DETAILED PROJECT REPORT
ON
IMPROVEMENT IN FURNACE INSULATION
HOWRAH CLUSTER

ENERGY IS LIFE
BEE
CONSERVE IT

Bureau of Energy Efficiency

Prepared By

Reviewed By

ISTSL

IMPROVEMENT IN FURNACE INSULATION

HOWRAH GALVANIZING AND WIREDRAWING CLUSTER

BEE, 2010

Detailed Project Report on Improvement in Furnace Insulation

Galvanizing and Wiredrawing SME Cluster,

Howrah, West Bengal (India)

New Delhi: Bureau of Energy Efficiency;

Detail Project Report No: ***HWR/WDG/FII/11***

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Indian Institute of Social Welfare and Business Management(IISWBM) is also thankful to District Industry Center(DIC), Howrah chamber of Commerce & Industry(HCCI), Bengal National Chamber of commerce & Industry(BNCCI), Federation of Small & Medium Industry(FOSMI) and West Bengal Renewable Energy Development Agency(WBREDA) for their valuable inputs, co-operation, support and identification of the units for energy use and technology audit studies and facilitating the implementation of BEE SME program in Howrah Galvanizing and Wire Drawing Cluster.

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Indian Institute of Social Welfare and

Business Management Kolkata

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List of Abbreviation

BEE	Bureau of Energy Efficiency
CDM	Clean Development Mechanism
DPR	Detailed Project Report
DSCR	Debt Service Coverage Ratio
GHG	Green House Gases
GT	Gas Turbine
GWh	Giga Watt Hours
IRR	Internal Rate of Return
MT	Million Ton
MW	Mega Watt
NPV	Net Present Value
ROI	Return on Investment
SCM	Standard Cubic Meter
MSME	Micro Small and Medium Enterprises
SHC Coal	Semi Hard Coke Coal
SIDBI	Small Industrial Development Bank of India
MoMSME	Ministry of Micro Small and Medium Enterprises

EXECUTIVE SUMMARY

IISWBM, Kolkata is executing BEE-SME program in the Galvanizing and Wiredrawing Cluster of Howrah, supported by Bureau of Energy Efficiency (BEE) with an overall objective of improving the energy efficiency in cluster units.

One of the identified sectors was Galvanizing and Wire-drawing in Howrah district of West Bengal. There are about 100 SMEs in Galvanizing and Wire-drawing sector of Howrah Cluster comprising about 50% galvanizing units and 50% Wiredrawing units. The units are constantly under threat of closure due to poor energy efficiency along with pollution issues and variability in demand. Improvement in energy efficiency would largely ensure sustainable growth of the sector, which needs a mechanism to identify technology and techniques for improving energy efficiency in these highly unorganized and so far uncared for industrial units.

Every galvanizing unit has a furnace to melt the zinc for the process of galvanization. The efficiency of these furnaces range from 15% to 25% but can go up to 30% in exceptional cases. The losses include heat wasted due to the presence of excess air, presence of moisture in the fuel, inefficient insulation on the side walls and other miscellaneous losses. This DPR studies how to improve insulation and thereby reduce the loss through that mode to enable saving fuel.

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)	3.01
2	Furnace Oil saving	Litre/year	9903
3	Monetary benefit	₹(in Lakh)/ year	3.37
4	Simple payback period	Years	0.89
5	NPV	₹	9.49
6	IRR	%age	87.38
7	ROI	%age	29.22
8	DSCR	Ratio	4.40
9	Process down time	Days	16

The projected profitability and cash flow statements indicate that the project implementation i.e. improvement in furnace insulation will be financially viable and technically feasible solution for galvanizing and Wiredrawing cluster.

ABOUT BEE'S SME PROGRAM

The Bureau of Energy Efficiency (BEE) is implementing a BEE-SME Programme to improve the energy performance in 25 selected SMEs clusters. Howrah Galvanizing and Wiredrawing Cluster is one of them. The SME Programme of BEE intends to enhance the awareness about energy efficiency in each cluster by funding/subsidizing need based studies 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*:**

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.

Capacity building of stakeholders 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 up of energy efficiency projects in the clusters.

Implementation of energy efficiency measures

To implement the technology up-gradation project in the 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.

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 cluster

The Galvanizing and Wiredrawing cluster in Howrah district of West Bengal is a very large cluster. There are about 100 SMEs in the Howrah Cluster and comprising of about 50% galvanizing units and 50% Wiredrawing units. The units are constantly under threat of closure due to poor energy efficiency along with pollution issues and variability in demand. Improvement in energy efficiency would largely ensure sustainable growth of the sector. It needs a mechanism to identify technology and techniques for improving energy efficiency in this highly unorganized and so far uncared for industrial units.

The major raw materials for the Galvanizing industry are zinc, ammonium chloride, hydrochloric acid, and di-chromate powder. On the other hand, the raw materials used in Wire-drawing units are MS / Copper / Aluminium Wires of gauges varying from 14 to 4 gauge i.e. 1.6 to 5.1 mm dia., while Uni-Lab powder (of Predington company based in Bombay) or Grommet–44 is used for lubrication (eg.).

The main form of energy used by the cluster units are grid electricity, Furnace Oil, coal, LPG and Diesel oil. Major consumptions of energy are in the form of Furnace Oil and Diesel. Details of total energy consumption at Howrah cluster are furnished in Table 1.1a and 1.1b:

Table 1.1a Details of annual energy consumption in the wiredrawing units

S. No	Type of Fuel	Unit	Value	% contribution
1	Electricity	GWh/year	2.24	76
2	Wood	Ton/year	300	5
3	LPG	Ton/year	70.5	19

Table 1.1b Details of annual energy consumption in the galvanizing units

S. No	Type of Fuel	Unit	Value	% contribution
1	Electricity	MWh/year	867.3	13
2	Diesel	kl/year	19.2	2
3	Furnace Oil	kl/year	731.7	62.5
4	Coal	Ton/year	1161	18.5
5	Wood	Ton/year	600	4

Classification of Units

The Galvanizing and Wiredrawing units can be broadly classified on the basis of the following criteria:

1) Product wise
2) Production capacity wise

Products Manufactured

The galvanizing units can be classified on the basis of products into five basis groups. Those are:

a) Units producing transmission tower structures
b) Units producing fastener items
c) Units producing angles and channels
d) Units working on scrap iron
e) Units producing wires

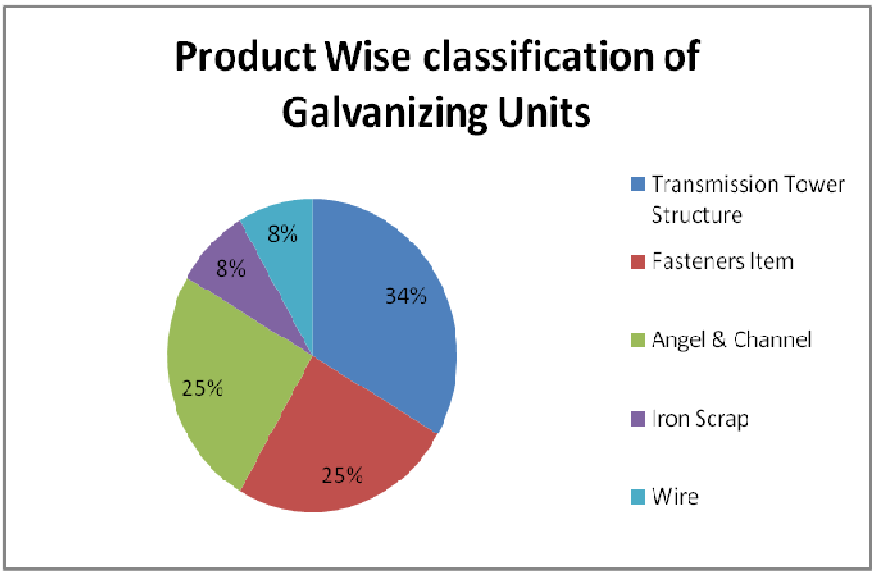


Figure 1.1: Product Wise Classification of Galvanizing Units

Similarly, the Wiredrawing units are mainly classified into the following categories on the basis of products manufactured as units, which produce:

a) MS wire

b) Copper Wire

c) High carbon wire

d) Aluminium wire

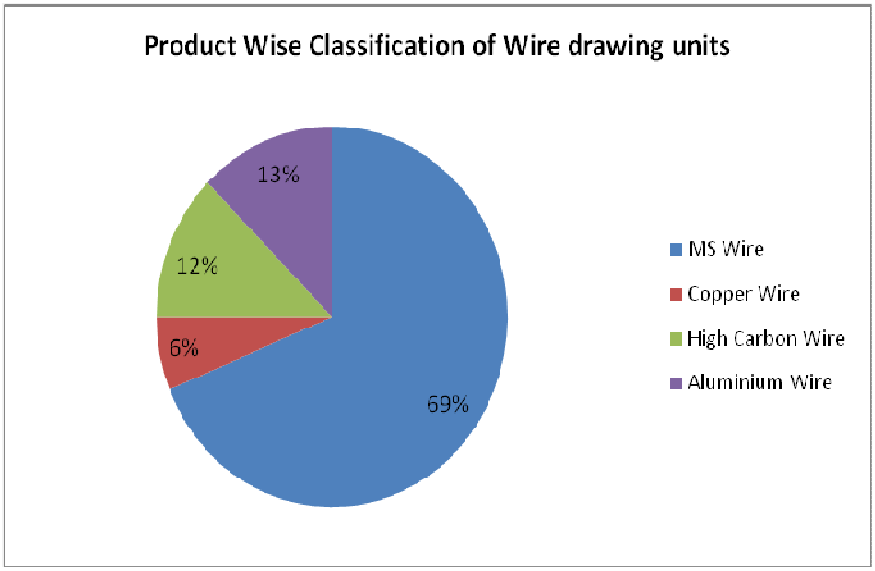


Figure 1.2: Product Wise Classification of Wire-drawing Units

Capacity wise production

In both Wiredrawing and Galvanizing units in Howrah, the production capacity has been found to vary more than 10 folds. In the units, where detailed audit has been performed, there are Wire-drawing units producing as low as 241 Ton/year to as high as 3500 Ton/year. Similarly, the production from Galvanizing units, where audit was performed, has been found to be within the range of 890 to 7500 Ton per annum. Both the Galvanizing and the Wiredrawing units have been classified on the basis of production into three categories, viz. 1-500 TPA (micro scale), 500-1000 TPA (small scale) and above 1000 TPA (medium scale) capacities. It may be noted that this classification is purely based on the range of capacity that has been observed in the galvanizing and Wiredrawing sector in Howrah cluster and has no reference to the existing classification of micro, small and medium industries reported else where.

The distribution of units of Galvanizing and Wiredrawing industries have been depicted in Figures 1.3 and 1.4.

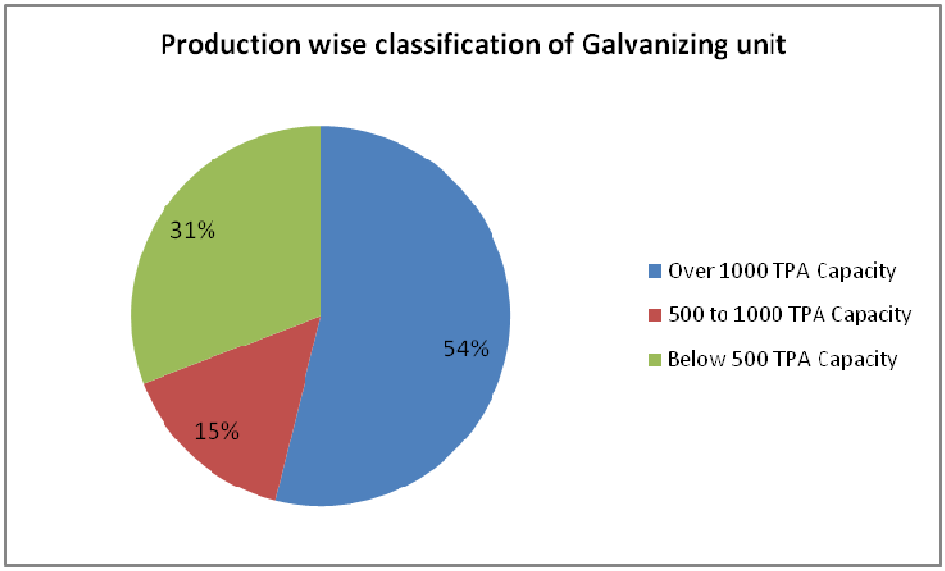


Figure 1.3: Production Wise Classification of Galvanizing Units

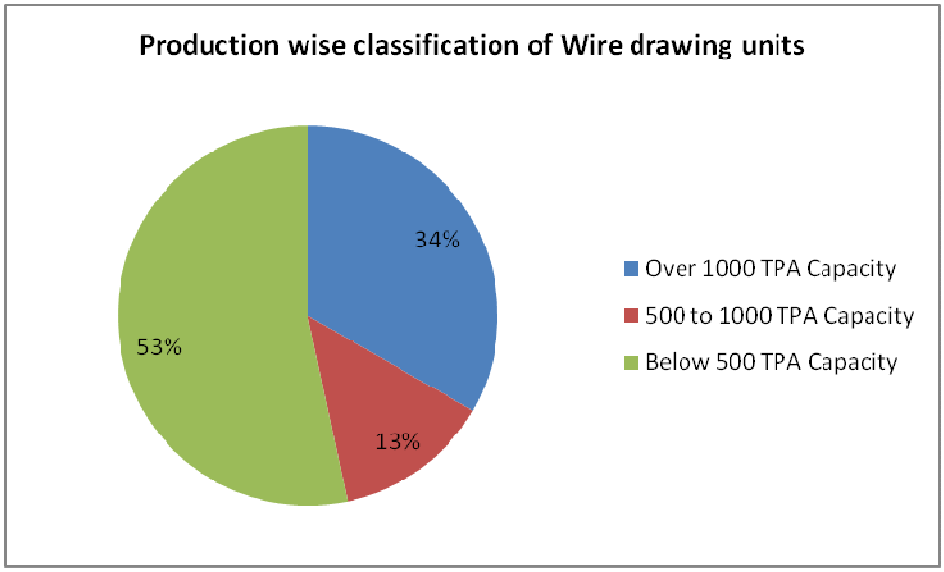


Figure 1.4: Production Wise Classification of Wire-drawing Units

Energy usages pattern

Average yearly electricity consumption in Wiredrawing unit ranges from 82 thousands to 7 lakh kWh depending on the size of the unit. In thermal energy, solid fuel such as wood and gaseous fuel like LPG are used in annealing furnaces in some of the units. The LPG consumption in a typical unit is about 135000 kg/year. The wood consumption in a typical unit is about 300 Ton/year.

Average monthly electricity consumption in a galvanizing unit ranges from 60 thousands to 3 lakh kWh depending on the size of the unit and type of operations performed. In thermal energy, furnace oil is primarily used in the galvanizing furnaces since it is reasonably cheap. The use of FO ranges from 0.5 to 4.5 lakh liters/year. The use of diesel oil ranges from 1.3 to 19.2 kl/year and is used in either drying the job or pre-heating flux solution. SHC coal is also used for the purpose of drying the job and ranges from 1.5 to 8 lakh kg/year. Wood is used in some larger units, which have facilities for running processes other than galvanizing. It can typically use 6 lakh kg/year of wood.

General production process for the Wiredrawing units

The wire about to be drawn is first put into an annealing furnace. The annealed wire is then put into drums for coiling wires. Thereafter, the wire is put through dies of various sizes interspersed by sets of coiler drums.

These drums are driven by electric motors that are of induction type. The chemical used for lubricating the wire through the die is mainly wire-drawing powder (as it is commonly termed in the wire-drawing industry). The finished products of MS Wires are stacked on a steeper from where finished goods are dispatched to the end customers, after dipping in to a rust-preventive oil solution, which protects the final product from corrosion for up to one-and-half month. The finished wire products are mainly supplied to downstream industries such as galvanizers, electrical manufactures and the local market.

