DETAILED PROJECT REPORT
ON
INSTALLATION OF ECO VENTILATORS IN PLACE OF EXHAUST FAN
(BATALA, JALANDHAR, LUDHIANA FOUNDRY CLUSTER)

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Bureau of Energy Efficiency (BEE)

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INSTALLATION OF ECO VENTILATORS IN PLACE OF EXHAUST FAN

BATALA, JALANDHAR, LUDHIANA FOUNDRY CLUSTER

BEE, 2011

Detailed Project Report on Installation of Eco Wind Ventilators In Place Of Exhaust Fans

Foundry SME Cluster, Batala, Jalandhar, Ludhiana (Punjab) (India)

New Delhi: Bureau of Energy Efficiency

Detail Project Report No.: **BJL/FND/EWV/05**

For more information please contact

Bureau of Energy Efficiency (BEE)
(Ministry of Power, Government of India)
4th Floor, Sewa Bhawan
R. K. Puram, New Delhi – 110066

Telephone: +91-11-26179699
Fax: +91-11-26178352
Website: www.bee-india.nic.in
Email: jsood@beenet.in/pktiwari@beenet.in

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Dr. Ajay Mathur, Director General, BEE

Smt. Abha Shukla, Secretary, BEE

Shri Jitendra Sood, Energy Economist, BEE

Shri Pawan Kumar Tiwari, Advisor (SME), BEE

Shri Rajeev Yadav, Project Economist, BEE

CII – AVANTHA Centre for Competitiveness for SMEs, Confederation of Indian Industry (CII) is also thankful to Industry Associations for their valuable inputs, cooperation, support and facilitating the implementation of BEE SME program in BJL Foundry Cluster.

We take this opportunity to express our appreciation for the excellent support provided by Foundry Unit Owners, Local Service Providers, and Equipment Suppliers for their active involvement and their valuable inputs in making the program successful and in completion of the Detailed Project Report (DPR).

CII – AVANTHA Centre for Competitiveness for SMEs, Confederation of Indian Industry (CII) is also thankful to all the SME owners, plant in charges and all workers of the SME units for their support during the energy use and technology audit studies and in implementation of the project objectives.

CII – AVANTHA Centre for Competitiveness for SMEs

Confederation of Indian Industry

Chandigarh

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List of Abbreviations

BEE	Bureau of Energy Efficiency
SME	Small and Medium Enterprises
DPR	Detailed Project Report
GHG	Green House Gases
PF	Power Factor
EEF	Energy Efficient Motor
CDM	Clean Development Mechanism
DSCR	Debt Service Coverage Ratio
NPV	Net Present Value
IRR	Internal Rate of Return
ROI	Return on Investment
MT	Metric Tonne
SIDBI	Small Industries Development Bank of India

EXECUTIVE SUMMARY

Confederation of Indian Industry is executing BEE-SME program in Batala, Jalandhar and Ludhiana Foundry Cluster, supported by Bureau of Energy Efficiency (BEE) with an overall objective of improving the energy efficiency in cluster units.

Batala, Jalandhar and Ludhiana Foundry cluster, is one of the largest Foundry clusters in India; accordingly this cluster was chosen for energy efficiency improvements by implementing energy efficient measures / technologies, so as to facilitate maximum replication in other Foundry clusters in India. The main energy forms used in the cluster units are grid electricity.

Most of the Industrial installations in the country have large electrical loads which are severely inductive in nature, such as motors, large machines etc which results in a high power consumption. Also a number of exhaust fans are also installed for the exhaust of the fumes, smoke generated for the furnace. This means loss and wastage of electrical energy. This can be taken care by installation of Eco Wind Ventilators in place of electrically powered Exhaust Fans.

Implementation of Eco Wind Ventilators will reduce the running cost of energy. It helps in reducing the electricity bill amount and so reduction in power consumption from the Punjab State Electricity Board.

Replacement of 6 No. of exhaust fan of 1 kW capacity by total 36 Eco ventilators will lead to reduction of electricity consumption by 22.50 MWh per year in a typical foundry unit.

This DPR highlights the details of the study conducted for the Replacement of Exhaust fans to Eco Ventilators, 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 in different scenarios and schedule of Project Implementation.

This bankable DPR also found eligible for subsidy scheme of MoMSME for “Technology and Quality Upgradation Support to Micro, Small and Medium Enterprises” under “National Manufacturing and Competitiveness Programme”. The key indicators of the DPR including the Project cost, debt equity ratio, monetary benefit and other necessary parameters are given in table.

S. No.	Particular	Unit	Value
1	Project cost	`(in lakh)	2.14

S. No.	Particular	Unit	Value
2	Electricity Savings	MWh/ Year	22.50
3	Monetary benefit	`(in lakh)	1.125
4	Debit equity ratio	Ratio	3:1
5	Simple payback period	Years	1.90
6	NPV	`(in lakh)	1.98
7	IRR	%age	35.06
8	ROI	%age	26.50
9	DSCR	Ratio	2.15
10	Process down time	Days	3 to 4
11	CO_2 reduction	Tonne/year	18.2

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 energy performance in 29 selected SMEs clusters. Batala, Jalandhar and Ludhiana Foundry Cluster is one of them. The BEE's SME Programme intends to enhance 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. INTRODUCTION

1.1. Brief Introduction about the Cluster

Indian foundry industry is very energy intensive. The energy input to the furnaces and the cost of energy play an important role in determining the cost of production of castings. Major energy consumption in medium and large scale foundry industry is the electrical energy for induction and Arc furnaces. Furnace oil is used in rotary furnaces. In Small foundry industry, coal is used for metal melting in Cupola furnaces. The energy costs contribute about 25 - 30% of the manufacturing cost in Indian foundry industry.

