Wire Wound Resistors

PRODUCT CODE (ASICC)	:	78989
QUALITY AND STANDARDS	:	IS 8909 : 1983 (Part-1 to 4)
PRODUCTION CAPACITY	:	Qty. : 9,60,000 Nos. (per annum) Value : Rs. 47,52,000
YEAR OF PREPARATION	:	2002 – 2003
PREPARED AND UPDATED BY	:	Small Industries Service Institute, Bamunimaidan, Guwahati-781021 And Office of the Development Commissioner (Small Scale Industries), Electronics and Electrical Division, 7th Floor, Nirman Bhavan, New Delhi-110011

Introduction

Resistor is a passive electronic component having resistivity and is used for various applications in any electronic equipment as a part of electronic circuit used in it. Resistors offer resistance to flow of current. Resistor can be broadly classified into fixed resistor and variable resistor. Again fixed resistor is grouped into carbon composition, metal composition, oxide coated and wire wound resistors. Resistors are characterised by resistance value, power rating (in watts) and tolerance.

Wire wound resistors, which are used in electronic equipments and instruments where high precision and more power dissipation are specified. Wire Wound Resistors are preferred over metal oxide resistors because of being better temperature co-efficient and of smaller size. Again wire wound resistors can be divided into silicon coated ceramic type, aluminium type etc., based on chemical composition and type of application. Silicon coated resistor is further divided into radial, axial, commercial type, fusible etc., depending on the application. Wire Wound Resistor finds application in power equipments, testing and measuring equipments, communication equipments, medical electronic equipments, computer hardware, audio and video equipments, Defence and Space applications etc.

Market Potential

As mentioned earlier, Wire Wound Resistor finds applications in all electronic equipments consisting of electronic circuits. They are widely used in process control instruments, telecommunication equipments, testing and measuring instruments, power equipments etc., for various functions like current limiting, on load, overload, protection etc.

There are many units in the country manufacturing different types of Wire Wound Resistors. Most of them are

manufacturing silicon coated, ceramic encased and aluminium wound resistors. But there is an incremental growth of electronic industries in the country, which has created further scope of new industries in the field of wire wound resistors.

The new entrepreneur should have knowledge and should collect data about various types of wire wound resistors used by the electronic industry and its different applications. Manufacturing Wire Wound Resistors with high precision, better tolerance will increase the market share.

Conventional plant and machinery is indigenously available. Automatic machinery can be imported. Some of the raw materials have to be imported.

It is essential that entrepreneur may make market survey, identify users and distributors before starting the venture for its success.

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 utilisation 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 Guwahati. 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) set up by the State Governments and STQC Directorate of the Department of Information Technology, Ministry of Communication and Information Technology, to manufacture products conforming to BIS standards.

IMPLEMENTATION SCHEDULE

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

Sl. No.	*Name of Activity*	*Period in Months (Estimated)*
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

Sl. No.	Name of Activity	Period in Months (Estimated)
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 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

The porcelain pipes of the required sizes are obtained and cleaned. The brass/ nickel silver clamps are fixed on the ends. The nichrome or other resistance wire of required gauge is then wound on these porcelain pipes. The resistance is then tested to the required specifications. The ends of the resistance wire are soldered with the clamps on both ends of the porcelain pipes. Then the resistance is given a coating of vitreous enamel and baked in a furnace. The coating process is repeated two or three times for perfect insulation. Finally they are tested according to the specifications.

For ceramic encapsed type resistor (power resistor), the resistors are manufactured by winding resistance wire on ceramic rods. Then ends are spot welded to ceramic caps with leads on lugs followed by dipping in silicon based resin and drying. These resistors are tented at high temperature and high power dissipation as per the specification before packing and despatch.

Quality Control and Standards

Standards

Since performance of electric equipments depends on the quality of component used, it is very essential that quality standards are followed. The samples can be tested as per Indian Standards.

IS 8909 (Part - 1 to 5) 1978.

General Specification

Vitreous enamel/ Silicon coated wire wound resistors	Ceramic coated resistors
Range : 0.1 Ohm to 100 K Ohm	Range : 0.025 Ohm to 100 K Ohm
Power Ratio: 1 to 200Watts	Power rating: 1 to 20 watts
Tolerance: above 1 Ohm ± 1% 1 Ohm ± 5% below 1 Ohm ± 10%	Tolerance: 5% and 10%
Temp. co-efficient: 100 PPM to 200 PPM	Temp.co-efficient: 200 PPM/deg. C To 1500 PPM/deg.C

Production Capacity (per annum)

Quantity (Nos.)	Value (Rs.)
9,60,000	47,52,000

Motive Power 25 KVA (Approx.)

Pollution Control

The Govt. 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. Awareness among the staff members of the industrial undertaking should also be created for abatement of pollution.