General production process flow diagram for drawing wires is shown in Figure 1.5.

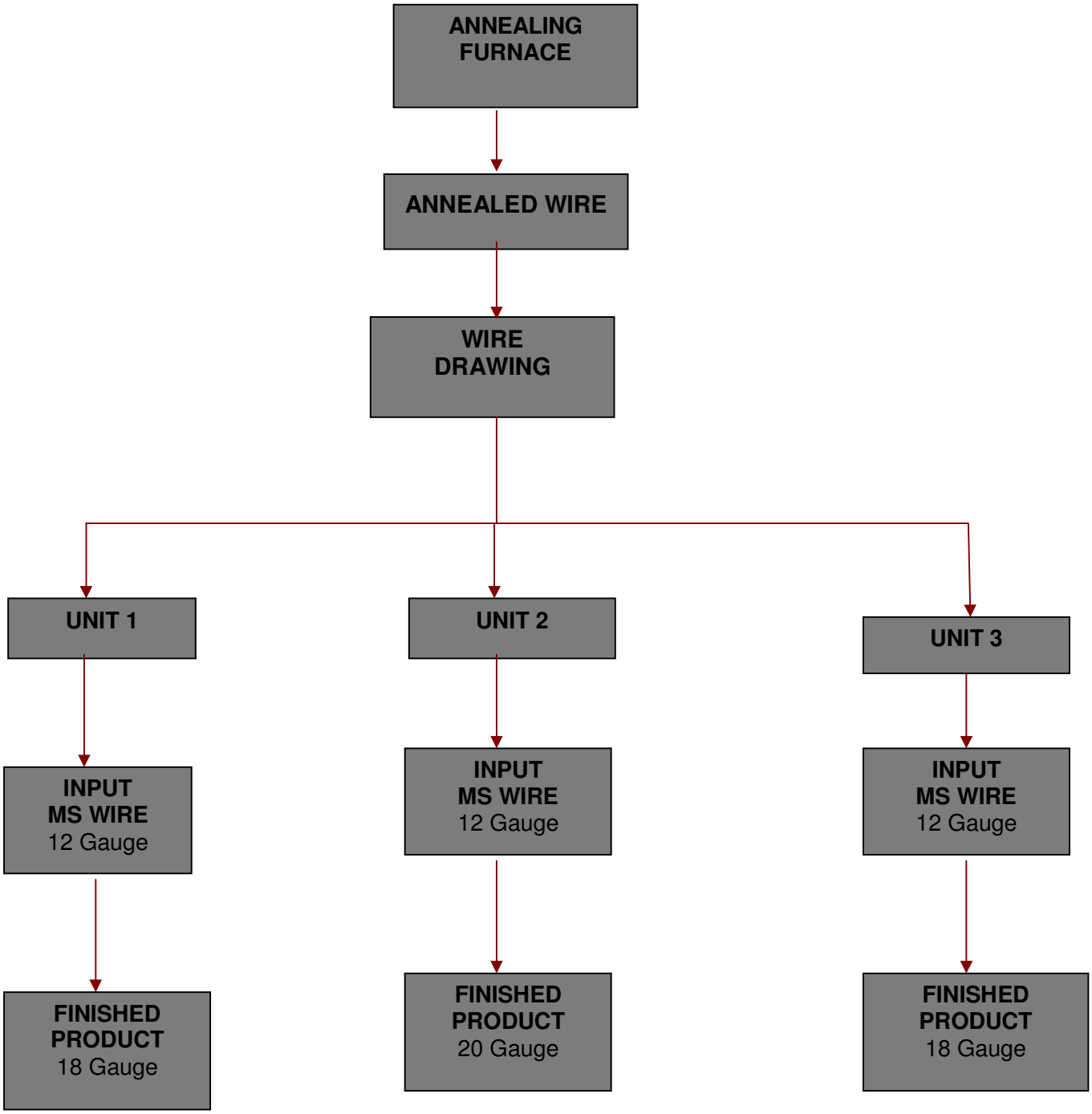


Figure 1.5 Process flow diagram for a typical Wiredrawing unit

General production process for the galvanizing units

In a typical galvanizing unit, the production process involves seven stages as is shown in the schematic diagram in Figure 1.6. First the job or the raw material, which is to be galvanized, is dipped in dilute acid solution and termed acid pickling. Then after the acid pickling process, the job is rinsed in plain water to remove any acid layer present on the job surface. Thereafter, the job is moved onto a SHC coal or diesel based drying bed or flux solution for preheating and drying purpose. This helps produce a uniform layer of zinc on the job surface when the job is dipped in the zinc bath. Then after the drying process is over, the job is dipped into the zinc bath for galvanizing where a layer of molten zinc is deposited uniformly over the job surface.

When the job is taken out of the zinc bath, ammonium chloride powder (the fluxing agent) is sprayed over the job to remove the impurities and other dust particles remaining over the surface. Then the job is dipped in plain cold water for cooling. This process is termed as water quenching. After completion of the water-quenching process, the job is dipped into dichromate solution to give a glazing effect to the job galvanized. The description of the above galvanizing process is depicted in the following process flow diagram.

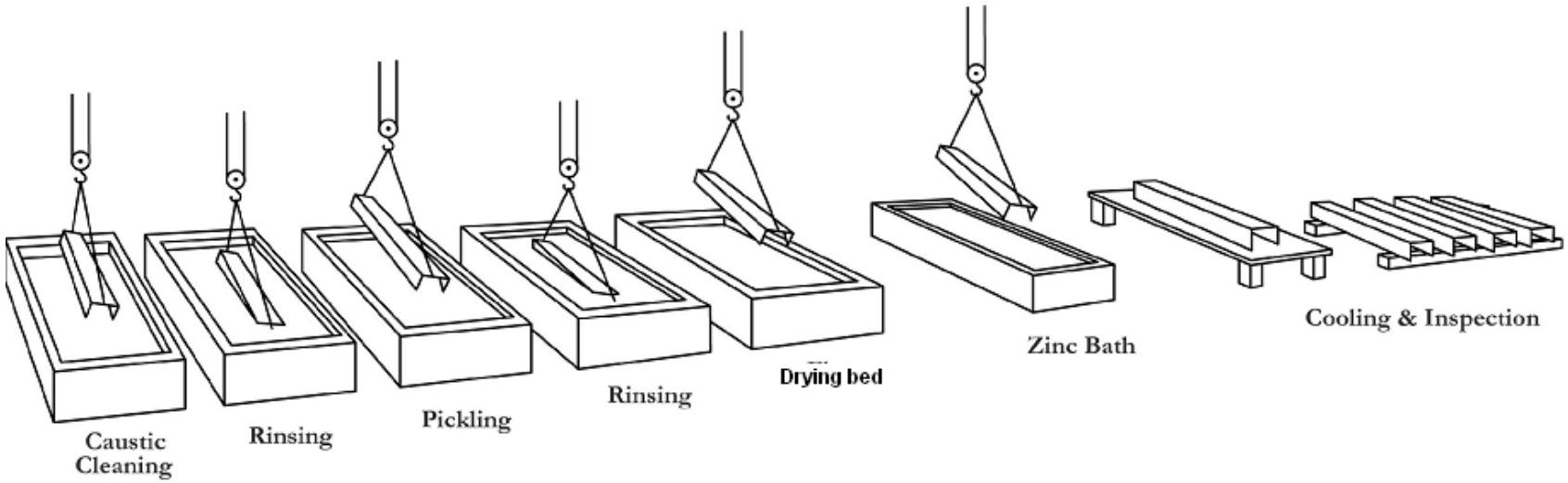


Fig 1.6: Process Flow diagram of galvanizing unit

1.2 Energy performance in existing system

1.2.1 Fuel consumption

Average fuel and electricity consumption in typical Wiredrawing units is given in Table 1.2 and that of galvanizing units is given in Table 1.3. A small unit is defined to be a unit with production between 500 and 1000 TPA and medium to be greater than 1000 TPA. The micro units are defined to have capacity less than 500 TPA.

Only the larger Wiredrawing industries have furnaces and also perform annealing. Among the Wiredrawing units audited, only one, which was also larger used wood for annealing. Further, most of the Wiredrawing units produce MS wires.