There are approximately 450 units, engaged in Foundry Cluster (automobile parts, agricultural implements, machine tools, diesel engine components, manhole covers, sewing machine stands, pump-sets, decorative gates and valves) production. The major locations wherein the units are spread are G.T. Road, Industrial area, Focal Point in Batala. In Jalandhar Dada Colony Industrial Area, Focal point, Focal Point Extn, Udyog Nagar, I.D.C, Kapurthala Road & Preet Nagar. In Ludhiana Focal Point Phase 5 to 8, Janta Nagar, Bhagwan Chowk Area & Industrial area – A/B. .

Availability of Electricity in Batala – across Dhir Road, GT Road is an issue; power is available from the grid for maximum 12/14 hours a day. There are some units in Jalandhar and Ludhiana having induction furnace in the range of 500 kg to 1 ton capacity whereas other units which are using local scrap as well as have high melting temperatures are having cupola and rotary furnace and has a capacity of minimum 5 ton per day.

The foundry produces a wide variety of castings such as manhole covers, pipe and pipe fittings, sanitary items, tube well body, metric weights, automobile components, railway parts, electric motor, fan body etc. 90% of the castings produced are from the SSI sector.

1.1.1. Energy Usage Pattern

Major energy sources being used in foundry cluster are electricity and fuels such as Coal, Furnace Oil, and Diesel. Electrical energy is being used in melting of iron in induction furnaces, operation of electrical utilities and thermal energy is being used in cupola furnaces operation.

1.2. Classification of Units

Broadly units are classified with respect to production capacity;

- Large Scale Units
- Medium Scale Units
- Small Scale Units

1.2.1. Production Wise Unit Breakup

Foundry cluster at Batala, Jalandhar and Ludhiana can be broken into three categories viz. small, medium and large size unit. Table 1.2 shows that production wise breakup of Foundry cluster.

Table 1.1 Production wise unit breakups

S. No.	Type of Unit	Production Capacity
1	Large scale unit	More than 1500 MT
2	Medium scale unit	250 to 1500 MT
3	Small scale unit	Less than 250 MT

1.2.2. Products Manufactured

Foundry SME cluster at Batala, Jalandhar and Ludhiana produces a wide variety of castings such as manhole covers, pipe and pipe fittings, sanitary items, tube well body, metric weights, automobile components, railway parts, electric motor, fan body etc.

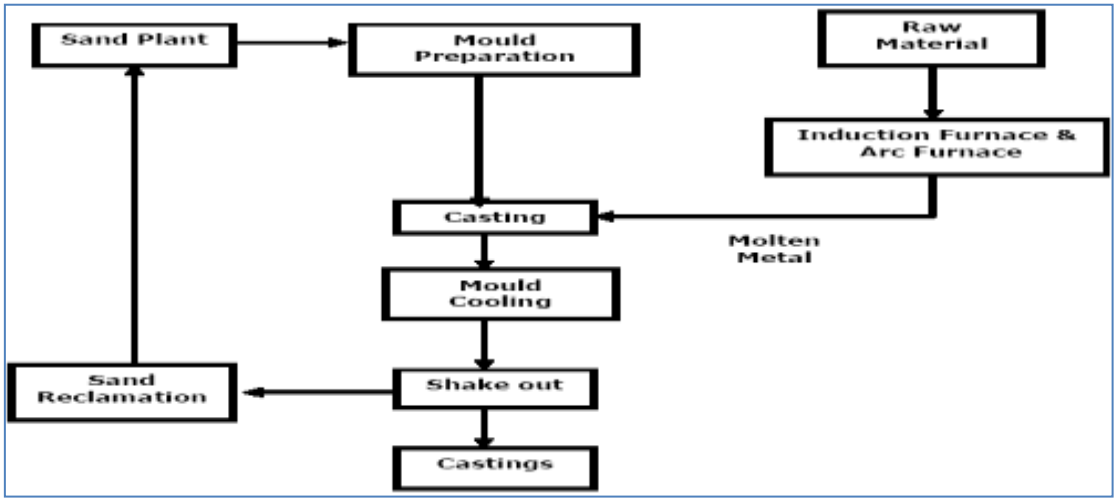

Figure 1.1: Process Flow diagram of a Foundry Cluster

The manufacturing process is described as below;

Melting Section:

The raw material is melted in melting furnace. The melting furnace can be an induction furnace or rotary or arc furnace or cupola furnace. Molten metal from the melting furnace is tapped in Ladles and then transferred to the holding furnaces. Typically the holding furnaces are induction furnaces. The holding furnace is used to maintain the required molten metal temperature and also acts as a buffer for storing molten metal for casting process. The molten metal is tapped from the holding furnace whenever it is required for casting process.

