DETAILED PROJECT REPORT
ON
AIR PRE HEATER AND FLUX SOLUTION HEATING
HOWRAH CLUSTER











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AIR PRE-HEATER AND FLUX SOLUTION HEATING FOR GALVANIZING AND ANNEALING FURNACES

HOWRAH GALVANIZING

AND WIRE DRAWING CLUSTER

BEE, 2010

Detailed Project Report on Air-Pre Heater and Flux Solution Heating for Galvanizing and Annealing Furnaces

Galvanizing and Wire Drawing SME Cluster,

Howrah, West Bengal (India)

New Delhi: Bureau of Energy Efficiency;

Detail Project Report No: ***HWR/WDG/APH/02***

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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
GWh	Giga Watt Hours
IRR	Internal Rate of Return
MT	Million Ton
NPV	Net Present Value
ROI	Return on Investment
SHC Coal	Semi Hard Coke Coal
SIDBI	Small Industrial Development Bank of India
MoMSME	Ministry of Micro Small and Medium Enterprises

EXECUTIVE SUMMARY

Indian Institute of School Welfare and Business management (IISWBM), Kolkata is executing BEE-SME program in the Galvanizing and Wire Drawing 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 is Galvanizing and Wire-drawing cluster 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% wire drawing 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 of the cluster has furnaces to melt zinc. Even some of the wire-drawing units have furnaces to perform annealing. Conventionally, the flue gas from these furnaces is simply allowed to escape, taking away a lot of unused heat. A part of the wasted heat may be recovered by installing apparatus to circulate the flue gas under a container that has flux solution. The rest of the wasted heat maybe recovered by installing apparatus like Air Pre-Heater where the secondary air to be used for combustion is pre-heated, thereby consuming less fuel.

Installation the boiling flux solution as well as air pre heater in the existing furnace would lead to fuel saving upto 5647 litre furnace oil per year from air pre heater and about 19200 litre Diesel oil due to heating of flux solution by utilising waste heat from flue gas.

This DPR highlights the details of the study conducted for assessing the potential for installation of proposed technology, 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)	2.94
2	Furnace Oil saving	Litre/year	5647
3	Diesel Oil saving	Litre/year	19200
4	Monetary benefit	₹ (in lakh)	8.80
5	Debit equity ratio	Ratio	3:1
6	Simple payback period	Years	0.33
7	NPV	₹ (in lakh)	28.64
8	IRR	%age	217.06
9	ROI	%age	31.97
10	DSCR	Ratio	11.71
11	Process down time	Days	5

The projected profitability and cash flow statements indicate that the project implementation i.e. installation of boiling flux solution as well as air pre heater will be financially viable and technically feasible solution for galvanizing and wire drawing 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 Wire Drawing 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*:**

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 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.

Activity 3: 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.

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 cluster

The Galvanizing and Wire-drawing 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% wire drawing 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 wire drawing 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 Wire Drawing 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

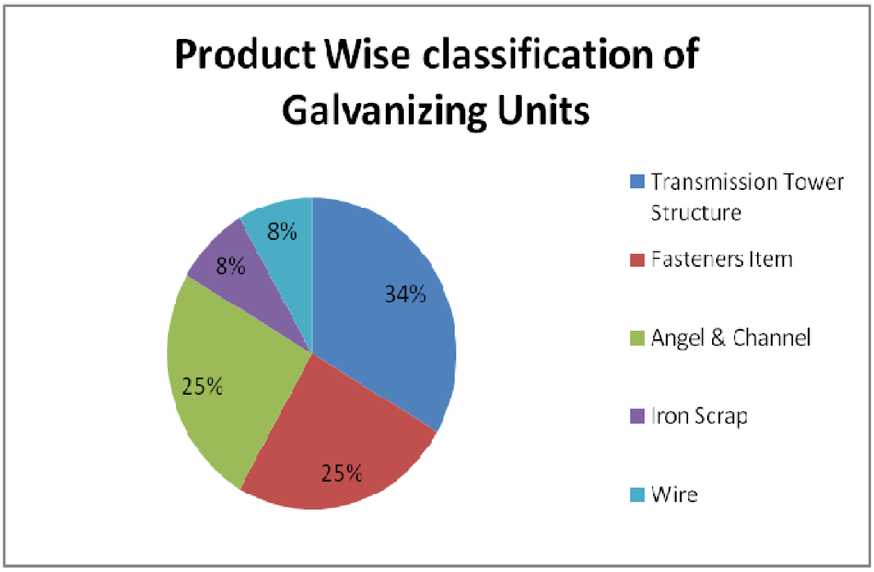


Figure 1.1: Product Wise Classification of Galvanizing Units

Similarly, the wire drawing 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

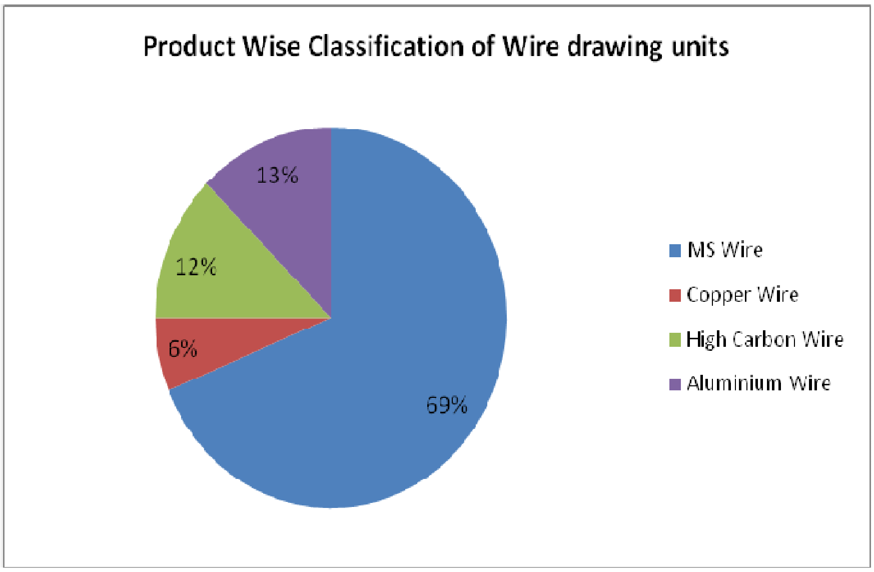


Figure 1.2: Product Wise Classification of Wire-drawing Units

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 Wire Drawing units have been classified on the basis of production into three categories, namely 1-500 TPA (calling micro scale), 500-1000 TPA (Small scale) and above 1000 TPA (medium scale) capacities.