Table 1.2 Average fuel and electricity consumption in typical Wiredrawing units

Energy	*Micro*	*Small*	*Medium*		
Scale of Unit	*Electricity*	*Electricity*	*Electricity*	*LPG*	*Wood*
	kWh/ yr	*kWh/ yr*	*kWh/ yr*	*Ton/yr*	*Ton/yr*
MS wire	101486	209216	266889	NA	300
Copper wire	NA	NA	295310	70.5	NA
High carbon wire	NA	NA	1088751	NA	NA
Aluminium wire	NA	NA	266889	NA	NA

Table 1.3 Average fuel and electricity consumption in typical galvanizing units

Energy	Small			Medium				
Scale of Unit	Electricity	Furnace Oil	Diesel Oil	Electricity	Furnace Oil	Diesel Oil	SHC coal	Wood
	kWh/ yr	l/yr	l/yr	kWh/ yr	l/yr	l/yr	kg/yr	kg/yr
Transmission Tower Structure	NA	NA	NA	59346	85195	NA	NA	NA
Fasteners Item	107670	132000	19200	109883	112500	NA	21000	NA
Angle & Channel	NA	NA	NA	35491	165000	NA	150000	NA
Wire	NA	NA	NA	302013	165000	7040	NA	600000

1.2.2 Average annual production

Annual production in terms of TPA is taken in case of Wiredrawing units. The micro units are defined to have production less than 500 TPA, small to be between 500 and 1000 TPA and medium to have production higher than 1000 TPA.

Table 1.4 Typical average annual production in Wiredrawing units

S. No.	Type of Industry	Production (in TPA)		
		Micro scale	Small scale	Medium scale
1	MS wire	100	600	2000
2	Copper wire	NA	NA	1000
3	High carbon wire	NA	NA	1000
4	Aluminium wire	100	NA	700

Table 1.5 Typical average annual production in galvanizing units

S. No.	Type of Industry	Production (in TPA)		
		Micro scale	Small scale	Medium scale
1	Transmission Tower Structure	NA	NA	1969
2	Fasteners Item	200	890	4320
3	Angel & Channel	150	NA	3750
4	Wire	NA	NA	3650

1.2.3 Specific energy consumption

Specific energy consumption both electrical and thermal energy per Ton of production for galvanizing and Wiredrawing units are furnished in Table 1.6 below:

Table 1.6: Specific Energy Consumption in Galvanizing and Wire-drawing Units

		Specific Energy Consumption			Unit
		Min	Max	Average	
Galvanizing	Electrical	5.12	120	46.15	kWh/Ton
	Thermal	200370	579600	385978	kcal/Ton
Wiredrawing	Electrical	30	868	308	kWh/Ton
	Thermal	135	511	323	kcal/Ton

Specific energy consumptions are found to vary widely for wire-drawing and galvanizing processes in the Howrah cluster as shown in the above table. This is because of the variation in size of units, size & type of job, fuels types and volume of process, as, for example, some of the Galvanizing units, manufacturing the microwave tower and high-tension electricity transmission towers, have extensive fabrication activity as a part of the process.

1.3 Existing technology/equipment

1.3.1 Description of existing technology

In a galvanizing unit, drying bed and zinc vat furnaces are used for drying the job before they are galvanized and for melting the zinc. The primary use of the furnaces in galvanizing units is to melt zinc into which the job to be galvanized is dipped. IS: 2629 – 1985 suggests temperature of the zinc vat as 440 - 460 deg C. Before dipping into the galvanizing bath the job is dried in the drying bed. Most of these furnaces were found to be very poorly insulated which leads to a considerable amount of heat loss from the surfaces, thereby, reducing the furnace efficiency and increasing the fuel consumption. It has been found that in a typical unit, surface temperature of the furnace wall & drying bed furnace is on an average 121 ^{o}C & 200 ^{o}C which if brought down to 60 ^{o}C ('touch temperature') through better insulation can save 1366 l/yr & 8688 l/yr of FO, respectively. The share of furnace oil cost among the entire fuel bill is about 91% and is approximately ₹ 30 lakh per year in a typical unit.

Existing furnace and drying bed specifications are shown in Table 1.7 below.

Table 1.7 Cluster specifications of furnace and drying bed

S. No.	*Parameter*	*Detail of furnace*
1	Manufacturer	Local
2	Dimensions	1.06 m x 0.66 m x 0.76 m to 6.8 m x 0.86 m x 0.86 m
3	Average fuel consumption	31 to 91 l/hr F.O.
4	Temperature	460 to 490 deg C molten zinc
5	Typical wall temperature	90 to 150 deg C
6	Ambient temperature max	40 deg C

In some areas of Howrah, such as, Jangalpur, electricity is supplied by the West Bengal State Electricity Distribution Company Limited (WBSEDCL) at the following tariff rates:

Energy charges

The cost of furnace oil and diesel oil in a typical unit is ₹ 30/l and ₹ 37/l respectively.

Table 1.8 Electricity charges for WBSEDCL

S. No.	Unit consumed, kWh	Energy Charges, ₹/kWh
1	Upto 500	4.63
2	Next 1500	5.81
3	Above 2000	6.07

Contract demand charges is ₹ 15/kVA. Thus the energy charge for a typical unit with contract demand of 49 kVA and average monthly energy consumption of 9157 kWh is ₹ 6.03 / kWh.

In some areas of Howrah, such as, Ghusuri, Liluah, electricity is supplied by CESC at the following tariff rates:

Table 1.9 Electricity charges for CESC

S. No.	Unit consumed, kWh	Energy Charges, ₹/kWh
1	For first 500	4.43
2	For next 1500	4.87
3	For next 1500	5.20
4	For above 3500	5.49

Contract demand charge is ₹ 15/kVA. Thus the energy charge for a typical unit with contract demand of 35.6 kVA and average monthly energy consumption of 4946 kWh is ₹ 5.21 / kWh.

1.3.2 Role in process

Furnaces heat up the vats in which zinc is melted. The job to be galvanized is dipped in the molten zinc during the hot dip process. IS: 2629 – 1985 suggests temperature of the zinc vat as 440 - 460 deg C. Before dipping into the galvanizing bath the job is dried in the drying bed.

1.4 Baseline establishment for existing technology

1.4.1 Design and operating parameters

The typical furnaces used at present in the galvanizing and Wire drawing units provide temperatures of 460 to 500 deg C. The typical dimension of furnace is 104 inch X 96 inch X 39 inch.

Table 1.10 Present furnace and drying bed furnace specifications

S. No.	*Parameter*	*Detail of zinc vat furnace*
1	Manufacturer	Local
2	Dimensions	104 inch X 96 inch X 39 inch
3	Average fuel consumption	41 l/hr F.O.
4	Temperature	465 deg C molten zinc
5	Temperature of the furnace	Up to 1200 deg C
6	Capacity	5 Ton zinc; 1.5 Ton per hour
7	Typical wall temperature	90 deg C
8	Ambient temperature max	40 deg C

Furnace Oil consumption in the galvanizing furnaces depend on the following parameters

a) Condition of the walls and insulation

b) Size of the job to be galvanized

c) Amount of excess air provided for combustion.

d) Amount of zinc to be heated

Fuel requirement in the galvanizing plant depends on the production. Detail of fuel consumption in a typical unit is given in Table 1.11 below:

Table 1.11 Fuel consumption at a typical galvanizing unit

S. No.	Energy Type	Unit	Value
1	Electricity	kWh/yr	59346
2	Furnace Oil	l/yr	105000

1.4.2 Operating efficiency analysis

Operating efficiency for a normal furnace is found to be in the range of 15 to 25%. The tables in annexure-1 shows a calculations of efficiency by the direct and the indirect methods.

1.5 Barriers in adoption of proposed equipment

1.5.1 Technological barrier

In Howrah cluster, the technical understanding of the Wiredrawing process has been excellent with several committed technical personnel having detailed know-how of the processes involved. Some of them are visiting countries like China and European ones to find the best possible technological solutions to the challenges in their units. Indeed there is committed effort on the part of the management in such units to grasp alterations which may give them benefits however with the caveat that the advantages be proven without any doubt.