Sand Plant:

Green sand preparation is done in the sand plant. Return sand from the molding section is also utilized again after the reclamation process. Sand Muller's are used for green sand preparation. In the sand millers, green sand, additives and water are mixed in appropriate proportion. Then the prepared sand is stored in bunkers for making moulds.

Pattern Making:

Patterns are the exact facsimile of the final product produces. Generally these master patterns are made of aluminum or wood. Using the patterns the sand moulds are prepared.

Mould Preparation:

In small-scale industries still the moulds are handmade. Modern plants are utilising pneumatic or hydraulically operated automatic molding machines for preparing the moulds. After the molding process if required the cores are placed at the appropriate position in the moulds. Then the moulds are kept ready for pouring the molten metal.

Casting:

The molten metal tapped from the holding furnace is poured into the moulds. The molten metal is allowed to cool in the moulds for the required period of time and the castings are produced. The moulds are then broken in the shake out for removing the sand and the used sand is sent back to the sand plant for reclamation and reuse. The castings produced are sent to fettling section for further operations such as shot blasting, heat treatment etc. depending upon the customer requirements.

1.3. Energy performance in existing situation

Major energy sources being used in foundry cluster are electricity and fuels such as Coal, Furnace Oil, and Diesel. Electrical energy is being used in melting of iron in

induction furnaces, operation of electrical utilities and thermal energy is being used in cupola furnaces operation.

1.3.1. Average Production

The Average Production of the Foundry Units in above mentioned category during Year 2009-10 are as follows;

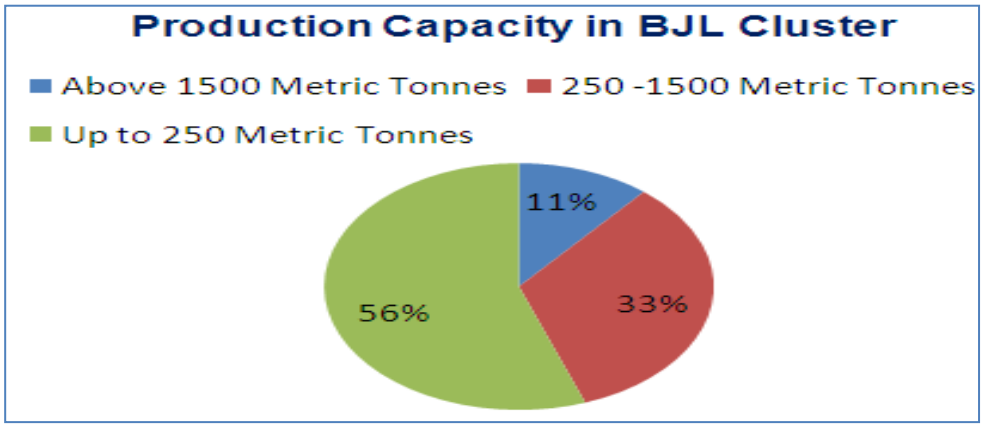

Figure 1.2 Production Capacity BJL Foundry cluster

1.3.2. Energy Consumption

Energy consumption (electrical) in a typical Foundry plant for different types of products is given in Table 1.5 below:

Table 1.2 Annual Energy Consumption

S. No.	Production Capacities	% of Units
1	Above 1500 Metric Tonne	11
2	250 to 1500 Metric Tonne	33
3	Below 250 Metric Tonne	56

Table 1.3 Annual Energy Consumption (Electricity)

Electricity Consumption Pattern	Unit Consumed in kWh	Total Unit Consumption kWh
Blower Motor for Cupola	962100	26.92 Lakhs
Rotary Motor for Rotary Furnace	330000	
Melting material in Induction Furnace	1400000	

Table 1.4 Annual Energy Consumption (Coal & Furnace Oil)

Thermal Energy Consumption Pattern	Consumption per Year
Coal for Cupola	5000 Metric Tonnes
Furnace Oil for Rotary Furnace	17.8 Lakhs Litter

1.3.3. Specific Energy Consumption

Specific energy consumption of Foundry units depends upon the production capacity & their corresponding power consumption. Specific energy consumption also depends on type of furnace. A brief summary of specific energy consumption depending upon type of furnace is shown in below table;

Table 1.5 Specific Energy Consumption

S. No	Types of Furnace	Types of Fuel	Specific Fuel Consumption / One kg Molten Material	Cost of Fuel in `
1	Cupola	Coal	0.2 kg	2.6
2	Rotary Furnace	Furnace Oil	0.15 Lt	4.20
3	Arc / Induction Furnace	Electricity	0.72 kWh	3.6

**Assuming Coal rate Rs.15.0 /kg*

**Assuming F.O rate Rs. 28.0 /Lt.*

**Assuming electricity rate Rs 5.0/kWh*

1.4. Existing Technology/Equipment

1.4.1. Description about the existing technology

In the foundry cluster the burning of inefficient burning fuel using the age old technique and equipment results in the formation of dense fume, and exhaust fumes creates a lot of problem in working area of plant. So this existing Scenario of Exhaust fumes in the unit is cope up by 6 large Exhaust fans of 1 HP each to circulate fresh air and discharge fume. These fans are operated for in all about 5000 hours a year. It was observed that air circulators are continuously ON during the shift. Due to the presence of the furnaces the plant temperature becomes very high. High temperature fumes create sweating and itching in eye which gives requirement of starting air circulation. Installation of Eco Ventilators will increase number of air changes and will reduce the fumes and reduce temperature in the plant.