The distribution of units of Galvanizing and Wire Drawing industries has been depicted in Figures 1.3 and 1.4 below:

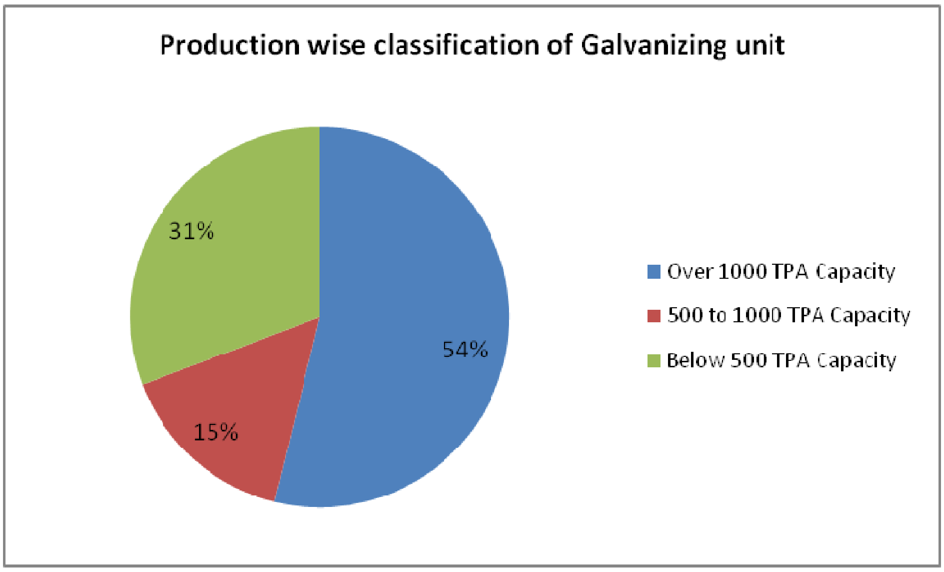


Figure 1.3: Production Wise Classification of Galvanizing Units

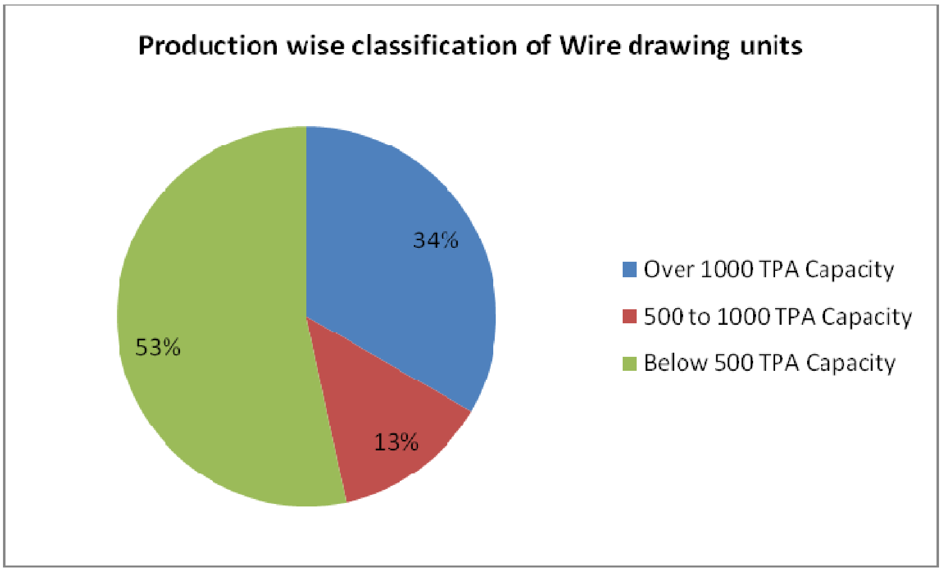


Figure 1.4: Production Wise Classification of Wire-drawing Units

Energy usages pattern

Average yearly electricity consumption in Wire Drawing 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 yearly 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 kilolitre/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 wire drawing 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 below:

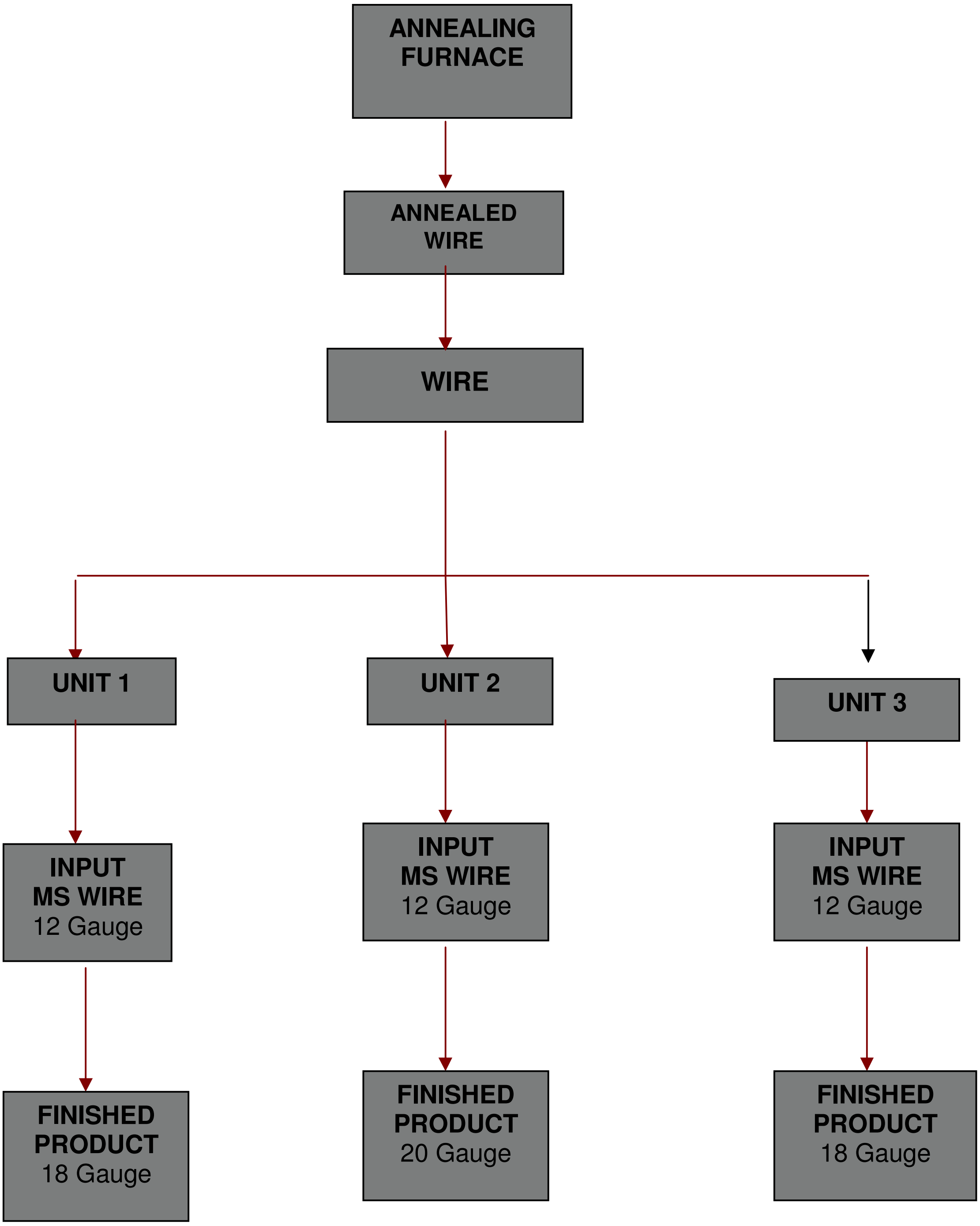


Figure 1.5 Process flow diagram for a typical wire drawing unit

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 Figure 1.6 below:

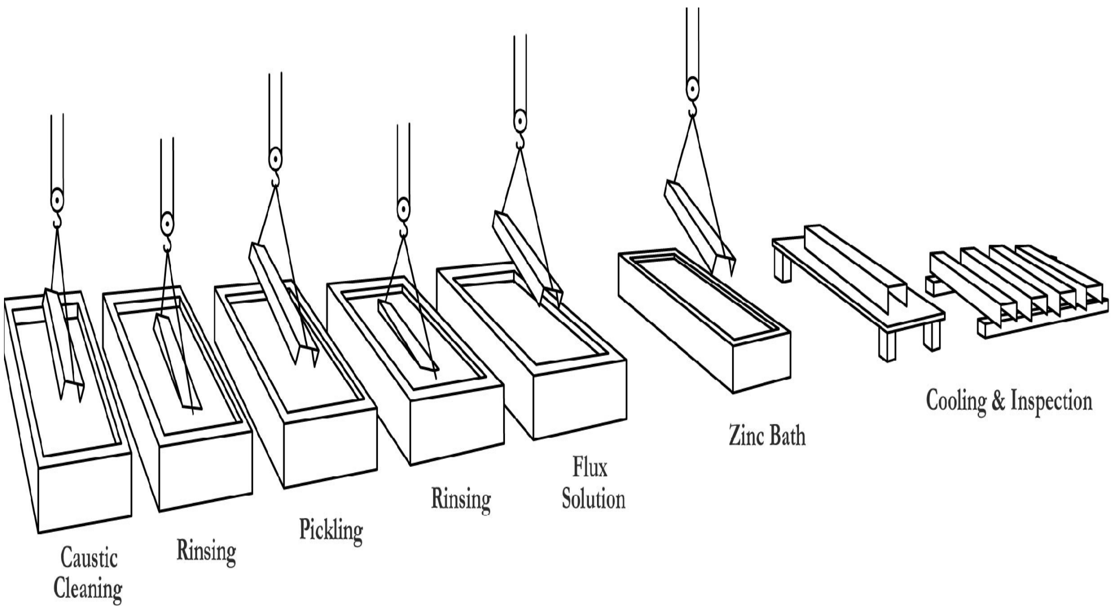


Fig 1.6: Process Flow diagram of galvanizing unit

1.2 Energy performance in existing system

1.2.1 Fuel consumption

Average fuel and electricity consumption in typical wire drawing 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 wire drawing industries have furnaces and also perform annealing. Among the wire drawing units audited, only one, which was also larger used wood for annealing. Further, most of the wire drawing unit produces MS wires.

Table 1.2 Average fuel and electricity consumption in typical wire drawing 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 wire drawing 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 wire drawing 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 wire drawing 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
Wire Drawing	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, furnace oil is being used in zinc vat furnace and diesel or **coal** is used as fuel for the boiling flux solution. The percentage of the cost of furnace oil among the entire fuel bill is about 73% and costs approximately ₹ 37 lakh per year in a typical unit. The corresponding figures for diesel oil, being used for boiling the flux solution, are 14% of fuel bill and cost approximately ₹ 7 lakh per year i.e. 19200 litre per year @ ₹ 37 per litre. This oil is burnt to boil continuously about 70 to 80 litre flux solution during the entire galvanizing process. A brief description of existing process is shown in Fig. 1.6 of section 1.1. Fuel is used very inefficiently for flux solution heating. On the contrary significant amount of heat is wasted through flue gas at a temperature 470 deg C (Fig. 1.7) much higher than the temperature required for flux solution heating. Moreover this waste heat can also be utilized for flux solution heating and the combustion air in a air pre-heater which is absent in existing technology in the cluster. The waste can be equivalent to 22371 liter of oil (or 54027 kg of coal) per annum. The calculations of heat loss are shown below.

Table 1.7: Heat loss calculation

Particular	Unit	Value
Flue gas temperature	deg C	470
Mass flow of flue gas (from measurement)	kg/kg of fuel	21.72
Specific heat of flue gas	kcal/kg/deg C	0.24
Allowable exhaust temperature of flue gas	deg C	100
Temperature drop	deg C	370
Heat loss	kcal/kg of fuel	1929
Total oil consumption	l/yr	120480

Particular	Unit	Value
Total oil consumption	kg/yr	112046
Heat loss per year	kcal/yr	216107925
Gross Calorific Value of oil	kcal/kg	10500
Equivalent oil loss	kg/yr	20582
	litre/yr	22371
Gross Calorific Value of coal	kcal/kg	4000
Equivalent coal loss	kg/yr	54027

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 treated in the boiling flux solution and subsequently dried with its own sensible heat. The flux solution contains ammonium chloride and helps in preventing oxidation of the jobs surface before it is galvanized to make the quoting more permanent and uniform. Existing furnace and flux solution vat specifications are shown in Table 1.8.

