

## Electric Furnace

PRODUCT CODE (ASICC)	:	77152
QUALITY AND STANDARDS	:	The technical specification of electric furnace is as per customers requirement. The testing procedure of resistance heating type of electric furnace is governed by BIS Specifications IS 9025:1978 and IS 8506:1977
Production Capacity	:	Quantity: 48 Nos. (per annum) Value : Rs. 76,80,000
YEAR OF PREPARATION	:	2002 _ 2003
PREPARED BY	:	Branch Small Industries Service Institute 386, Patel Road, Ram Nagar, Coimbatore_641009 and Office of the Development Commissioner Small Scale Industries Electrical and Electronics Division, 7th Floor, Nirman Bhavan, New Delhi-110 011.

### Introduction

Electric furnace is used for heating purpose in various industrial production processes. Electric furnaces are used where more accurate temperature control is required. There are three types of electrical furnaces namely: (1) Induction Heating Furnace (2) Resistance Heating Furnace and (3) Arc furnace depending upon the method of heat generation.

Induction heating furnaces and arc furnaces are beyond the scope of this project profile. The scope of this project profile is confined to the resistance heating furnace only. In resistance heating furnaces, the resistance heating

elements are used to generate the heat in a heating chamber. The heating elements used are Nichrome wire, Kanthal wire or Graphite rods depending upon the temperature requirements. The unit proposed in this project profile envisages manufacturing furnaces to a maximum temperature of 1000<sup>o</sup>C and only up to 50 kW power rating. In this case, Kanthal wire is used. The temperature is controlled using thermostats and the temperature is monitored by thermocouples. The heating chamber is constructed by M. S. Sheets and channels and for thermal Insulation, fire clay bricks and refractory bricks are used

### **Market Potential**

Electric furnaces find its application in Engineering Industries, Food processing industries, Chemical processing Industries, Laboratories etc. The furnace is designed and constructed as per the requirement of the customer. The various parameters such as maximum attainable temperature dimension of the heating chamber, automatic or semi - automatic controlling of temperature etc. depends upon the requirement of the customer.

The demand for this item depends upon the growth of industrialization. The present day growth in demand for this product is approximately 10% per year. There are 15 to 20 SSI units manufacturing this item in Kerala and Tamil Nadu. Since this is industrial machinery, quality assumes prime importance.

### **Basis and Presumptions**

- i) The basis for calculation of production capacity has been taken on single shift basis on 75% efficiency.
- ii) The maximum capacity utilization on single shift basis for 300 days a year. During first year and second year of operations the capacity utilization is 60% and 80% respectively. The unit is expected to achieve full capacity utilization from the third year onwards.
- iii) The salaries and wages, cost of raw materials, utilities, rents, etc. are based on the prevailing rates in and around Coimbatore. These cost factors are likely to vary with time and location.
- iv) Interest on term loan and working capital loan has been taken at the rate of 16% on an average. This rate may vary depending upon the policy of the financial institutions/agencies from time to time.
- v) The cost of machinery and equipments refer to a particular make/model and prices are approximate.
- vi) The break-even point percentage indicated is of full capacity utilization.
- vii) The project preparation cost etc. whenever required could be considered under pre-operative expenses.

viii) The essential production machinery and test equipment required for the project have been indicated. The unit may also utilize common test facilities available at Electronics Test and Development Centres (ETDCs) and Electronic Regional Test Laboratories (ERTLs) and Regional Testing Centres (RTCs).

### **Implementation Schedule**

The major activities in the implementation of the project has been listed and the average time for implementation of the project is estimated at 12 months:

<i><b>Sl.No.</b></i>	<i><b>Activity</b></i>	<i><b>Period (In Months)</b></i>
1.	Preparation of project report	1
2.	Registration and other formalities	1
3.	Sanction of loan by financial institutions	3
4.	Plant and Machinery:	
	a) Placement of orders	1
	b) Procurement	2
	c) Power connection/ Electrification	2
	d) Installation/Erection of machinery/Test Equipment	2
5.	Procurement of raw materials	2
6.	Recruitment of Technical Personnel etc.	2
7.	Trial production	11
8.	Commercial production	12

### *Notes*

1. Many of the above activities shall be initiated concurrently.
2. Procurement of raw materials commences from the 8th month onwards.
3. When imported plant and machinery are required, the implementation period of project may vary from 12 months to 15 months.