1.5. Establishing the Baseline for the Proposed Technology

At Present all the Foundry plants at Batala, Jalandhar and Ludhiana are operating with many exhaust fans at plant. Installation of Eco Ventilators in place of exhaust fans will save the power as eco ventilators do not need power to run. The baseline is tabulated below:

Table 1.6 Baseline Establishment

S. No.	Particular	Unit	Value
1.	Exhaust Fan Power Capacity	HP	1

S. No.	Particular	Unit	Value
2.	Electric load	kW/ fan	0.75
3.	Total Nos. of Exhaust Fans	Nos.	6
4.	Effective Load	kW	4.5
5	Operating hours	Hours/year	5000
6	***Annual Electricity Consumption***	***kWh***	***22500***

1.6. Barriers in adoption of proposed technology

1.6.1. Technological Barrier

- Lack of awareness and information of the loss in terms power consumption by an exhaust fan.
- Due to lack of technical knowledge and expertise, eco - ventilators are used less in the Foundry units.
- In this cluster, like many others, there is lack of leadership to take up the energy efficiency projects in the plant.

1.6.2. Financial Barrier

Availing finance is not the major issue. Among the SMEs, the larger units, if convinced they are capable of either financing it themselves or get the finance from their banks. The smaller units will require competitive loan and other support to raise the loan. However as most of them have been able to expand their setup and grow, there is readiness to spend for energy efficiency technologies which have good returns. Energy Efficiency Financing Schemes such as SIDBI's, if focused on the cluster, will play a catalytic role in implementation of identified energy conservation projects & technologies.

1.6.3. Skilled Manpower

In Foundry cluster at Batala, Jalandhar and Ludhiana, the availability of skilled manpower is one of the limitations; this issue gets further aggravated due to more number of Foundry units as compared to the availability of skilled manpower. For major equipments of Foundry units, maintenance or the repair works is done the equipment suppliers itself.

2. PROPOSED TECHNOLOGY

2.1. Detailed Description of Technology

2.1.1. Description of Technology

Fumes are generated when fuel is burnt in the furnace. Most of the units are using electrical exhaust fans to remove fumes from the furnace shed. Now days natural wind ventilators are available to remove fumes from the plant shed. These ventilators work on the principle of differential pressure created by hot fumes & velocity of wind.

Six numbers of natural wind ventilators can replace an electrical exhaust fan of 0.75 kW capacities.

Operating principle of eco ventilator

A natural air ventilator works on natural movement of wind by utilizing the velocity energy of wind to induce air flow by centrifugal action. Centrifugal force on ventilator is caused by spinning of blades that create a low pressure region, which attracts and throws out the hot air allowing it to be replaced by fresh and cool air from outside with the help of spinning vanes that creates a region of low pressure. The Fly Wheel Effect of the Rotor cage helps to use stored energy to provide continue ventilation, even-when, the breeze stops the ventilator to spin. Eco ventilators suction process works on slowest velocity of wind as well, thereby ventilating the heat and moisture at all wind speed – even when there is no wind, the flywheel affects the rotor cage uses the stored energy to constantly remove the unwanted air, giving rise to ventilation.

These exhaust fans must be replaced by the Eco Ventilators which leads to reduction in power consumption of plant. This technology can be implemented to those units which are having shed structure.

2.1.2. Technology Specification

Eco Ventilator

Figure 2.1 Eco Ventilator

Eco ventilator, an exceptional product that exhausts hot gases from enclosed place without using electric power as it works on natural air blow. eco friendly air ventilator

works by utilizing wind power induced by centrifugal action the centrifugal force caused by rotating vanes creates low pressure which draws air out through rotating body. Amount of air drawn by ventilator is continuously replaced by replaced by fresh air from outside vanes of ventilator is made of light wt. material, so slight breeze is also enough to rotate ventilator cage.

Table 2.1 Technical Specification

Parameter	*Specification*
MOC of Vanes	Industrial Hi-Grade Aluminium
MOC of Top Plate	Stainless Steel
MOC Bottom of Ring	Stainless Steel
Weight of Ventilator	06 Kg
Height of Ventilator	410mm ± 5 mm
Centre Width of Ventilator	735mm ± 5 mm
Dia of Top Plate	500mm ± 5 mm
Dia of Bottom Ring	600mm ± 15 mm
Nos. of Vanes	42 Nos. Rolled Formed
Thickness of Vanes	0.45 mm
Nos. of Bearing	02 Nos.

2.1.3. Suitability or Integration with Existing Process and Reasons for Selection

This is the simplest and widely accepted measure for energy cost reduction in all the industries. It does not affect the process but improves the process efficiency. Eco Ventilator does not require any electrical power for removing exhaust fumes from plant.