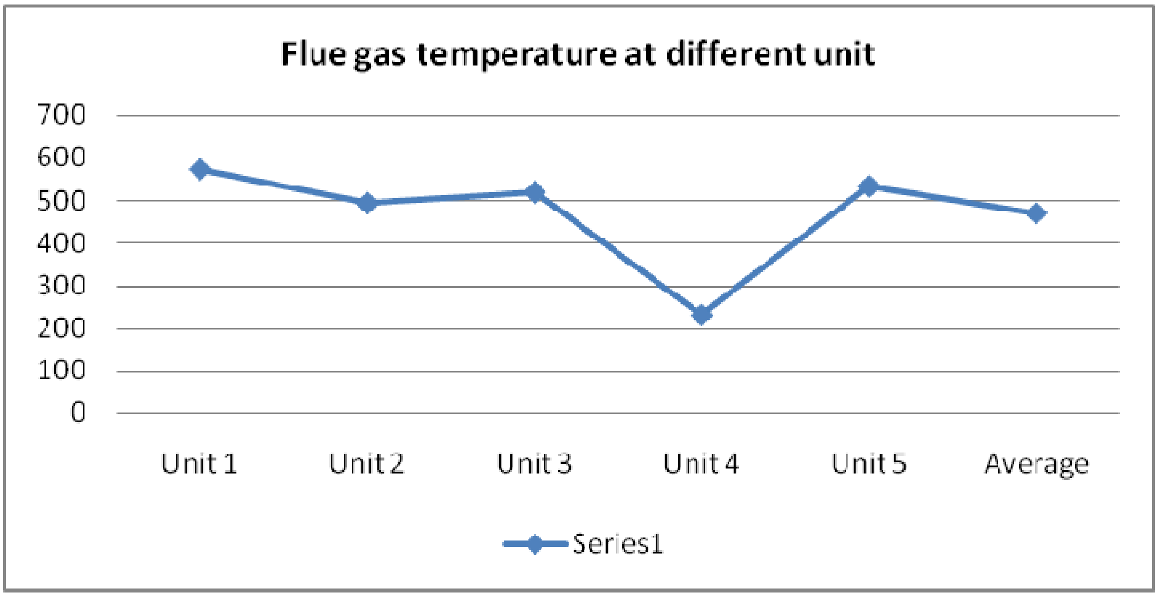


Fig 1.7: Flue gas temperature at different unit

Table 1.8 Cluster specifications of present furnace and flux solution vat

S. No.	Parameter	Detail of zinc vat furnace	Detail of flux solution vat
1	Manufacturer	Local	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	31 inch X 24 inch X 10 inch
3	Average fuel consumption	31 to 42 l/hr F.O.	5-8 l/hr diesel; 60–140 kg/day coal
4	Temperature	460 to 490 deg C zinc vat	90-100 deg C flux solution
5	Capacity of vat	5 to 13 Ton zinc	200 – 500 litre flux solution
6	Typical wall temperature	90 to 150 deg C	NAp (It is mostly underground)
7	Ambient temperature max	30 deg C	30 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/litre and ₹37/litre respectively.

Table 1.9 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 charge is Rs. 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 Rs. 6.03 / kWh.

In some areas of Howrah, such as, 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 charges are Rs.15/kVA. Thus the energy charge for a typical unit with contract demand of 71.8 kVA and average monthly energy consumption of 8972 kWh is Rs. 5.40 /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 treated in the boiling flux solution and subsequently dried with its own sensible heat.

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 and the boiling flux solution vat dimension is 31 inch X 24 inch X 10 inch.

Table 1.10 Present furnace and flux solution heating furnace specifications

S. No.	Parameter	Detail of zinc vat furnace	Detail of flux-solution heating furnace
1	Manufacturer	Local	Local
2	Dimensions	104 inch X 96 inch X 39 inch	31 inch X 24 inch X 10 inch
3	Average fuel consumption	41 l/hr F.O.	7 l/hr diesel
4	Temperature	465 deg C molten zinc	90-100 deg C flux solution
5	Temperature of the furnace	Up to 1200 deg C	1000 deg C
6	Capacity	5 Ton zinc; 1.5 Ton per hour	250 l; 1.5 Ton per hour
7	Typical wall temperature	90 deg C	NAp (It is mostly underground)
8	Ambient temperature max	40 deg C	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	107670
2	Furnace Oil	l/yr	120480
3	Diesel Oil	l/yr	19200

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 show a calculation 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 wire drawing 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 those 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 wire drawing units have one main furnace and one side furnace in them. The main furnace lets flue gases out at temperatures of 400-600 ^{o}C which simply escape to the environment. The heat in the flue gas could be reused to completely bypass using fuel in the secondary furnaces. The flue gas line is designed in such a way as to circulate under the flux solution container, thereby heating it in the process. The temperature required to boil flux solution would be about 100 deg C, and could be easily done by the flue gas which is at 400 - 600 ^{o}C. The rest of waste heat is utilizing in the air pre heater. If the secondary combustion air to the furnace is pre-heated using the Air Pre-Heater, the furnace requires less fuel.

2.1.2 Equipment/technology specification

The furnaces used typically dump flue gases at temperatures of 400-600 ^{o}C. The device to boil flux solution reuses this waste heat. After using the flue gas in boiling flux solution, it is used in the air pre heater.

Table 2.1 Technical specification of an air pre-heater

S. No	Parameter	Detail
1	Manufacturer	YANTRA SHILPA UDYOG (P) LTD.
2	Dimensions of APH	1 m x 1 m x 1.5 m
3	Chimney diameter	300 mm
4	Average F.O. consumption	41 liter/hr
5	Air mass flow rate	1204 kg/hr
6	Temperature of fresh air at the APH inlet	30 deg C
7	Temperature of combustion air at the APH outlet	120 deg C
8	Typical temperature of flue gas going into APH	490 deg C
9	Typical temperature of flue gas coming out of APH	380 deg C
10	Expected improvement in efficiency	4.8 %

Table 2.2 Technical specification of a boiling flux solution vat

S. No	Parameter	Detail
1	Manufacturer	YANTRA SHILPA UDYOG (P) LTD.
2	Dimensions of flux solution vat	Dia-300 mm, Height-500 mm
3	Material size	30 mm
4	Temperature of flux solution	90 - 100 deg C
5	Typical temperature of flue gas going into under the flux solution container	490 deg C
6	Typical temperature drop in process	150 deg C
7	Ambient temperature max	40 deg C

Further details of APH and flux solution vat are shown in Annexure-3.

2.1.3 Integration with existing equipment

The flue gas coming out of the furnace could be circulated in a channel under the flux solution container. This apparatus could be installed separately and would not affect the operation of the furnace in any way. The rest of the flue gas after using in boiling flux solution vat, could be put into the inner channel of an Air Pre-Heater where the combustion air would circulate on the outer side.