### **Technical Aspects**

### **Process of Manufacture**

A Furnace essentially consists of a chamber in which the materials to be heated are placed. Heat is supplied to this chamber from the resistance heating elements placed around the chamber. Heat is transmitted to the object by radiation. M.S. Sheets and channels construct the chamber. Then the chamber is lined with fire clay bricks. Fire clay bricks provide thermal insulation. After this a lining with refractory bricks is made. Heating elements are embedded on the refractory lining. Suitable grooves will be provided to accommodate the heating elements on the refractory lining. The terminals of the heating elements are taken out for connecting to the electric power supply. The terminals are insulated using "SYNDANIO" an insulating material.

### **Quality Control and Standards**

The technical specification of electrical furnace is as per the customers' requirement. BIS specification IS 9025: 1978 and IS 8506: 1977 govern the testing procedure of resistance heating type electric furnace.

### **Production Capacity (per annum)**

The annual production capacity is 48 furnaces of 50 kW rating.

**Motive Power** 25 kW.

### **Pollution Control**

The Government accords utmost importance to control environmental pollution. The small-scale entrepreneurs should have an environmental friendly attitude and adopt pollution control measures by process modification and technology substitution.

India having acceded to the Montreal Protocol in September 1992, the production and use of Ozone Depleting Substances (ODS) like Chlorofluore Carbon (CFCs), Carbon Tetrachloride, Halons and methyl Chloroform etc. need to be phased out immediately with alternative chemicals/solvents. A notification for detailed Rules to regulate ODS phase out under the Environment Protection Act, 1986 have been put in place with effect from 19th July 2000.

### **Energy Conservation**

With the growing energy needs and shortage coupled with rising energy cost, a greater thrust in energy efficiency in industrial sector has been given by the Government of India since 1980s. The Energy Conservation Act, 2001 has been enacted on 18th August 2001, which provides for efficient use of energy, its conservation and capacity building of Bureau of Energy Efficiency created under the Act.

The following steps may help for conservation of electrical energy:

- i) Adoption of energy conserving technologies, production aids and testing facilities.

ii) Efficient management of process/manufacturing machineries and systems, QC and testing equipments for yielding maximum Energy Conservation.

iii) Optimum use of electrical energy for heating during soldering process can be obtained by using efficient temperature controlled soldering and de-soldering stations.

iv) Periodical maintenance of motors, compressors etc.

v) Use of power factor correction capacitors. Proper selection and layout of lighting system; timely switching on-off of the lights; use of compact fluorescent lamps wherever possible etc.

## Financial Aspects

### A. Fixed Capital

#### (i) Land and Building

(a) Built up area	6000 Sq. ft.
(b) Office, Stores	1300 Sq. ft.
(c) Assembly and testing	4500 Sq. ft.
(d) Open area	200 Sq. ft.
(e) Rent payable (per month)	Rs. 12,000

#### (ii) Machinery and Equipment

Sl. No.	Description	Qty.	Rate (Rs.)	Amount (Rs.)
1.	Shearing machine 1200 mm	1 No.	30,000	30,000
2.	Arc welding set 1	1 No.	25,000	25,000
3.	Bending press	1 No.	26,000	26,000
4.	Power press	1 No.	50,000	50,000
5.	Drilling machine 2" cap.	2 No.	18,000	36,000
6.	Grinding machine 200 mm dia. Double ended 2 HP	2 Nos.	10,000	20,000
7.	Spring coil winding machine	1 No.	26,000	26,000
8.	Air compressor with spray painting Equipment	1 No.	20,000	20,000
9.	Flexible grinder (1/2 HP)	1 No.	8,000	8,000
10.	Chain pulley block (5 T capacity)	1 No.	20,000	20,000

		Total	2,61,000
11.	Micro ohm meter (Digital)	1 No.	10,000
12.	Multimeter	1 No.	3,000
13.	HV Testing equipment	1 No.	20,000
14.	Standard pyrometer	1 No.	4,000
15.	Thermocouple test set	1 No.	5,000
16.	Ammeter	3 Nos.	1,800
17.	Voltmeter	3 Nos.	1,800
18.	Wattmeter	2 Nos.	3,000
19.	Anemometer	1 No.	1,200
		Total	60,000
		<b>Say</b>	<b>3,21,000</b>
20.	Electrification and Installation charges @10% of cost of machinery and equipment		32100
21.	Office equipments and furniture		40,000
22.	Hand Tools/ Jigs/fixture etc.		20,000
(iii)	<b>Pre-operative expenses</b>		<b>10,000</b>
		<b>Total</b>	<b>4,23,100</b>
		<b>Say</b>	<b>4,23,000</b>