2.1.4. Availability of Technology

Now days when energy cost is high, it is poor practice to use exhaust fans, if fumes can be removed by eco ventilator. As far as technology is concerned Eco ventilators are available in local/ national market. It is well proven technology which is adopted in many of the other similar and dissimilar units. Local vendors can arrange eco ventilator at order. Local service providers are also available in Punjab. More details of service provider are given in annexure 6.

2.1.5. Source of Technology

The technology is wide spread and quite popular among modern entrepreneurs. The technology is commercial available in the market and the suppliers & vendors of the technology not only at major commercial cities but also are locally available. With the use of eco ventilators, power consumption will be reduced of a unit.

2.1.6. Terms and Conditions after Sale

Warranty period of one year will be provided from the date of invoice against any manufacturing defects.

2.1.7. Process down Time during Implementation

Technology provider will bring the complete setup for the proposed project from their site and make all the arrangements for implementation at the client's site, this will take about 3 to 4 days in all to setup the complete project.

2.2. Life Cycle Assessment

Life of the proposed energy efficient motors will be around 5 to 10 years which depends on the operating conditions and maintenance at client's side.

2.3. Suitable Unit for Implementation of the Identified Technology

For estimation of the saving potential on implementation of this project, here the Foundry plants engaged in producing castings, having exhaust fans can be considered for replacement of exhaust fan by eco ventilators.

3. ECONOMIC BENEFITS FROM PROPOSED TECHNOLOGY

3.1. Technical Benefits

3.1.1. Electricity savings per year

Project of Installation of 36 Eco ventilators in place of 6 large exhaust fans will result in savings of electricity consumption in Foundry plants, which is estimated to be about 22500 kWh of annual electricity consumption of the plant or unit.

3.1.2. Improvement in product quality

This project is not contributing to any improvement in product quality, but it gives better working environment hence enhanced efficiency of the unit.

3.1.3. Improvement in production

This project is not contributing for increasing in production in Foundry plant. But it reduces the power consumption for producing same amount of castings. Since all exhaust fans will be switched off.

3.1.4. Reduction in raw material consumption

Raw material consumption will be the same after the implementation of the proposed project.

3.1.5. Reduction in other losses

This project does not contribute to any reduction in any loss.

3.2. Monetary Benefits

Annual monetary savings with installation of Eco Ventilators will be `1.125 Lakhs per year.

Table 3.1 Monetary savings

S. No.	Particular	Unit	Value
1.	Exhaust Fan Power Capacity	HP	1
2.	Nos. of Exhaust Fans	No.	6
3.	Operating hours	Hours/year	5000
4.	Electric load	kW/ fan	0.75
5	***Annual Electricity Consumption***	***kWh***	***22500***
6.	Cost of Electricity	`/kWh	5.0
7	Annual Electricity Cost	`	112500
8	***Monetary savings due to replacement of Exhaust Fans***	***` in lakhs***	***1.125***
9	***Cost of Proposed System***	***` in lakhs***	***2.14***

S. No.	Particular	Unit	Value
10	*Payback Period*	*Years*	*1.90*

3.3. Social Benefits

3.3.1. Improvement in Working Environment in the Plant

There is significant impact of this project in the working environment in the plant. This project will improve working condition for operators and improve the operator efficiency.

3.3.2. Improvement in Skill Set of Workers

The technical skills of operators will definitely improve. Training on the regular maintenance will help in improving the technical understanding of the workers.

3.4. Environmental Benefits

The major GHG reduction would be in CO_2 reduction. The technology will reduce grid electricity consumption and emission reductions are estimated at 18.2 tons of CO_2 per annum.

4. INSTALLATION OF THE PROPOSED TECHNOLOGY

4.1. Cost of Technology Implementation

Table 4.1: Details of Proposed Technology Installation Cost

S. No.	Particular	Cost` in (Lakhs)
1	Equipment cost (For total 36 Eco –ventilator)	1.76
2	Packaging & Forwarding and Taxes	0.134
3	Misc (Installation & commissioning and Other cost)	0.24
4	Total Cost	2.14

Six numbers of natural wind ventilators can replace an electrical exhaust fan of 0.75 kW/ 1HP capacity.

4.1.1. Technology Cost

Cost of the project is about ` 2.14 Lakhs which includes the purchase of Eco Ventilators

4.1.2. Other Cost

Miscellaneous costs required will be ` 0.24 Lakhs which includes Installation & commissioning, and other costs etc and Packaging and forwarding costs and taxes will be ` 0.134 Lakhs.

4.2. Arrangements of Funds

4.2.1. Entrepreneur's Contribution

Entrepreneur will contribute 25% of the total project cost which is `0.54 Lakh.

4.2.2. Loan Amount

Remaining 75% cost of the proposed project will be borrowed from bank which is `1.61 Lakh.

4.2.3. Terms & Conditions of Loan

The interest rate is considered at 10% which is normal rate of interest for energy efficiency 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 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 ` 2.14 Lakh and monetary savings due to reduction in electricity consumption is ` 1.125 Lakhs hence, the simple payback period works out to be 1.90 years.

4.3.3. Net Present Value (NPV)

The Net present value of the investment at 10% works out to be `1.98 Lakhs.