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 and completely suitable with the existing furnace. It can amount to savings of the order of ₹ 879819 per year for the company with paybacks of about 4 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 Performa invoice prior to dispatch. Further the warranty period extends upto 12 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 five days for making changes to the flue gas line and install the boiling flux solution vat and APH.

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 galvanizing units as most of them are having the flue gas temperature out of the furnace at 470 deg C on an average. All of them need drying of pickled and water cleansed job before dipping in to galvanizing vat. Units using boiling flux solution, however, would not require this, as the job out of the boiling flux solution would dry by its own sensible heat. Preheating of combustion air utilizing waste heat from flue gas would reduce fuel consumption in each and every case. The production capacity of a typical unit is about 2399 Ton/year and having total furnace oil and diesel oil consumption is about 120480 liter and 19200 liter per year respectively.

3. ECONOMIC BENEFITS FROM PROPOSED TECHNOLOGY

3.1 Technical benefit

3.1.1 Fuel saving

Installing Air pre heater & boiling flux solution would save more than 5647 liters of furnace oil and 19200 liters diesel oil over a year. Actually there is no need to diesel oil for flux solution. Boiling flux solution is heating by flue gas.

3.1.2 Electricity saving

This project does not affect the electricity consumption ***directly or indirectly.***

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 and diesel oil consumption by 5647 litre and 19200 litre per year respectively. This lead to monetary savings is of Rs. 8,79,810 /yr. Detail of the saving calculation 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	litre/year	120480
2	Cost of furnace oil	Rs. /litre	30
3	Present diesel oil consumption in a unit	litre/year	19200
4	Cost of diesel oil	Rs. /litre	37
5	Savings by using APH	litre/year	5647
6	Saving by using flue gas for boiling flux solution	litre/year	19200
7	Monetary savings due to APH and boiling flux solution	Rs. /year	879810

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 since it reduces 5195 kg & 16896 kg of FO & diesel consumption respectively, annually. Reduction of CO_2 emission amounts to 16833 kg/yr & 53729 kg/yr for FO & diesel respectively, as 3.24 kg of CO_2 and 3.18 kg of CO_2 would be reduced for a reduction of 1 kg of FO and diesel respectively.

3.4.3 Reduction in other emissions like SO_X

Significant amount of SO_X will be reduced amounting to 33 kg/yr & 65 kg/yr due to reduction in FO & diesel consumption respectively, as 0.006318 kg of SO_X and 0.003872 kg of SO_X would be reduced for a reduction of 1 kg of FO and diesel respectively.

4 INSTALLATION OF PROPOSED EQUIPMENT

4.1 Cost of project

4.1.1 Equipment cost

The cost of Air pre heater & boiling flux solution is ₹ 2,25,000/- as per the quotation provided by the vendor given in Annexure 8.

4.1.2 Erection, commissioning and other misc. cost

The installation & other costs could amount to further ₹ 69,340. Detail of project cost is given in Table 4.1 below:

Table 4.1 Details of proposed technology project cost

S.No	Particular	Unit	Value
1	Cost of APH and boiling flux solution vat	₹ (In lakh)	2.25
2	Cost of Installation	₹ (In lakh)	0.40
3	Taxes & other misc. cost	₹ (In lakh)	0.29
4	Total cost	₹ (In lakh)	2.94

4.2 Arrangements of funds

4.2.1 Entrepreneur's contribution

The entrepreneur shall have to pay 25% of the total amount upfront i.e. ₹ 0.74 lakh. The rest could be arranged as loans.

4.2.2 Loan amount

Loan amount would be 75% i.e. ₹ 2.21 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 10%, 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 5 years excluding moratorium period of 6 months. 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 ₹ 8.80 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 ₹ 6.18 lakh in the first year operation and gradually increases to ₹ 43.93 lakh at the end of eighth year.

4.3.2 Simple payback period

The total cost of implementing the proposed technology is ₹ 2.94 lakh and monetary savings is ₹ 8.80 lakh. Therefore, simple payback period works out to be 4 months.

4.3.3 Net Present Value (NPV)

The Net present value of the investment works out to be ₹ 28.64 lakh.

4.3.4 Internal rate of return (IRR)

The Internal rate of return of the project would be 217.06%.

4.3.5 Return on investment (ROI)

The average return on investment of the project activity works out at 31.97%.

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	4
2	IRR	%age	217.06
3	NPV	Rs. lakh	28.64
4	ROI	%age	31.97
5	DSCR	Ratio	11.71

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	217.06	28.64	31.97	11.71
5% increase in fuel savings	227.19	30.19	32.05	12.33
5% decrease in fuel savings	206.91	27.09	31.88	11.18

4.5 Procurement and implementation schedule

Procurement and implementation schedule required about 6 weeks for proposed project. Detail of Procurement and implementation schedule is given in Annexure 6.