People are generally reluctant to invest in an experimental scheme particularly if the sufficient savings are not guaranteed. Hence, finding the first person, who is willing to implement a change is still a challenge. While carrying out the audits and presenting the Energy audit reports to the units, in the discussion with the plant owners & other personnel, many of them agreed with many of the identified energy saving measures and technologies but they demanded demonstration of the energy saving technologies in any plant and thereafter they have readiness to follow.

1.5.2 Financial barrier

Discussions of financial issues with the units concluded that they are not scared of investments. The larger units are confident of financing their own alterations while the smaller units are certain to find good schemes from the banks to fund their respective efficiency measures. However, the good part of the discussions was that more and more units are

taking energy conservation measures seriously and willing to go the distance. A mention must be made of SIDBI whose schemes have attracted attention and can play a catalytic role in the implementation of the measures.

1.5.3 Skilled manpower

Technical personnel employed in the units are generally skilled works but not engineers. Thus the production process remains traditional. This is one of the main hindrances in adopting newer technology. Specialized training among the workforce and local experts can circumvent the problem significantly. Effective dissemination can enhance replication potential in the various units. The gains obtained by one plant can inspire other units to follow suit.

2. PROPOSED EQUIPMENT FOR ENERGY EFFICENCY IMPROVEMENT

2.1 Description of proposed equipment

2.1.1 Details of proposed equipment

All the galvanizing units and some Wiredrawing units have furnaces in them. These furnaces sustain temperatures of about 1000 ^{o}C for melting zinc and maintaining about 490 ^{o}C in the vat. However, the present efficiency of these furnaces are typically in the range of 15-25%. If the insulation on the walls are improved, so that there is better heat retention inside the furnace, we could expect better efficiencies, thereby lowering the consumption of fuel.

2.1.2 Equipment/technology specification

The furnaces used typically have wall temperatures in excess of 80 deg C. This can be brought down to less than 60 deg C.

Table 2.1 Technical specification of a furnace & drying bed

S. No	*Parameter*	*Detail*
1	Manufacturer	YANTRA SHILPA UDYOG (P) LTD.
2	Dimensions of Furnace	104 inch X 96 inch X 39 inch
3	Dimension of drying bed	31 inch X 24 inch X 10 inch
4	Length of duct from furnace to drying bed	12 feet
5	Length of duct from drying bed to chimney	12 feet
6	Area of duct line	12 inch X 12 inch
7	Average F.O. consumption	35 liter/hr
8	Air mass flow rate	657 kg/hr
9	Expected improvement in efficiency through furnace insulation	9 %

Further details of better insulation are shown in Annexure-3.

2.1.3 Integration with existing equipment

The insulating material could be added on the outer sides of the existing furnace, thereby being a very convenient way to adapt to the present apparatus.

The following are the reasons for selection of this technology

- It will reduce the total amount of fuel required.
- It reduces the GHG emissions
- This project is also applicable for getting the carbon credit benefits.

2.1.4 Superiority over existing system

Use of this technology reduces the amount of fuel required. It can amount to a saving of ₹ 3.36 lakh per year for the company with paybacks of about 10 months.

2.1.5 Source of equipment

There are many vendors for such technology. It has successfully been adopted and implemented throughout the country and benefits reaped been established beyond doubt. There are no concerns of scarcity of such devices and the prices are reasonable as well.

2.1.6 Availability of technology/equipment

Suppliers of this technology are available at local level very easily. Many of the suppliers took initiative in reaching out to the industry representatives and informing them about the utility of such devices.

2.1.7 Service providers

Details of technology service providers are shown in Annexure-7.

2.1.8 Terms and conditions in sales of equipment

50% of the charges would have to be paid upfront and the rest along with the taxes would have to be paid while sending the proforma invoice prior to dispatch. Further, the warranty period extends upto 2 months from the point of delivery for any inherent manufacturing defect or faulty workmanship.

2.1.9 Process down time

The down time might be 16 days for making changes to the improvement in furnace insulation and duct line insulation.

2.2 Life cycle assessment and risks analysis

Life of the equipment is about three years. Risk involves in the implementation of proposed project is to avoid any leaks on the inner channel to avoid mixing of the flue gas with the fresh air going in. Such leaks can affect the combustion process severely.

2.3 Suitable unit for Implementation of proposed technology

Suitable unit for implementation of this technology is a galvanizing unit having the production capacity of about 1712 Ton/yr and having total furnace oil of about 105000 l/yr.

3. ECONOMIC BENEFITS FROM PROPOSED TECHNOLOGY

3.1 Technical benefit

3.1.1 Fuel saving

Improvement in furnace insulation and duct line insulation would save more than 9903 liters of furnace oil over a year.

3.1.2 Electricity saving

This project does not affect the electricity consumption directly.

3.1.3 Improvement in product quality

The quality of the product would still remain the same. It shall have no impact on the galvanizing process but merely make it more efficient.

3.1.4 Increase in production

The production will remain the same as in present.

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

It does not affect the modes of heat lost but merely recovers the heat dumped into the flue gas.

3.2 Monetary benefits

The monetary benefits of the unit are mainly due to reduction in the furnace oil consumption by 9903 l/yr. This amounts to monetary savings of ₹ 336704/yr. A detailed estimate of the saving has been provided in the Table 3.1.

3.3 Social benefits

3.3.1 Improvement in working environment

Reduction in furnace oil consumption would probably not change the working environment apart from making the management happier.

Table 3.1 Energy and monetary benefit

S.No	Parameter	Unit	Value
1	Present furnace oil consumption in a unit	l/year	105000
2	Cost of furnace oil	₹ /l	34
3	Savings by improvement in furnace and duct line insulation	l/year	9903
4	Monetary savings due to furnace and duct line information	₹ /year	336704
5	Total monetary benefit	₹ /year	336704

Further details of total monetary benefit are given in Annexure - 3.

3.3.2 Improvement in workers skill

The workers would probably not find too much of a difference in the day to day operation of the device. Hence their skills are probably going to be unaffected.

3.4 Environmental benefits

3.4.1 Reduction in effluent generation

There would be less effluent generation since there would less fuel burned in the furnace.

3.4.2 Reduction in GHG emission

The measure helps in reducing CO_2 emission is 31492 kg/yr, as 3.18 kg of CO_2 would be reduced for a reduction of 1 kg of FO.

3.4.3 Reduction in other emissions like SO_X

Significant amount of SO_X will be reduced amounting to 63 kg/yr due to reduction in energy consumption, as 0.006318 kg of SO_X would be reduced for a reduction of 1 kg of FO.

4 INSTALLATION OF PROPOSED EQUIPMENT

4.1 Cost of project

4.1.1 Equipment cost

Improvement of furnace and duct line insulation cost is ₹ 3.01 lakh.

4.1.2 Erection, commissioning and other misc. cost

The installation & other costs could amount to a further ₹ 1.11 lakh.

Table 4.1 Details of proposed technology project cost

S.No	*Particular*	*Unit*	*Value*
1	Improvement of furnace and duct line insulation cost	₹(in lakh)	1.90
2	Cost of Installation	₹(in lakh)	0.80
3	Taxes & other misc. cost	₹(in lakh)	0.31
4	Total cost	₹(in lakh)	3.01

4.2 Arrangements of funds

4.2.1 Entrepreneur's contribution

The total cost is ₹ 301000. The entrepreneur shall have to pay 25% of the total amount upfront (i.e. ₹ 75250). The rest could be arranged as loans.

4.2.2 Loan amount

Loan amount would be 75% i.e. ₹ 2.26 lakh. There are loans available for buying such equipments from SIDBI and from the MSME of the Government of India which have 25% subsidy in some schemes.

4.2.3 Terms & conditions of loan

The interest rate is considered at 11%, which is SIDBI's rate of interest for energy efficient projects (refer to annexure-9). 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 project is expected to achieve monetary savings of ₹ 3.37 lakh /yr.

- 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.

Considering the above mentioned assumptions, the net cash accruals starting with ₹ 2.63 lakh in the first year operation and gradually increases to ₹ 15.12 lakh at the end of eighth year.