India having acceded to the Montreal Protocol in Sept. 1992, it has become mandatory for India to phase out the production and use of Ozone Depleting Substances (ODS) like Chlorofluoro Carbon (CFC), Carbon Tetrachloride, Halons and Methyl Chloroform etc. These chemicals/

solvents are to be phased out immediately with alternative chemicals/solvents. Government of India has already taken a number of policy measures, both fiscal and legislative, to encourage early adoption of non-ODS technologies. 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. The Rules give the necessary legal backing and time frame for the phase out of ODS.

We are at the very critical stage where the momentum generated in the past has to further strengthened. As such the following steps may help to control pollution in electronics industry wherever applicable.

i) In electronic industry fumes and gases are released during hand soldering / wave soldering/Dip soldering, which are harmful to people as well as environment and the end products. Alternate technologies may be used to phase out the existing polluting technologies. Numerous new fluxes have been developed containing 2-10% solids as opposed to the traditional 15-35% solids.

ii) Electronic industry uses CFC, Carbon Tetrachloride and Methyl Chloroform for cleaning of printed circuit boards after assembly to remove flux residues left after soldering, and various kinds of foams for packaging.

Many alternative solvents could replace CFC-113 and Methyl Chloroform in electronics cleaning. Other Chlorinated solvents such as Trichloroethylene, Perchloroethylene and Methylene Chloride have been used as effective cleaners in electronics industry for many years. Other organic solvents such as Ketones and Alcohols are effective in removing both solder fluxes and many polar contaminants.

Energy Conservation

With the growing energy need and shortage coupled with rising energy cost, a greater thrust in energy efficiency in industrial sector has been given by the Govt. of India since 1980s. The Energy Conservation Act, 2001 has been enacted on 18th August 2001, which provide 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 desoldering 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	
Built-up Area	400 sq. mts.
Office Stores	50 sq. mts.
Assembly and Testing	350 sq. mts.
Rent payable (per annum)	Rs. 60,000

(ii) Machinery and Equipments

Sl. No.	Description	Ind/ Imported	Qty. (Nos.)	Amount (Rs.)
1.	Toggle Action Press ½ Ton Cap.	Ind.	2	20,000
2.	Automatic Coil Winding Machine	Ind.	3	65,000
3.	Lead cutting Machine Grinder	Ind.	1	7,000
4.	Lead Straightening machine	Ind.	1	5,000
5.	Lead Tinning machine	Ind.	1	50,000
6.	Spot Welding machine	Ind.	1	10,000
7.	Oven (Temp. controlled)	Ind.	1	20,000
8.	Stirrer (Ball Mills)	Ind.	3	15,000
9.	LCR - Q Meter	Ind.	1	15,000
10.	Digital Temperature Indicator 4½ Digit Bench Micro ohm Meter	Ind.	2	25.000
11.	Dimmer Stat (4A)	Ind.	1	7,000
12.	4 ½ Digit Digital Multimeter	Ind.	1	10,000
13.	Load Tester and Brake Tester	Ind.	1	3,000
14.	Fusing Tent Machine	Ind.	1	5,000
15.	Tension Tester	Ind.	1	6,000
16.	Marking Machine with accessories	Ind.	1	5,000
17.	Resistance oil standards	Ind.	LS	10,000
18.	Electrification @ 10% of the above			27,800
19.	Office Equipment/ Furniture			50,000
20.	Jigs/Fixtures			15,000
(iii)	Pre-operative Expenses			10,000
	Total Fixed Capital			3,80,800
	or Say			3,81,000

B. Working Capital (per month)

(i) Staff and Labour

Sl. No.	Designation	No.	Salary/ month(Rs.)	Total (Rs.)
1.	Manager	1	5,000	5,000
2.	Sales Engineer	1	3,000	3,000
3.	Accountant	1	2,500	2,500
4.	Clerk/Typist	1	2,000	2,000
5.	Peon	1	1,000	1,000
6.	Watchman	1	1,000	1,000
7.	Skilled Workers	5	2,000	10,000
8.	Unskilled Workers	6	1,000	6,000
		Total		30,500
Add Perquisites @ 15% of salary				4,575
		Total		35,075
		or Say		35,000

(ii) Raw Material Requirement (per month)

Sl. No.	Particulars	Ind/ Imp.		Cost/unit for 80,000 resistors (Rs.)
1.	Viterous enamel/ Silicon based resin – 80 Kgs	Imp		56,000
2.	Strips – 80 Kgs.	Imp		80,000
3.	Resistance wires – 40 Kgs.	Imp		75,000
4.	Caps and Beads	Imp		20,000
5.	Consumables like Hardner, rubber sheet, and packaging	Ind	LS	10,000
		Total		2,41,000

Note: Requirement and cost of raw material vary with production programme like type of resistors and quantity.