4.3.4. Internal Rate of Return (IRR)

The after tax Internal Rate of Return of the project works out to be 35.06%. 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 26.50%.

Table 4.2: Financial Indicators of Proposed Technology

S No	Particular	Unit	Value
1	Simple Payback	Years	1.90
2	NPV	` In Lakh	1.98
3	IRR	%age	35.06
4	ROI	%age	26.50
5	DSCR	Ratio	2.15

4.4. Sensitivity analysis in realistic, pessimistic and optimistic scenarios

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 rupees savings or decrease in rupees savings. For the purpose of sensitive analysis, two following scenarios have been considered.

- Optimistic scenario (Increase in monetary savings by 5%)

- Pessimistic scenario (Decrease in monetary 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 Scenarios

Scenario	Monetary Benefit(` Lakh)	IRR (%)	NPV(in Lakh)	ROI (%)	DSCR
Pessimistic	1.07	32.52	1.77	26.27	2.04
Base	1.12	35.06	1.98	26.50	2.15
Optimistic	1.18	37.58	2.20	26.71	2.26

4.5. Procurement and Implementation Schedule

Procurement and implementation schedule required for implementation of this technology is about 5 weeks and 3 to 4 days would required as a process break down. Details of procurement and implementation schedules are shown in Table 4.4 below

Table 4.4: Procurement and Implementation Schedule

S. No.	Activity	Weeks				
		1	2	3	4	5
1.	Issue of Purchase Order					
2.	Receipt of Equipment					
3.	Civil works for foundation and mounting					
4.	Commissioning					

ANNEXURES

Annexure 1: Energy audit data used for baseline establishment

S. No.	Particular	Unit	Value
1.	Exhaust Fan Power Capacity	HP	1
2.	Nos. of Exhaust Fans	No.	6
3.	Operating hours	Hours/year	5000
4.	Electric load	kW/ fan	0.75
5.	Total Electric load	kW	4.5
6.	***Annual Electricity Consumption***	***kWh***	***22500***
7.	Cost of Electricity	`/kWh	5.0
8.	Annual Electricity Cost	`	112500

Annexure 2: Detailed Technology Assessment Report

S. No.	Particular	Unit	Value
1.	Exhaust Fan Power Capacity	HP	1
2.	Nos. of Exhaust Fans	Nos.	6
3.	Operating hours	Hours/year	5000
4.	Electric load	kW/ fan	0.75
5	***Annual Electricity Consumption***	***kWh***	***22500***
6.	Cost of Electricity	`/kWh	5.0
7	Annual Electricity Cost	`	112500
8	***Monetary savings due to replacement of Exhaust Fans***	***` in lakhs***	***1.125***
9	***Cost of Proposed System***	***` in lakhs***	***2.14***
10	***Payback Period***	***Years***	***1.90***

Annexure 3: Detailed Financial Calculations

Name of the Technology	Eco Ventilator		
Rated Capacity	**6 Eco Ventilator can replace 1kW exhaust fan**		
Details	**Unit**	**Value**	**Basis**
No of Annual working Hours	Hours	5000	
No of Ventilators	no.	36	
Proposed Investment			
Plant & Machinery	` (in lakh)	1.90	
Civil Work	` (in lakh)	0.00	
Erection & Commissioning	` (in lakh)	0.14	
Misc. Cost	` (in lakh)	0.10	
Total Investment	` (in lakh)	2.14	
Financing pattern			
Own Funds (Equity)	` (in lakh)	0.54	Feasibility Study
Loan Funds (Term Loan)	` (in lakh)	1.61	Feasibility Study
Loan Tenure	Years	5.00	Assumed
Moratorium Period	Months	6.00	Assumed
Repayment Period	Months	66.00	Assumed
Interest Rate	%age	10.00%	
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	22500	
Cost of electricity	`/kWh	5.00	
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	1.61	0.08	1.53	0.19
2	1.53	0.24	1.29	0.14
3	1.29	0.32	0.96	0.11
4	0.96	0.40	0.56	0.08
5	0.56	0.40	0.16	0.04
6	0.16	0.16	0.00	0.00
		1.61		

WDV Depreciation **`(in lakh)**

Particulars / years	1	2
Plant and Machinery		
Cost	2.14	0.43
Depreciation	1.71	0.34
WDV	0.43	0.09

Projected Profitability **` (in lakh)**

Particulars / Years	1	2	3	4	5	6	7	8
Electricity savings	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125
Total Revenue (A)	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125
Expenses								
O & M Expenses	0.09	0.09	0.09	0.10	0.10	0.11	0.11	0.12
Total Expenses (B)	0.09	0.09	0.09	0.10	0.10	0.11	0.11	0.12
PBDIT (A)-(B)	1.04	1.04	1.03	1.03	1.02	1.02	1.01	1.00
Interest	0.19	0.14	0.11	0.08	0.04	0.00	0.00	0.00
PBDT	0.85	0.89	0.92	0.95	0.98	1.01	1.01	1.00
Depreciation	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
PBT	0.74	0.78	0.80	0.83	0.87	0.90	0.90	0.89
Income tax	0.00	0.19	0.31	0.32	0.33	0.34	0.34	0.34
Profit after tax (PAT)	0.74	0.59	0.49	0.51	0.54	0.55	0.55	0.55