4.3.2 Simple payback period

The total cost of implementing the proposed technology is ₹ 3.01 lakh and monetary savings is ₹ 3.36 lakh. Hence the simple payback period works out to be 11 months.

4.3.3 Net Present Value (NPV)

The Net present value of the investment works out to be ₹ 9.49 lakh.

4.3.4 Internal rate of return (IRR)

The Internal rate of return of the project would be 87.38%.

4.3.5 Return on investment (ROI)

The average return on investment of the project activity works out at 29.22%.

Details of financial indicator are shown in Table 4.2 below:

Table 4.2 Financial indicators of proposed technology/equipment

S.No	Particulars	Unit	Value
1	Simple Pay Back period	Month	11
2	IRR	%age	87.38
3	NPV	₹(in lakh)	9.49
4	ROI	%age	29.22
5	DSCR	Ratio	4.40

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.

Details of sensitivity analysis at different scenarios are shown in Table 4.3 below:

Table 4.3 Sensitivity analysis at different scenarios

Particulars	IRR	NPV	ROI	DSCR
Normal	87.38	9.49	29.22	4.40
5% increase in fuel savings	91.48	10.08	29.43	4.60
5% decrease in fuel savings	83.25	8.90	28.99	4.19

4.5 Procurement and implementation schedule

Procurement and implementation schedule for proposed project are shown in Table 4.4 below.

Table 4.4 Procurement and implementation schedule

S. No.	*Activities*	*Weeks*								
		1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9-11*
1	Ordering the improvement of furnace and duct line insulation									
2	Replacing the duct line pathway									
3	Installing the furnace and duct line insulation									

Annexure

Annexure -1: Energy audit data used for baseline establishment

Calculation of efficiency of the furnace by the direct method

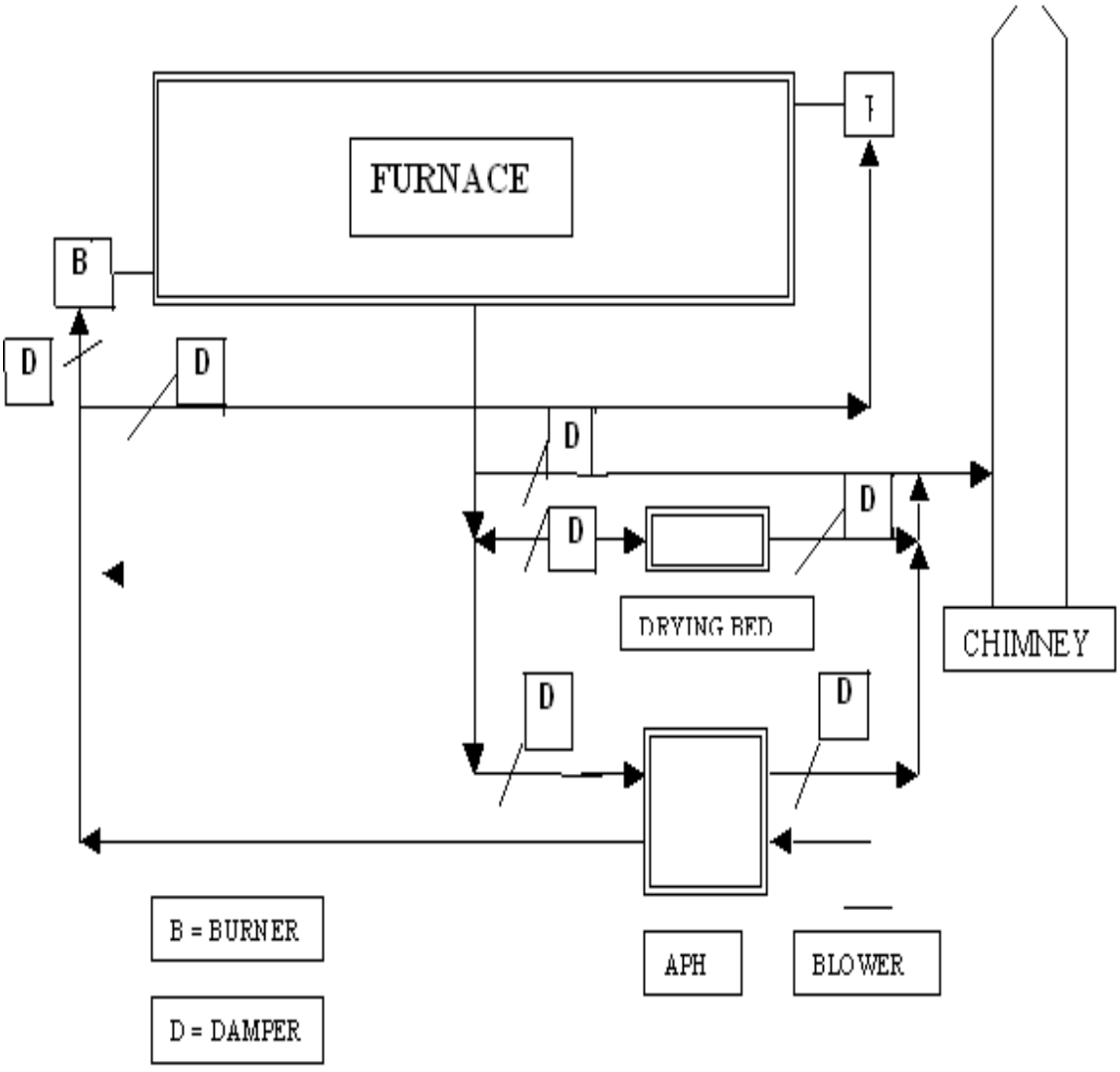
Parameter	*Unit*	*Value*
Production	kg/hr	833
Annual Production	Ton/yr	2399
GCV of Furnace Oil	kcal/kg	10500
Amount of FO required annually	l/yr	120480
Sp. Gravity of FO		0.92
Amount of FO required annually	kg/yr	110842
Energy burnt from FO annually	kcal/yr	1163836800
Energy burnt from FO annually	kJ/yr	4888114560
Zinc VAT temperature	deg C	520
Heat taken by zinc	kJ	49620144
Heat taken by iron	kJ	502440943
Heat taken by Metals	kJ/MT	205392
	kJ/yr	552061087
Efficiency	%	11.29

Calculation of efficiency of furnace by the indirect method

Parameter	*Unit*	*Value*
Flue gas temperature	deg C	490
Ambient temperature	deg C	40
Specific gravity of FO		0.92
Average FO consumption	l/hr	41
Average FO consumption	kg/hr	37.72
GCV of FO	kcal/kg	10500
Average oxygen percentage in flue gas		4.5
Sensible Heat Loss in Flue Gas		
Excess Air	%	27.27
Theoretical air required to burn 1 kg of oil	kg	15
Total air supplied	kg/kg of oil	19.09
Mass of fuel (1kg)	kg	1
Actual mass of air supplied/kg of fuel	kg/kg of oil	20.09
Specific heat of flue gas	kcal/kg/deg C	0.24
Temperature difference	deg C	450
Heat loss	kcal/kg of oil	2169.82
Heat loss in flue gas	%	20.66
Evaporation loss due to moisture content in FO		
Moisture in 1kg of FO	kg/kg of FO	0.15
Flue gas temperature	deg C	490

Parameter	***Unit***	***Value***
Ambient temperature	deg C	40
Temperature difference	deg C	450
GCV of FO	kcal/kg	10500
Loss	%	1.12
Loss due to Evaporation of water formed due to Hydrogen in FO		
Amount of hydrogen in 1 kg of FO	kg/kg of FO	0.1123
GCV of FO	kcal/kg	10500
Loss	%	7.57
Loss through furnace walls	%	9.2
Unaccounted for heat loss	%	48
Sensible Heat Loss in Flue Gas	%	20.66
Evaporation loss due to moisture content in FO	%	1.12
Loss due to Evaporation of water formed due to Hydrogen in FO	%	7.57
Loss through furnace side walls	%	9.2
Unaccounted Heat loss	%	48
Total Heat loss	%	86.56
Furnace Efficiency	%	13.44