ANNEXURE

Annexure -1: Energy audit data used for baseline establishment

Calculation of efficiency of the furnace by the direct method

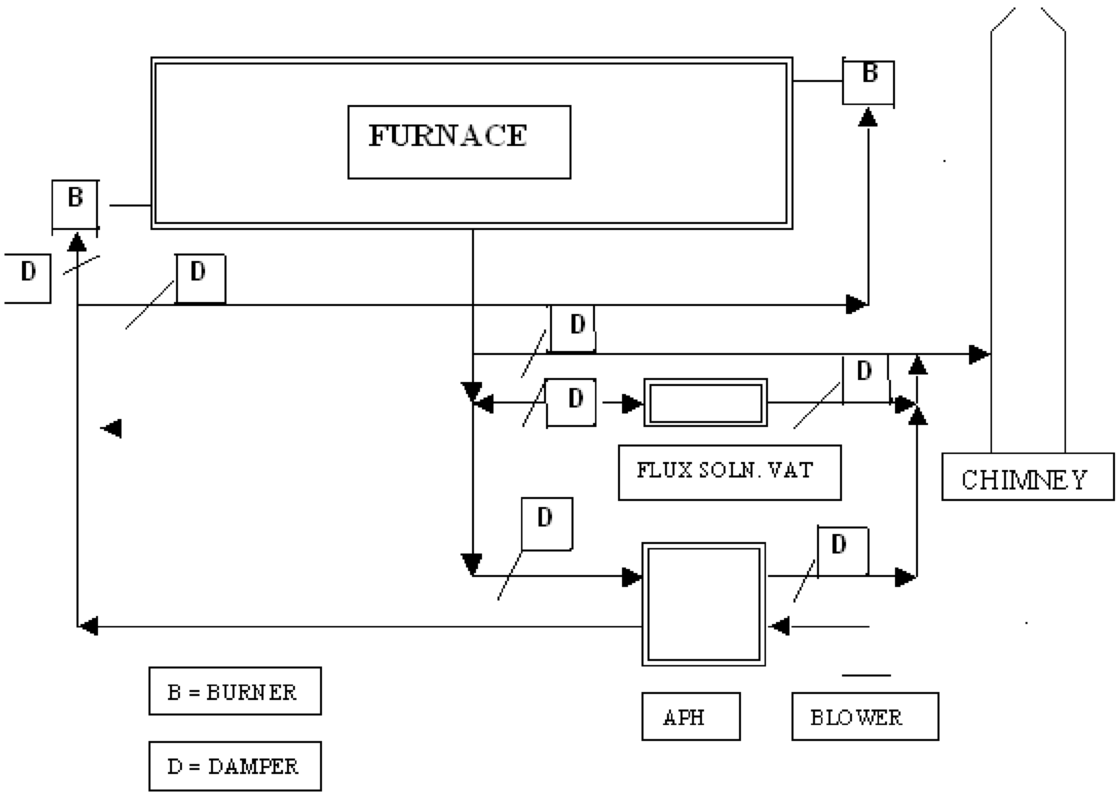
Parameter	Unit	Value
Production	kg/hr	833
Annual Production	Ton/yr	2399
GCV of Furnace Oil	kCal/kg	10500
Amount of FO required annually	litre/yr	120480
Sp. Gravity of FO	-	0.92
Amount of FO required annually	kg/yr	110842
Energy burnt from FO annually	kCal/yr	1163836800
Energy burnt from FO annually	kJ/yr	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
Heat utilized	kJ/yr	552061087
Efficiency	% age	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	litre/hr	41
Average FO consumption	kg/hr	37.72
GCV of FO	kCal/kg	10500
Average oxygen percentage in flue gas	% age	4.5
Excess Air	% age	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	**% age**	**20.66**
Moisture in 1kg of FO	kg/kg of FO	0.15
GCV of FO	kCal/kg	10500
Evaporation loss due to moisture content in FO	% age	1.12
Amount of hydrogen in 1 kg of FO	kg/kg of FO	0.1123

Parameter	***Unit***	***Value***
GCV of FO	kCal/kg	10500
Loss due to Evaporation of water formed due to Hydrogen in FO	% age	7.57
Loss through furnace walls	% age	9.2
Unaccounted for heat loss	% age	48
Total Heat loss	% age	86.56
Furnace Efficiency	% age	13.44

Annexure -2: Process flow diagram after project implementation

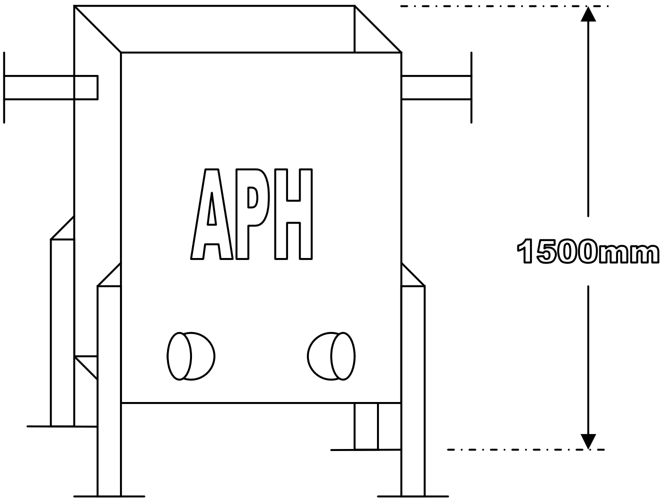


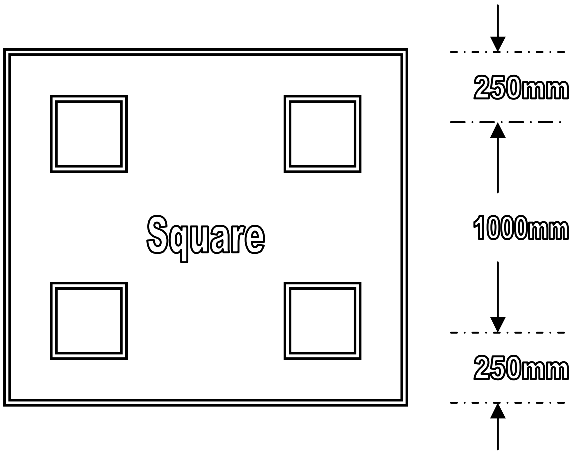
Annexure -3: Detailed technology assessment report

Particulars	Units	Value
Annual FO consumption	litre/yr	120480
Temperature of the flue gas at APH inlet	deg C	490 or 260*
The Temperature of the flue gas at APH outlet	deg C	380 or 150*
Drop in temperature	deg C	110
Increase in efficiency	%age	4.687
Furnace oil saving due to APH	litre/yr	5647
Savings	₹/yr	169410
Annual diesel oil consumption	litre/yr	19200
Temperature of the flue gas at boiling flux solution vat inlet	deg C	490
The Temperature of the flue gas at boiling flux solution vat outlet	deg C	260
Savings due to heating of flux solution by exhaust flue gas	₹/yr	710400
Total savings	₹/yr	879810
Total investment	₹	294340
Estimated life of system	Yrs	3
Simple payback	months	4

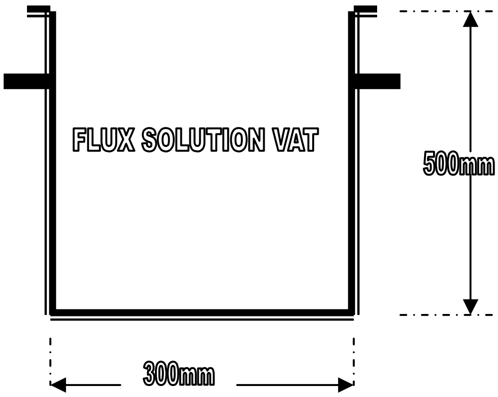
**Temperature of flue gas at out let of flux box*