**B. Working Capital (per month)****(i) Salaries and Wages (per month)**

Sl. No.	Description	Qty.	Rate (Rs.)	Amount (Rs.)
1.	Manager	1	8,000	8,000
2.	Technical Supervisor	2	6,000	12,000
3.	Clerk-cum-Typist	1	3,000	3,000
4.	Peon	1	2,000	2,000
5.	Skilled Workers	6	3,000	18,000
6.	Un-skilled Workers	4	2,000	8,000
		<b>Total</b>		<b>51,000</b>

<i>Add perquisites @ 15%</i>	7,650
<b>Total</b>	<b>58,650</b>

**(ii) Raw Material (per month)**

Sl. No.	Description	Qty	Rate (Rs.)	Amount (Rs.)
1.	Kanthal resistance wire	8 Kgs	4,000	32,000
2.	Thermocouples	4 Nos.	4,000	16,000
3.	Thermostats	4 Nos.	800	3,200
4.	Thermo couple compensating cable	5 m	35	175
5.	Fire clay bricks	5100 Nos.	16	81,600
6.	Refractory Bricks	5000 Nos.	22	1,10,000
7.	Fire clay	200 Kgs	16	3,200
8.	M.S. Sheets (18 guage)	1300 Kgs	22	28,600
9.	M.S. Channel	450 Kgs	21	9,450
10.	Miscellaneous items such as paints, Bolts, Nuts, Welding rods etc.	Lumpsum		8,000
11.	Control panel assembly	4 Nos.	26,000	1,04,000
	<b>Total</b>			<b>3,96,225</b>

**(iii) Utilities (per month)**

Sl. No.	Description	Amount (Rs.)
1.	Power	6,400
2.	Water	1,200
	<b>Total</b>	<b>7,600</b>

**(iv) Other Contingent Expenses (per month)**

Sl. No.	Description	Amount (Rs.)
1.	Rent	12,000
2.	Postage and Stationery	2,400
3.	Telephone	4,000

4.	Transport Charges	8,000
5.	Advertisement, Publicity and Sales promotion	15,000
6.	Repair and Maintenance	2,800
7.	Misc. expenditure	3,000
	<b>Total</b>	<b>47,200</b>
	<b>(v) Recurring Expenditure (per month)</b>	<b>5,09,675</b>
	<b>Say</b>	<b>5,09,600</b>
	<b>(vi) Working Capital Requirement</b>	<b>(Rs.)</b>
	Requirement of working capital is taken as 3 months recurring expenditure = 3 x 5,09,600	15,28,800

### C. Total Capital Investment

(i) Fixed Capital	Rs. 4,23,000
(ii) Working Capital (3 month basis)	Rs. 15,28,800
<b>Total</b>	<b>Rs. 19,51,800</b>

### Financial Analysis

<b>Cost of Production (per annum)</b>	<b>(Rs.)</b>
Total recurring expenditure	61,15,200
Depreciation on machinery and equipment @ 10%	32,100
Depreciation on tools, jigs and fixtures @ 25%	5,000
Depreciation on office equipment, furniture @ 20%	8,000
Interest on total capital investment @ 16%	3,12,288
<b>Total</b>	<b>64,72,588</b>
<b>Say</b>	<b>64,72,500</b>

### (2) Turnover (per annum)

Item	Qty.(Nos.)	Rate/ Unit (Rs.)	Total sales (Rs.)
50 kW Furnace of Maximum Temperature rise 800°C	48	1,60,000	76,80,000

### (3) Profit (per annum) (Before Taxes) 12,07,500



**(4) Net Profit Ratio**

= Profit per annum × 100

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Sales per annum

= 12,07,500 × 100

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76,80,000

= **15.72%**

**(5) Rate of Return**

= Profit per annum × 100

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Total capital investment

= 12,07,500 × 100

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19,51,800

= **61.86%**

**(6) Break-even Point**

<b>Fixed Cost (per annum)</b>	<b>(Rs.)</b>
Rent	1,44,000
Depreciation on machinery and equipment @ 10%	32,100
Depreciation on tools, jigs and fixtures @ 25%	5,000
Depreciation on office equipment, furniture @ 20%	8,000
Interest on total capital investment @ 16%	3,12,288
40% of Salaries and wages	2,81,520
40% of other contingent expenses and utilities (excluding rent)	2,05,440
<b>Total</b>	<b>9,88,348</b>
<b>Say</b>	<b>9,88,000</b>