Computation of Tax **` (in lakh)**

Particulars / Years	1	2	3	4	5	6	7	8
Profit before tax	0.74	0.78	0.80	0.83	0.87	0.90	0.90	0.89
Add: Book depreciation	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Less: WDV depreciation	1.71	0.34	-	-	-	-	-	-
Taxable profit	(0.86)	0.55	0.92	0.95	0.98	1.01	1.01	1.00
Income Tax	-	0.19	0.31	0.32	0.33	0.34	0.34	0.34

Projected Balance Sheet **` (in lakh)**

Particulars / Years	1	2	3	4	5	6	7	8
Share Capital (D)	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
Reserves & Surplus (E)	0.74	1.33	1.82	2.34	2.87	3.43	3.98	4.53
Term Loans (F)	1.53	1.29	0.96	0.56	0.16	0.00	0.00	0.00
Total Liabilities (D)+(E)+(F)	2.80	3.15	3.32	3.44	3.57	3.96	4.52	5.07
Assets	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Gross Fixed Assets	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14
Less Accumulated Depreciation	0.11	0.23	0.34	0.45	0.57	0.68	0.79	0.90
Net Fixed Assets	2.03	1.92	1.80	1.69	1.58	1.46	1.35	1.24
Cash & Bank Balance	0.77	1.24	1.52	1.75	1.99	2.50	3.17	3.83
TOTAL ASSETS	2.80	3.15	3.32	3.44	3.57	3.96	4.52	5.07
Net Worth	1.28	1.87	2.36	2.87	3.41	3.96	4.52	5.07
Debt Equity Ratio	2.85	2.40	1.80	1.05	0.30	0.00	0.00	0.00

Projected Cash Flow **` (in lakh)**

Particulars / Years	0	1	2	3	4	5	6	7	8
Sources									
Share Capital	0.54	-	-	-	-	-	-	-	-
Term Loan	1.61								
Profit After tax		0.74	0.59	0.49	0.51	0.54	0.55	0.55	0.55
Depreciation		0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Total Sources	2.14	0.85	0.71	0.61	0.63	0.65	0.67	0.67	0.66
Application									
Capital Expenditure	2.14								
Repayment Of Loan	-	0.08	0.24	0.32	0.40	0.40	0.16	0.00	0.00
Total Application	2.14	0.08	0.24	0.32	0.40	0.40	0.16	0.00	0.00

Net Surplus	-	0.77	0.47	0.28	0.22	0.25	0.51	0.67	0.66
Add: Opening Balance	-	-	0.77	1.24	1.52	1.75	1.99	2.50	3.17
Closing Balance	-	0.77	1.24	1.52	1.75	1.99	2.50	3.17	3.83

IRR **` (in lakh)**

Particulars / months	0	1	2	3	4	5	6	7	8
Profit after Tax		0.74	0.59	0.49	0.51	0.54	0.55	0.55	0.55
Depreciation		0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Interest on Term Loan		0.19	0.14	0.11	0.08	0.04	0.00	-	-
Cash outflow	(2.14)	-	-	-	-	-	-	-	-
Net Cash flow	(2.14)	1.04	0.85	0.72	0.70	0.69	0.67	0.67	0.66
IRR	35.06 %								
NPV	1.98								

Break Even Point **` (in lakh)**

Particulars / Years	1	2	3	4	5	6	7	8
Variable Expenses								
O & M Expenses (75%)	0.06	0.07	0.07	0.07	0.08	0.08	0.09	0.09
Sub Total(G)	0.06	0.07	0.07	0.07	0.08	0.08	0.09	0.09
Fixed Expenses								
O & M Expenses (25%)	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03
Interest on Term Loan	0.19	0.14	0.11	0.08	0.04	0.00	0.00	0.00
Depreciation (H)	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Sub Total (I)	0.32	0.28	0.25	0.22	0.18	0.15	0.14	0.14
Sales (J)	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13
Contribution (K)	1.06	1.06	1.05	1.05	1.05	1.04	1.04	1.03
Break Even Point (L= G/I)%	30.25%	26.22%	23.78%	20.56%	16.92%	13.92%	13.65%	13.85%
Cash Break Even {(I)-(H)}%	19.58%	15.52%	13.05%	9.79%	6.12%	3.07%	2.76%	2.91%
Break Even Sales (J)*(L)	0.34	0.29	0.27	0.23	0.19	0.16	0.15	0.16

Return on Investment **` (in lakh)**

Particulars / Years	1	2	3	4	5	6	7	8	Total
Net Profit Before Taxes	0.74	0.78	0.80	0.83	0.87	0.90	0.90	0.89	6.71
Net Worth	1.28	1.87	2.36	2.87	3.41	3.96	4.52	5.07	25.33
									26.50%

Debt Service Coverage Ratio **` (in lakh)**

Particulars / Years	1	2	3	4	5	6	7	8	Total
Cash Inflow									
Profit after Tax	0.74	0.59	0.49	0.51	0.54	0.55	0.55	0.55	3.43
Depreciation	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.68
Interest on Term Loan	0.19	0.14	0.11	0.08	0.04	0.00	0.00	0.00	0.56
Total (M)	1.04	0.85	0.72	0.70	0.69	0.67	0.67	0.66	4.67