Annexure -2: Process flow diagram after project implementation

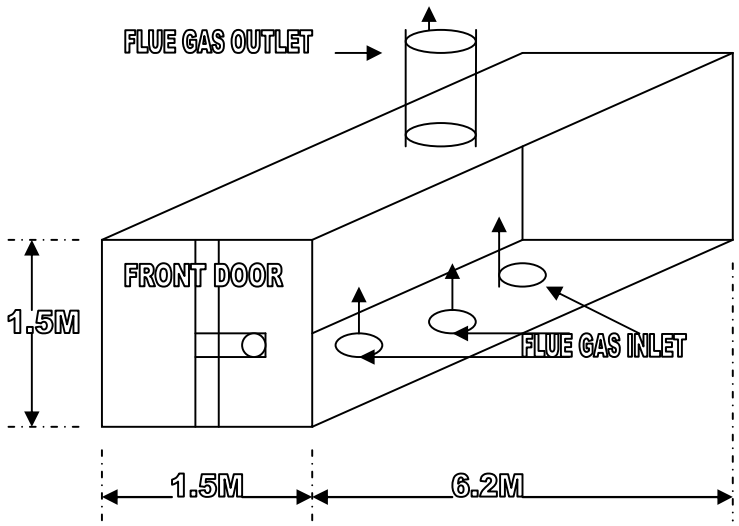


Annexure -3: Detailed technology assessment report

Parameter	Unit	Value	Value
Furnace dimension			
Length	mm	7685	
Breadth	mm	2430	
Height	mm	630	
Heating chamber/Drying Bed dimension			
Length	m	6.2	
Breadth	m	1.53	
Height	m	0.52	
Average FO consumption	l/hr	41	
Ambient Temperature around furnace	deg C	40	
Heat Loss through furnace side walls			
North Wall			**With Better Insulation**
Temperature	deg C	92	60
Heat loss at 92 deg C	kcal/m^2/hr	625	198
Area of furnace wall (north side)	m^2	1.53	1.53
Heat Loss	kcal/hr	957	304
Calorific Value of furnace oil	kcal/kg	10500	10500
Equivalent oil loss	kg/hr	0.09	0.03
Specific Gravity of Oil		0.92	0.92
Equivalent oil loss	l/hr	0.10	0.031441
Savings with better insulation	Rs/yr		6713.3
East Wall			
Temperature	deg C	121	60
Heat loss at 121 deg C	kcal/m^2/hr	1107	198
Area of furnace wall (north side)	m^2	4.8	4.8
Heat Loss	kcal/hr	5358	961
Calorific Value of furnace oil	kcal/kg	10500	10500
Equivalent oil loss	kg/hr	0.51	0.09
Specific Gravity of Oil		0.92	0.92
Equivalent oil loss	l/hr	0.55	0.1
Savings with better insulation	Rs/yr		44064.0
West Wall			
Temperature	deg C	54	60
Heat loss at 54 deg C	kcal/m^2/hr	128	198
Area of furnace wall (north side)	m^2	4.8	4.8
Heat Loss	kcal/hr	618	961
Calorific Value of furnace oil	kcal/kg	10500	10500
Equivalent oil loss	kg/hr	0.06	0.09
Specific Gravity of Oil		0.92	0.92
Equivalent oil loss	l/hr	0.06	0.1
Savings with better insulation	Rs/yr		

South Wall			
Temperature	deg C	69	60
Heat loss at 69 deg C	kcal/m^2/hr	312	198
Area of furnace wall (north side)	m^2	1.53	1.53
Heat Loss	kcal/hr	477	304
Calorific Value of furnace oil	kcal/kg	10500	10500
Equivalent oil loss	kg/hr	0.05	0.03
Specific Gravity of Oil		0.92	0.92
Equivalent oil loss	l/hr	0.05	0.03
Savings with better insulation	₹/yr		1958.4
Heating Chamber/Drying Bed			
Temperature	deg C	200	60
Heat loss at 300 deg C	kcal/m^2/hr	3173	224
Area of furnace wall	m^2	9.49	9.49
Heat Loss	kcal/hr	30097	2123
Calorific Value of furnace oil	kcal/kg	10500	10500
Equivalent oil loss	kg/hr	2.87	0.2
Specific Gravity of Oil		0.92	0.92
Equivalent oil loss	l/hr	3.12	0.22
Savings with better insulation	₹/yr		283968
Total Savings	**₹/yr**		336704
Total investment for furnace & duct line insulation	**₹/yr**		301000
Simple payback period	**months**		11

Annexure -4 Drawings for proposed electrical & civil works



Annexure -5: Detailed financial analysis

Assumption

Name of the Technology	Furnace Insulation		
Details	*Unit*	*Value*	*Basis*
No of working days	Days	240	
No of Shifts per day	Shifts	1	
No. Of operating Hours per day	Hrs.	12	
Proposed Investment			
Equipment cost	₹ (In lakh)	1.90	
Installation cost	₹ (In lakh)	0.80	
Other cost	₹ (In lakh)	0.31	
Total investment	₹ (In lakh)	3.01	
Financing pattern			
Own Funds (Equity)	₹ (In lakh)	0. 75	Feasibility Study
Loan Funds (Term Loan)	₹ (In lakh)	2.26	Feasibility Study
Loan Tenure	yr	5	Assumed
Moratorium Period	Months	6	Assumed
Repayment Period	Months	66	Assumed
Interest Rate	%/yr	10	SIDBI Lending rate
Estimation of Costs			
O & M Costs	% on Plant & Equip	4	Feasibility Study
Annual Escalation	% age	5	Feasibility Study
Estimation of Revenue			
Saving in furnace oil	liter/yr	99.03	
Cost of FO	₹/ litre	34	
St. line Depn.	% age	5.28	Indian Companies Act
Depreciation in the first year	% age	80	Income Tax Rules
Income Tax	% age	33.99	Income Tax

Estimation of Interest on Term Loan

Years	*Opening Balance*	*Repayment*	*Closing Balance*	*Interest*
1	2.26	0.12	2.14	0.32
2	2.14	0.24	1.90	0.23
3	1.90	0.48	1.42	0.19
4	1.42	0.50	0.92	0.13
5	0.92	0.64	0.28	0.07
6	0.28	0.28	0.00	0.01
		2.26		

WDV Depreciation

Particulars / years	*1*	*2*
Plant and Machinery		
Cost	3.01	0.60
Depreciation	2.41	0.48
WDV	0.60	0.12

Projected Profitability **₹ (in lakh)**

Particulars / Years	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Fuel savings	3.37	3.37	3.37	3.37	3.37	3.37	3.37	3.37
Total Revenue (A)	3.37	3.37	3.37	3.37	3.37	3.37	3.37	3.37
Expenses								
O & M Expenses	0.12	0.13	0.13	0.14	0.15	0.15	0.16	0.17
Total Expenses (B)	0.12	0.13	0.13	0.14	0.15	0.15	0.16	0.17
PBDIT (A)-(B)	3.25	3.24	3.23	3.23	3.22	3.21	3.21	3.20
Interest	0.32	0.23	0.19	0.13	0.07	0.01	-	-
PBDT	2.92	3.01	3.05	3.10	3.15	3.20	3.21	3.20
Depreciation	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
PBT	2.77	2.85	2.89	2.94	2.99	3.04	3.05	3.04
Income tax	0.18	0.86	1.04	1.05	1.07	1.09	1.09	1.09
Profit after tax (PAT)	2.59	1.99	1.85	1.89	1.92	1.96	1.96	1.95

Computation of Tax

₹ (in lakh)

Particulars / Years	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Profit before tax	2.77	2.85	2.89	2.94	2.99	3.04	3.05	3.04
Add: Book depreciation	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Less: WDV depreciation	2.41	0.48	-	-	-	-	-	-
Taxable profit	0.52	2.53	3.05	3.10	3.15	3.20	3.21	3.20
Income Tax	0.18	0.86	1.04	1.05	1.07	1.09	1.09	1.09

Projected Balance Sheet

Particulars / Years	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Liabilities								
Share Capital (D)	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Reserves & Surplus (E)	2.59	4.58	6.43	8.32	10.24	12.20	14.16	16.11
Term Loans (F)	2.14	1.90	1.42	0.92	0.28	0.00	0.00	0.00
Total Liabilities (D)+(E)+(F)	5.48	7.23	8.60	9.99	11.27	12.95	14.91	16.86