Annexure -4 Drawings for proposed electrical & civil works

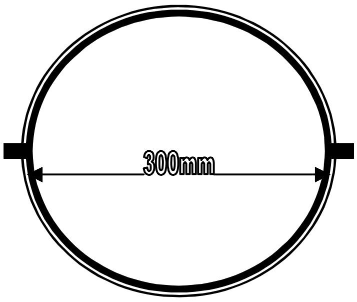




For boiling flux solution



ELEVATION



PLAN

Annexure -5: Detailed financial analysis

Assumption

Name of the Technology	Air Pre-heater with Flux Solution Vat		
Details	**Unit**	**Value**	**Basis**
No of working days	Days	300	Feasibility Study
No of Shifts per day	Shifts	1	Feasibility Study
Proposed Investment			
Investment for Air Pre-heater	₹ (In lakh)	1.80	Feasibility Study
Investment for Flux Solution Vat	₹ (In lakh)	0.45	
Cost of installation	₹ (In lakh)	0.40	
VAT 4 % will be charged	₹ (In lakh)	0.072	Feasibility Study
Packaging & forwarding	₹ (In lakh)	0.036	Feasibility Study
Excise duty (@ 10.3%) will be charged	₹ (In lakh)	0.18	
Total investment	₹ (In lakh)	2.94	
Financing pattern			
Own Funds (Equity)	₹ (In lakh)	0.74	Feasibility Study
Loan Funds (Term Loan)	₹ (In lakh)	2.21	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	%	5	Feasibility Study
Estimation of Revenue			
Saving accounting for expenses on APH	liter/yr	5647	
Cost of FO	₹/ litre	30	
Saving accounting for expenses on Flux Solution Vat	liter/yr	19200	
Cost of diesel	₹/ litre	37	
Saving accounting for expenses on APH and boiling flux solution heating	₹ (In lakh)	8.80	
St. line Depn.	% age	5.28%	Indian Companies Act
Depreciation in the first year	% age	80	
Income Tax	% age	33.99	

Estimation of Interest on Term Loan

Years	Opening Balance	Repayment	Closing Balance	Interest
1	2.21	0.18	2.03	0.26
2	2.03	0.24	1.79	0.20
3	1.79	0.40	1.39	0.17
4	1.39	0.48	0.91	0.12
5	0.91	0.60	0.31	0.07
6	0.31	0.31	0.00	0.01
		2.21		

WDV Depreciation

Particulars / years	1	2
Plant and Machinery		
Cost	2.94	0.59
Depreciation	2.35	0.47
WDV	0.59	0.12

Projected Profitability ₹ (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8
Fuel savings	8.80	8.80	8.80	8.80	8.80	8.80	8.80	8.80
Total Revenue (A)	8.80	8.80	8.80	8.80	8.80	8.80	8.80	8.80
Expenses								
O & M Expenses	0.12	0.12	0.13	0.14	0.14	0.15	0.16	0.17
Total Expenses (B)	0.12	0.12	0.13	0.14	0.14	0.15	0.16	0.17
PBDIT (A)-(B)	8.68	8.67	8.67	8.66	8.65	8.65	8.64	8.63
Interest	0.26	0.20	0.17	0.12	0.07	-	-	-
PBDT	8.43	8.48	8.50	8.54	8.58	8.65	8.64	8.63
Depreciation	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
PBT	8.27	8.32	8.34	8.38	8.43	8.49	8.48	8.48
Income tax	2.06	2.72	2.89	2.90	2.92	2.94	2.94	2.93
Profit after tax (PAT)	6.21	5.60	5.45	5.48	5.51	5.55	5.55	5.54

Computation of Tax ₹ (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8
Profit before tax	8.27	8.32	8.34	8.38	8.43	8.49	8.48	8.48
Add: Book depreciation	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Less: WDV depreciation	2.35	0.47	-	-	-	-	-	-
Taxable profit	6.07	8.01	8.50	8.54	8.58	8.65	8.64	8.63
Income Tax	2.06	2.72	2.89	2.90	2.92	2.94	2.94	2.93

Projected Balance Sheet

Particulars / Years	1	2	3	4	5	6	7	8
Liabilities								
Share Capital (D)	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Reserves & Surplus (E)	6.21	11.81	17.26	22.74	28.25	33.81	39.35	44.90
Term Loans (F)	2.03	1.79	1.39	0.91	0.31	0.00	0.00	0.00
Total Liabilities (D)+(E)+(F)	8.97	14.33	19.38	24.39	29.30	34.54	40.09	45.63
Assets	1	2	3	4	5	6	7	8
Gross Fixed Assets	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94
Less Accm. depreciation	0.16	0.31	0.47	0.62	0.78	0.93	1.09	1.24
Net Fixed Assets	2.79	2.63	2.48	2.32	2.17	2.01	1.86	1.70
Cash & Bank Balance	6.18	11.70	16.91	22.06	27.13	32.53	38.23	43.93
TOTAL ASSETS	8.97	14.33	19.38	24.39	29.30	34.54	40.09	45.63
Net Worth	6.94	12.54	18.00	23.48	28.99	34.54	40.09	45.63
Debt Equity Ratio	2.76	2.43	1.89	1.23	0.42	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	0.74	-	-	-	-	-	-	-	-
Term Loan	2.21								
Profit After tax		6.21	5.60	5.45	5.48	5.51	5.55	5.55	5.54
Depreciation		0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Total Sources	2.94	6.36	5.76	5.61	5.64	5.67	5.71	5.70	5.70
Application									
Capital Expenditure	2.94								
Repayment Of Loan	-	0.18	0.24	0.40	0.48	0.60	0.31	-	-
Total Application	2.94	0.18	0.24	0.40	0.48	0.60	0.31	-	-
Net Surplus	-	6.18	5.52	5.21	5.16	5.07	5.40	5.70	5.70
Add: Opening Balance	-	-	6.18	11.70	16.91	22.06	27.13	32.53	38.23
Closing Balance	-	6.18	11.70	16.91	22.06	27.13	32.53	38.23	43.93

IRR ₹ (in lakh)

Particulars / months	0	1	2	3	4	5	6	7	8
Profit after Tax		6.21	5.60	5.45	5.48	5.51	5.55	5.55	5.54
Depreciation		0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Interest on Term Loan		0.26	0.20	0.17	0.12	0.07	-	-	-
Cash outflow	(2.94)	-	-	-	-	-	-	-	-
Net Cash flow	(2.94)	6.62	5.95	5.78	5.76	5.74	5.71	5.70	5.70
IRR	217.06%								
NPV	28.64								

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	0.11	0.12	0.12
Sub Total(G)	0.09	0.09	0.10	0.10	0.11	0.11	0.12	0.12
Fixed Expenses								
Oper. & Maintenance Exp	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04
Interest on Term Loan	0.26	0.20	0.17	0.12	0.07	0.00	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)	0.44	0.38	0.36	0.31	0.26	0.19	0.19	0.20
Sales (J)	8.80	8.80	8.80	8.80	8.80	8.80	8.80	8.80
Contribution (K)	8.71	8.71	8.70	8.70	8.69	8.69	8.68	8.67
Break Even Point (L= G/I)	5.05%	4.41%	4.10%	3.59%	3.01%	2.22%	2.24%	2.27%
Cash Break Even {(I)-(H)}	3.27%	2.63%	2.32%	1.81%	1.22%	0.43%	0.45%	0.48%
Break Even Sales (J)*(L)	0.44	0.39	0.36	0.32	0.26	0.20	0.20	0.20