(iii) Utilities (per month)	(Rs.)
Power	4000
Water	1000
Total	5,000

(iv) Other Contingent Expenses (permonth)	(Rs.)
Rent	5,000
Postage and Stationery	2,000
Repair and Maintenance	2,000
Telephone/Telex/Fax charges	4,000

Transport and Conveyance Charges	5,000
Advertisement and Publicity	5,000
Insurance	500
Misc. expenditure	1,500
Total	25,000

(v) Total Recurring Expenditure (i) + (ii) + (iii) + (iv) Rs. 3,06,000

C. Total Capital Investment

Fixed Capital	Rs. 3,81,000
Working capital for 3 months	Rs. 9,18,000
Total	Rs. 12,99,000

FINANCIAL ANALYSIS

(1) Cost of Production (per annum)	(Rs)
1. Total recurring expenditure	36,72,000
2. Depreciation on Machinery/ Equipment @ 10%	27,800
3. Depreciation on Office Equipment/Furniture @ 20%	10,000
4. Depreciation on Jigs/ Fixtures @ 25%	3,750
5. Interest on total capital investment @ 16%	2,07,840
Total	39,21,390
or Say	39,21,000

(2) Sales Turnover (per annum)

Item	Qty.	Rate (Rs.)	Value (Rs.)
Wire Wound Resistors (Different values)	9,60,000	4.95	47,52,000

(3) Profit (per annum) Rs. 8,31,000

(4) Net Profit Ratio

$$= \frac{\text{Profit (per annum)} \times 100}{\text{Sales (per annum)}}$$

$$= \frac{831000 \times 100}{4752000}$$

$$= 17.49\%$$

(5) Rate of Return

$$= \frac{\text{Profit (per annum) x 100}}{\text{Total capital investment}}$$

$$= \frac{831000 \times 100}{1299000}$$

$$= 64\%$$

(6) Break-even Point

Fixed Cost (per annum)	(Rs.)
Rent	60000
Depreciation on machinery and equipment @ 10 %	27800
Depreciation on tools, jigs and fixtures @ 25%	3750
Depreciation on office furniture @ 20%	10000
Interest on total capital investment @ 16%	207840
Insurance	6000
40% Salaries and wages	168000
40% other contingent expenses and utilities (excluding rent and insurance)	117600
Total	609900
or say	601000

B.E.P

$$= \frac{\text{Fixed cost} \times 100}{\text{Fixed cost + Profit}}$$

$$= \frac{601000 \times 100}{601000 + 831000}$$

$$= 42\%$$

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 Electronics 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/Equipment Suppliers

1. M/s. Alpha Radio and Novalities Pvt. Ltd.
   8, Madan Street,
   Kolkata -700072
   (Winding Machine)
2. M/s. Vikrant Special Machines Ltd.
   8/5F, Gariahat Road, (Morin Park)
   Kolkata -700019
   (Winding Machine)
3. M/s. Retrace Electronics
   C 1A/14C, Janakpuri,
   New Delhi -110058
   (Spot Welding Machine)
4. M/s. Excella Electronics,
   54, Anupama Industrial Estate, Tilak Road, Ghatkopar Road, Mumbai - 400077
   (Marking Machine.)
5. M/s. Circuit Aids Inc.
   No.20/2, 80 FT Road, 4th Block,
   Koramangla, Bangalore-34
   (Lead Tining and Straightining Machines.)
6. M/s. T.M.P.L. Machines
   64-C, Bommasandra Industrial Area, Hosur Road,
   Bangalore
   (Lead Tining and Straightining Machines.)
7. M/s. W.A.J. Clock and Co. Pvt. Ltd.
   No.7, K.S. Roy Road,
   Kolkata -700001
   (Oven)
8. M/s. Aplab
   6th Floor, 2/7, Sarat Bose Road,
   Kolkata -700020
   (Testing and Measuring Instruments.)
9. M/s. Librathem Instruments
   D/5, Shreenath Nagar,
   Shivavallabh Road,
   Dahisar (E), Mumbai - 400068
   (Load Tension and Fusing test Machines.)
10. M/s. Calcutta Resistance Co.
    No.27, Bepin Behari Ganguly Street,
    Post Box No.7803,
    Kolkata -700012
    (Resistance Standards.)
11. M/s. Batliboi and Co.
    Mahindra Spicer Building,
    J.N. Herdia Marg,
    Ballored Pier,
    Mumbai - 400038
    (Machinery and Tools.)

Addresses of Raw Material Suppliers

1. M/s. J.J-Desussa(s) Pvt. Ltd.
   No.2 Corporation Road, Corporation Place,
   Singapore - 618494
   (Silicon Resin.)
2. M/s. Topway Electronic (s) Pvt. Ltd.
   61, DLOR 17, Geylang No.05-01
   Lam Leong Bldg.
   Singapore - 388574
   (Resistance Wire.)
3. M/s. Bakelite Hylam Ltd.
   Tieticon, 18,
   Dr. E. Moses Road,
   Mumbai - 400011
   (Resin and Hardner)
4. M/s. Fort Gloster Industries Ltd.
   No.31 Chowringhee Road, Kolkata - 700016
   (Rubber Sheet.)