Assets	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Gross Fixed Assets	3.01	3.01	3.01	3.01	3.01	3.01	3.01	3.01
Less Accm. depreciation	0.16	0.32	0.48	0.64	0.79	0.95	1.11	1.27
Net Fixed Assets	2.85	2.69	2.53	2.37	2.22	2.06	1.90	1.74
Cash & Bank Balance	2.63	4.54	6.07	7.62	9.06	10.89	13.01	15.12
TOTAL ASSETS	5.48	7.23	8.60	9.99	11.27	12.95	14.91	16.86
Net Worth	3.34	5.33	7.19	9.07	11.00	12.95	14.91	16.86
Debt Equity Ratio	2.84	2.52	1.88	1.22	0.37	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	0.75	-	-	-	-	-	-	-	-
Term Loan	2.26								
Profit After tax		2.59	1.99	1.85	1.89	1.92	1.96	1.96	1.95
Depreciation		0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Total Sources	3.01	2.75	2.15	2.01	2.05	2.08	2.11	2.12	2.11
Application									
Capital Expenditure	3.01								
Repayment Of Loan	-	0.12	0.24	0.48	0.50	0.64	0.28	-	-
Total Application	3.01	0.12	0.24	0.48	0.50	0.64	0.28	-	-
Net Surplus	-	2.63	1.91	1.53	1.55	1.44	1.83	2.12	2.11
Add: Opening Balance	-	-	2.63	4.54	6.07	7.62	9.06	10.89	13.01
Closing Balance	-	2.63	4.54	6.07	7.62	9.06	10.89	13.01	15.12

IRR

₹ (in lakh)

Particulars / months	***0***	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***
Profit after Tax		2.59	1.99	1.85	1.89	1.92	1.96	1.96	1.95
Depreciation		0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Interest on Term Loan		0.32	0.23	0.19	0.13	0.07	0.01	-	-
Cash outflow	(3.01)	-	-	-	-	-	-	-	-
Net Cash flow	(3.01)	3.07	2.38	2.20	2.17	2.15	2.12	2.12	2.11
IRR	87.38%								

NPV	9.49

Break Even Point

Particulars / Years	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***
Variable Expenses								
Oper. & Maintenance Exp	0.09	0.09	0.10	0.10	0.11	0.12	0.12	0.13
Sub Total*(G)*	0.09	0.09	0.10	0.10	0.11	0.12	0.12	0.13
Fixed Expenses								
Oper. & Maintenance Exp (25%)	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04
Interest on Term Loan	0.32	0.23	0.19	0.13	0.07	0.01	0.00	0.00
Depreciation *(H)*	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Sub Total (I)	0.51	0.42	0.38	0.32	0.26	0.21	0.20	0.20
Sales (J)	3.37	3.37	3.37	3.37	3.37	3.37	3.37	3.37
Contribution (K)	3.28	3.27	3.27	3.26	3.26	3.25	3.25	3.24
Break Even Point (L= G/I)	15.60%	12.96%	11.55%	9.87%	8.08%	6.36%	6.14%	6.21%
Cash Break Even {(I)-(H)}	10.75%	8.11%	6.68%	5.00%	3.21%	1.47%	1.24%	1.31%
Break Even Sales (J)*(L)	0.53	0.44	0.39	0.33	0.27	0.21	0.21	0.21

Return on Investment

₹ (in lakh)

Particulars / Years	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*Total*
Net Profit Before Taxes	2.77	2.85	2.89	2.94	2.99	3.04	3.05	3.04	23.57
Net Worth	3.34	5.33	7.19	9.07	11.00	12.95	14.91	16.86	80.65
									29.22%

Debt Service Coverage Ratio

₹ (in lakh)

Particulars / Years	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*Total*
Cash Inflow									
Profit after Tax	2.59	1.99	1.85	1.89	1.92	1.96	1.96	1.95	12.20
Depreciation	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.95
Interest on Term Loan	0.32	0.23	0.19	0.13	0.07	0.01	0.00	0.00	0.95
Total (M)	3.07	2.38	2.20	2.17	2.15	2.12	2.12	2.11	14.10

DEBT

Interest on Term Loan	0.32	0.23	0.19	0.13	0.07	0.01	0.00	0.00	0.95
Repayment of Term Loan	0.12	0.24	0.48	0.50	0.64	0.28	0.00	0.00	2.26
Total (N)	0.44	0.47	0.67	0.63	0.71	0.29	0.00	0.00	3.21
	6.95	5.03	3.30	3.46	3.04	7.34	0.00	0.00	4.40
Average DSCR (M/N)	4.40								

Annexure:-6 Procurement and implementation schedule

Break up of shutdown period of plant required for furnace insulation

S.No	Activity	Day
1	Furnace and drying bed Insulation	6
2	Insulation in the duct line	9

Annexure -7: Details of technology service providers

S.No.	Name of Service Provider	Address	Contact Person and No.
1	Yantra Shilpa Udyog (P) Ltd	12-B, Amritlal Bose Street, Kolkata-700 005	Mr. Swapan Kr. Dutta Phone : 91-33-2555 0316 / 2555 0539 Fax : 91-33-2555 1995 Email : htsu@cal3.vsnl.net.in Web : www.hytsu.co.in
2	LOI Wesman Thermprocess Pvt Ltd	Wesman Center, 8 Mayfair Road, Kolkata 700 019, India	Mr. Prasant Saha Mobile : 9831868732 Tel: +91 (33) 40020300 Fax: +91 (33) 22008050 wesman.com
		uria	
		4@yahoo.co.in	

Annexure -8: Quotations or Techno-commercial bids for new technology/equipment

YSU

WEB: www.hytsu.co.in

YANTRA SHILPA UDYOG (P) LTD.
12-B, AMRITALAL BOSE STREET, KOLKATA – 700 005.
PHONE: 91 – 33 – 2555 0316 / 2555 0539
FAX : 91 – 33 – 2555 1995.
EMAIL : htsu@cal3.vsnl.net.in

Our Ref YSU/33/ENQ/10-11 December 28, 2010

TO

Energy Management Department of MPSM
Indian Institute of Social Welfare & Business Management (IISWBM)
Management House; College Square West; Kolkata - 700 073, INDIA
Ph. 033 2241 3756/5792/8694/8695; Mob. 94331 53009;
Fax 033 22413975 (pp)
Email: binoykchoudhury@gmail.com; iiswbm@iiswbm.edu

YSU

WEB: www.hytsu.co.in

TERMS AND CONDITIONS:

PRICES:	Ex-Works, Kolkata.
PACKING & FORWARDING CHARGES:	2% Extra, at actual.
INSTALLATION	Rs. 80, 000.00 Lump-sum
VAT:	4% Extra, as applicable.
EXCISE DUTY:	Extra as applicable at the time of delivery.
PAYMENT:	30% of the value is to be paid as an advance along with order – balance before delivery against Proforma Invoice of each consignment.
DELIVERY:	2 months from the date of receipt of your firm Order clear in all respect both technically and commercially.

Annexure -9: SIDBI financing scheme for energy saving projects in MSME sector

S. No.	Parameter	Norms
1	Minimum Assistance	Rs.10 lakh
2	Minimum promoters contribution	25% for existing units 33% for new units
3	Debt Equity Ratio	Maximum 2.5 :1
4	Interest Rate	The project expenditure eligible for coverage under the Line will carry rate of interest of 11% p.a. payable monthly
5	Upfront fee	Non refundable upfront fee of 1% of sanctioned loan plus applicable service tax.
6	Security	First charge over assets acquired under the scheme; first/second charge over existing assets and collateral security as may be deemed necessary.
7	Asset coverage	Minimum Asset Coverage should be 1.4:1 for new units and 1.3:1 for existing units.
8	Repayment period	Need based. Normally, the repayment period does not extend beyond 7 years. However, longer repayment period of more than 7 years can be considered under the Line if considered necessary.

Source: http://www.sidbi.in/energysaving.asp

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