**B.E.P.**

$$= \text{Fixed cost} \times 100$$

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Fixed cost + Profit

$$= 9,88,000 \times 100$$

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9,88,000 + 12,07,500

$$= 9,88,000 \times 100$$

**= 45%**

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21,95,500

### **Additional Information**

a. The Project Profile may be modified/tailored to suit the individual entrepreneurship qualities/capacity, production Programme and also to suit the locational characteristics, wherever applicable.

b. The Electrical Technology is undergoing rapid strides of change and there is need for regular monitoring of the national and international technology scenario. The unit may, therefore, keep abreast with the new technologies in order to keep them in pace with the developments for global competition.

c. Quality today is not only confined to the product or service alone. It also extends to the process and environment in which they are generated. The ISO 9000 defines standards for Quality Management Systems and ISO 14001 defines standards for Environmental Management System for acceptability at international level. The unit may therefore adopt these standards for global competition.

d. The margin money recommended is 25% of the working capital requirement at an average. However, the percentage of margin money may vary as per bank's discretion.

### **Addresses of Machinery and Equipment Suppliers**

1. M/s. Batliboi and Company Ltd.

Appejay house, 6th Floor, Dr. V.B. Gandhi Marg, Fort, Mumbai - 400 001.

*(General workshop machinery)*

2. M/s. Stanley Machine Tools

Alves Compound, Vadkum College Road, Dahanu Road (W. Rly.), Mumbai - 401 602

*(Drilling machine)*

3. M/s. MECO Instruments Pvt. Ltd.  
Bharat Industrial Estate, T. J. Road, Sewree, Mumbai - 400 015

(Electrical measuring instruments)

4. M/s. Parksons Engineering Corpn.  
37, Maharashtra Chamber of Commerce Lane, Mumbai - 400 001.

(General and workshop machinery)

5. M/s. Imanes Private Ltd.  
94, Swami Viveka Nanda Road, Post Box No.: 8002, Erla, Mumbai- 400 056.

(Spring coil winding machine)

6. M/s. Kirloskar Electric Co. Ltd.  
P.O. No.: 5555, Malleswaram West, Bangalore - 560 055

(Welding sets)

7. M/s. Machinery and Machine Tools  
Opp. Share Bazaar,  
Ambalal Doshi Marg (Hamam St.) Fort, Mumbai - 400 023

(*Shearing machine*)

8. M/s. Olivine Industries  
Industrial Estate, Irimpnam, Cochin - 682 309

(*Welding machine*)

9. M/s. India Machine Tools Co.  
Shamsu buildings, Kallai Road, Kozhikode - 673 002

(*Welding machine*)

### **Addresses of Raw Material Suppliers**

1. M/s. Ruia Enterprises  
Hari Nivas, Malaviya Road, Vile-parle (E) Mumbai - 400 057

(*Resistance heating wires, thermostats, Thermocouples, Compensating cables etc.*)

2. M/s. Kantilal Chunilal and Sons Appliances Pvt. Ltd 48 - 513, Jawahar Road, Udhna - 394 210,  
Surat District

*(Heating elements, Temperature controls)*

3. M/s. Chalakkudy Refractors Ltd.  
P.B. No. 25, Railway Station Road, Chalakkudy, Trichur, Kerala.

*(Refractories)*

4. M/s. Allied Refractors Pvt. Ltd.  
1477, Kandamod, Pirvam, Kerala

5. M/s. Pipes and Refractories of India  
R. K. P. 3/169 - A, Ramanattukara, Kozhikode

*(Refractories)*

6. M/s. Naresserial Industries  
Muttom, P.O. Haripad, Kerala

7. M/s. Ashok Bricks and Clay Products  
M.P. 3/4, Kankam,  
Kathiparambam, Kozhikode.

*(Fire clay Bricks)*

8. MPS Steel Industries Kerala Ltd.  
Kozhikode

*(M.S. Channels)*

9. M/s. Steel Authority of India Ltd.  
Kannamai Building, 611, Anna Salai, Chennai - 600 006.

*(M.S. Channels and Sheets)*