DEBT

Interest on Term Loan	0.19	0.14	0.11	0.08	0.04	0.00	0.00	0.00	0.56
Repayment of Term Loan	0.08	0.24	0.32	0.40	0.40	0.16	0.00	0.00	1.61
Total (N)	0.27	0.38	0.44	0.48	0.44	0.17	0.00	0.00	2.17
DSCR (M/N)	3.90	2.22	1.65	1.47	1.56	4.06	0.00	0.00	2.15
Average DSCR	2.15								

Annexure 4: Procurement and implementation schedule

S. No.	Activity	Weeks				
		1	2	3	4	5
1.	Issue of Purchase Order					
2.	Receipt of Equipment					
3.	Civil works for foundation and mounting					
4.	Commissioning					

Annexure 5: Break-up of Process down Time

S No.	Activities	Weeks		
		3/5	4/5	5/5
1	Removal of Exhaust Fans			
2	Installing of Eco Wind Ventilators			
3	Testing & Trial			

Annexure 6: Details of technology service providers

S. No.	Source of product	Details of Local vendor / service provider
1.	Chakshu Enterprises	**Ms. Sonam** Off. # 61, St. No. 2, Beant Nagar, Backside Blind School, Chandigarh Road, Jamalpur, Ludhiana- 3. PH. NO.-0161-5070642 Mob.No.-98155-64242. Email – chalshuent@yahoo.co.in
2.	Suman Contracts	**Mr. Ravi Patil** 301, Palace Plaza, Palace Road, Near Kashi Vishwanath Temple, Baroda Mob – 09824073959 Email – suman_contracts@yahoo.co.in

Annexure 7: Quotations or Techno-commercial bids for new technology / equipment

CHAKSHU ENTERPRISES

(WIND VETILATOR DIVISION)

Off. # 61, St. No. 2, Beant Nagar, Backside Blind School,

Chandigarh Road, Jamalpur, Ludhiana- 3.

PH. NO.-0161-5070642 Mob.No.-98155-64242.

E-Mail info@chakshuent.com, chakshuent@yahoo.co.in , web: www.chakshuent.com

CE/WVD/11-1205

Date: 29/07/2011

M/s.

Kind Attn: Mr. Gagandeep Mohey

Dear Sirs,

Subject: Installation of Wind Ventilators for Your Industry.

We sincerely thank you for kind courtesy extended to our Mr. Kamal Mehta during his visit to your Manufacturing facilities to discuss regarding the installation of Wind Ventilators.

As desired by you we are pleased to submit our Techno-commercial offer for your kind consideration.

We have introduced & promoted wind ventilators 'as a new concept'. We have sold more than 7000 ventilators to over 150 customers representing every segment of the Indian industry. Wind ventilators have following advantages over conventional ventilation systems.

- Conserve power & Save on electricity charges.
- Wind ventilators are maintenance free.
- Round the clock ventilation.
- Suitable in places even where power is not available.
- Free of accidental hazards.
- Saves on Manpower; persons not required to operate.

Here, we would like to inform you that we have engineered Wind Ventilators from the conceptual stages & introduced in the Indian market after necessary testing. Assuring you of our best services at all times.

With Warm Regards

Yours faithfully,

For Chakshu Enterprise

SONAM

(Sales Head of Wind Ventilator Division)

0161-5070642

Chakshu Enterprise

Continuation Sheet

Technical Recommendations for Wind Ventilator

1. Customer	: M/s.
2. Contact Person	: Mr. Gagandeep Mohey
3. Type of Buildings	: Furnace Shed
4. Wind Ventilators Model Recommended	: CWV-2128
5. Average Wind Velocity Assumed	: 5mph
6. Air Discharge Capacity Considered	: 95000Cft per Hour

Price Schedule For Wind Ventilator

1.	Basic Price of **CWV-2128** complete with Base plate, adjustable elbow & hardware	:	**Rs. 4900.00/-** each ventilator(DD/Cheque Drawn in favour of Chakshu Enterprises)
2.	**Packing & Forwarding**	:	2% of Basic Price
3.	VAT	:	5.5% Extra.
4.	Octroi & local levies	:	Extra, to be borne by consignee
5.	Delivery	:	One Week, Ex-Ludhiana
6.	Freight	:	Extra, to be borne by consignee
7.	Warrantee	:	12 months from the date of dispatch against manufacturing defects.
8.	Installation charges	:	RS. **400/** - each ventilator(DD/Cheque Drawn in favour of Drishi Enviro Services)
9.	Service tax on Installation Charges	:	Extra as applicable
10.	Payment terms	:	40% advance with order, balance against Performa Invoice

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

Confederation of Indian Industry
CII – AVANTHA Centre for Competitiveness
Block No.3, Dakshin Marg
Sector 31-A, Chandigarh - 160030
Tel: 0172-5080784 (D) / 2666517-19
Fax: 0172-2606259 / 2614974
E-mail: harinder.singh@cii.in
Website: www.ciicfc.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