: -** 30KW	1	95,000/-	30%	**66,500/-**

We trust that the above is in line with your requirement. However If you need further information / clarification please feel free to contact us. We ensure you the best of attention at all time. We look forward for your valuable purchase order.

Thanking you,
For Amtech Electronics (I) Ltd.

Vishal Visa
(9909910261)

AN ISO 9001:2008 COMPANY

ISO 9001 BUREAU VERITAS Certification
NABCB QM 003

ENERGY IS LIFE BEE CONSERVE IT

AMTECH ELECTRONICS

AMTECH
ELECTRONICS (INDIA) LTD.
MOTION CONTROL SYSTEM
E-6, GIDC ELECTRONICS ZONE
GANDHINAGAR - 382 028 (INDIA).
PHONE : +91-079-23289101,23289102,23289103
FAX : +91-079-23289111
GRAM : AXPERT
E-mail : info@amtechelectronics.com
WeB : www.amtechelectronics.com

AEIL/VV/PP/Q-1174/10-11
Date: 17th Dec-2010

COMMERCIAL TERMS & CONDITIONS

- The prices quoted are Ex-Works, Gandhinagar
- Packing and Forwarding will be extra @ 2%.
- Freight will be extra at actuals.
- Excise Duty will be charged extra @ 10% OR applicable at time of dispatch.
- Education Cess will be charged extra @ 2% on excise, + 1% S & H Edu. Cess OR applicable at time of dispatch.
- Central Sales Tax will be charged extra @ 2% against Form "C" OR applicable at time of dispatch.
- Central Sales Tax will be charged extra @ 5% without Form "C" OR applicable at time of dispatch.
- Octroi, if applicable, will be charged extra at actuals.
- Insurance will be in your account.
- Delivery: 4-6 week after receipt of advance. "LD/Penalty on delivery are not acceptable"
- Payment Terms: 100% advance & balance against proforma invoice prior to dispatch
- Warranty: 12 months from the date of commissioning or 18 months from the date of supply, whichever is earlier.
- Charges for supervision of Installation and Commissioning: Will be extra @ Rs.5, 000 per day per engineer + 2nd AC rail fare extra plus lodging and boarding and conveyance charges to be provided by you extra.
- Service tax extra @ 10.30% on supervision of Installation and Commissioning OR applicable at time of dispatch.
- Validity: 30 days from the date of this offer.
- Your order is to be placed on:

Amtech Electronics (India) Limited
E-6, GIDC Electronics Zone
Gandhinagar – 382 044

AN ISO 9001:2008 COMPANY

ISO 9001 BUREAU VERITAS Certification NABCB QM 003

ENERGY IS LIFE BEE CONSERVE IT

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

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DFC Building, Plot No.37-38,
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