Return on Investment ₹ (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8	Total
Net Profit Before Taxes	8.27	8.32	8.34	8.38	8.43	8.49	8.48	8.48	67.20
Net Worth	6.94	12.54	18.00	23.48	28.99	34.54	40.09	45.63	210.22
									31.97%

Debt Service Coverage Ratio ₹ (in lakh)

Particulars / Years	1	2	3	4	5	6	7	8	Total
Cash Inflow									
Profit after Tax	6.21	5.60	5.45	5.48	5.51	5.54	5.55	5.54	33.80
Depreciation	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.93
Interest on Term Loan	0.26	0.20	0.17	0.12	0.07	0.01	0.00	0.00	0.83
Total (M)	6.62	5.95	5.78	5.76	5.74	5.72	5.70	5.70	35.56

DEBT

Interest on Term Loan	0.26	0.20	0.17	0.12	0.07	0.00	0.00	0.00	0.82
Repayment of Term Loan	0.18	0.24	0.40	0.48	0.60	0.31	0.00	0.00	2.21
Total (N)	0.44	0.44	0.57	0.60	0.67	0.31	0.00	0.00	3.03
Average DSCR (M/N)	11.71								

Annexure:-6 Procurement and implementation schedule

S. No.	Activities	Weeks								
		1	2	3	4	5	6	7	8	9
1	Ordering the APH and boiling flux solution vat									
2	Replacing the flue gas pathway									
3	Installing the APH and boiling flux solution vat									

Break up of shutdown period of plant required for Operation of APH

S.No	Activity	Day
1	Prepare the pathway for the flue gas to go	2
2	Install the Air Pre-Heater and boiling flux solution vat	3

Day wise break up of shut down period for installation of APH & boiling flux box

S.No	Activity	Day				
		1	2	3	4	5
1	Marking the pathway for the flue gas					
2	Dismantling of existing pipeline					
3	New ducting & piping arrangement for flue gas					
4	Installation of APH					
5	Installation of boiling flux solution vat					
6	Connect secondary air to APH					
7	Instrumentations and trial					

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	Wesman Group of Companies	8, Mayfair Road, Kolkata - 700019	Mr. Arnab Ganguly Phone : 9433344999 Landline- 91-33-40020300/40020372 Fax 91-33-22816402/22908050 Email : arnab.ganguly@wesman.com
3	Indian Toxic Treatment	11/A, Jadu Colony, Behala, Kolkata - 700034	Mr. Prabir Sen (Tech. Director) Phone : (M) 91- 9831844880 Landline- 91-33-24685980/24575876/24455766 Fax : 91-33-24472832 /23977446 Email: indiantoxic@hotmail.com

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

YSU

WEB: www.hytsu.co.in

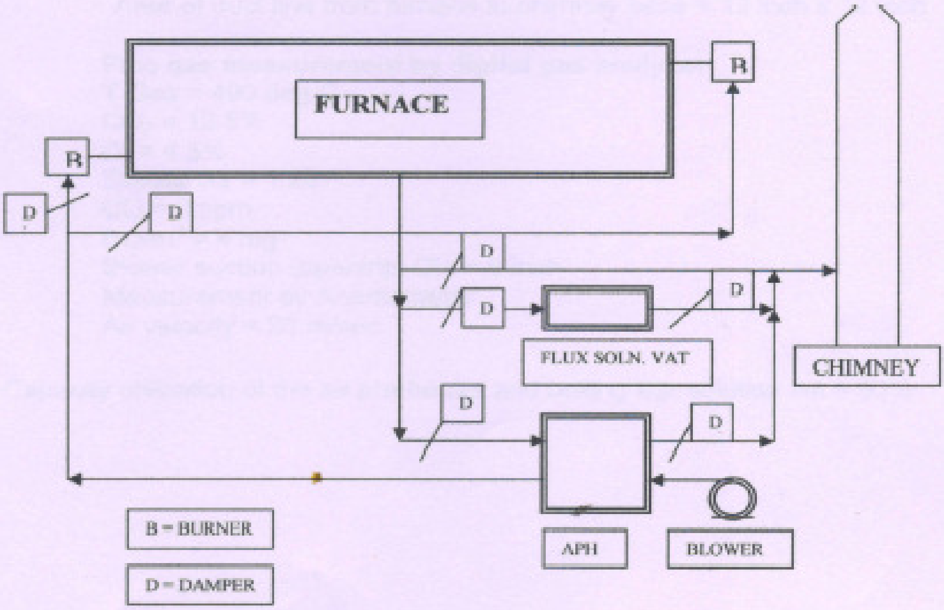
YANTRA SHILPA UDYOG (P) LTD.
12-B, AMRITALAL BOSE STREET, KOLKATA – 700 005.
PHONE: 91 – 33 – 2555 0316 / 2555 0539
FAX : 91 – 33 – 2555 1995.
EMAIL : htsu@cal3.vsnl.net.in

Our Ref YSU/32/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

SUB: OFFER FOR AIR PREHEATER + BOILING FLUX SOLUTION VAT



ENERGY IS LIFE
B E E
CONSERVE IT

YSU

WEB: www.hytsu.co.in

PRICE: Air Pre heater for combustion air of burner and Flux solution Vat as above Re. 2, 25, 000.00 (Two lakhs Twenty Five Thousand only) per Set

TERMS AND CONDITIONS:

PRICES:	Ex-Works, Kolkata.
PACKING & FORWARDING CHARGES:	2% Extra, at actual.
INSTALLATION	Rs. 55, 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.
GUARANTEE:	We stand guarantee for any manufacturing defects of the aforesaid equipment for twelve Months from the date of delivery EXCEPT Wearable Parts and bought out components.
VALIDITY:	Our offer will remain valid for 30 days from the offered date.

Hope you will find our offer very much attractive both technically and commercially. We now look forward to receive your valued order at the earliest.

Thanking you,

Yours faithfully,
FOR YANTRA SHILPA UDYOG (P) LTD.

S. K. DUTTA
DIRECTOR.

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

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

Indian Institute of Social Welfare and Business Management
MANAGEMENT HOUSE
College Square West,
Kolkata – 700 073
Website: www.iiswbm.edu

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