Rectifier D.C.

PRODUCT CODE (ASICC)	77207
QUALITY AND STANDARDS	IS 3700 : 1973 (Part 1 and Part 2)
PRODUCTION CAPACITY	Quantity: 600 Nos. (per annum) Value : Rs. 91,80,000
YEAR OF PREPARATION	2002 _ 2003
PREPARED BY	Small Industries Service Institute 386, Patel Road, Ram Nagar, Ciombatore-641009 and Office of the Development Commissioner Small Scale Industries Electrical and Electronics Division, 7th Floor, Nirman Bhavan, New Delhi - 110 011.

Introduction

Rectifier is a device which converts the alternating current (A.C.) power to direct current (D.C.) power. It is frequently necessary for such applications as electrolytic work, electroplating and charging of storage batteries. There are two types of rectifiers that have found wide industrial use are: (1) metal rectifiers and (2) mercury arc rectifiers. The term `Metal Rectifier' is widely accepted as covering a whole range of dry - contact rectifiers in which rectification takes place at the junction between a conductor and semi - conductor or between two semi- conductors of different properties. The ranges available from 6 V / 10 A to 24 V 500 A.

Market Potential

In manufacturing line of metal parts, the electroplating plays an important role. Now a days the charging of storage batteries which are very commonly used everywhere. Keeping in view of the increasing industrial activities the demand of D.C. Rectifiers is bound to increase at considerable rate.

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. 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:

Sl. No.	***Activity***	***Period (In Months)***
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

Centre-tapped full wave rectifier circuit. Here two half wave arrangements are in effect combined to use both half

cycles of the secondary output voltage. The combination is in fact more in the nature of a two - phase half wave circuit then a full wave circuit although the end result is that of full wave rectification. Each rectifier conducts alternatively and as the wave from both half cycles appears in the output but going in the same direction. As filter simply add a capacitor across the secondary output before load. Here we are considering the production of 12 V / 150 A aircooled metal rectifier 12 Sq. inch area of E and I stamping core is pressed without air gap and primary winding has been done with 10 gauge of enamelled copper wire of 132 turns. After proper insulation the secondary winding take place with 10 turns of enamelled copper wire. To avoid the voltage fluctuation and over heating one single phase varia be connected with primary winding. Between the terminals of secondary the Diode should be connected with Aluminium brass bar with brass terminals. It is very essential to design suitable transformer with less core loss. Proper insulation be provided over the electrical parts. The transformer, varia, control switch, indicating lamp and meters are properly fixed in the sheet metal cabin and tested unit for its performance.

Quality Control and Standards

BIS has not yet formulated specific standard for this product. However. The essential components should conform to IS 3700: (Part 1 and Part 2):1973 for various components and also these may be ensured as factory tested.

Production Capacity (per annum)

Quantity : 600 Nos.

Value : Rs. 91,80,000

Motive Power 10 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 (Rented per month)	**(Rs.)**
250 sq. mtrs.	
@ Rs. 25 per sq. mtr.	
Total	**6250**

(ii) Machinery and Equipments

Sl. No.	**Description**	**Qty.**	**Rate (Rs.)**	**Amount (Rs.)**
1.	Air compressor with spray gun	1	15,000	15,000
2.	Arc Welding set - 200 A	1	7,500	7,500
3.	Bench Grinder (6" wheel)	1	5,000	5,000
4.	Cost of Dies and Fixtures			25,000
5.	Cost of Office Furniture and			25,000

Working tables			
6. Drilling machine- 1" capacity	1	15,000	15,000
7. Drying oven - 6' × 6' × 6'	1	20,000	20,000
8. Electrification and Installation charges @ 10% of cost of machinery and equipments			18,000
9. Flexible shaft grinder	1	5,000	5,000
10. Fly press (No. 6)	1	7,500	7,500
11. Guilotive shearing machine - 1200 mm	1	20,000	20,000
12. H.V. Tester (5 kV)	1	5,000	5,000
13. Megger (500 V DC)		3,000	3,000
14. Power press - 30 T capacity	1	80,000	80,000
15. Pre-operative expenses	1		19,000
16. Test panel	1	10,000	10,000
17. Winding machine	1	5,000	5,000
Total			**2,85,000**

B. Working Capital

(i) Raw Material (per month)

Sl. No.	**Description**	**Qty.**	**Rate (Rs.)**	**Amount (Rs.)**
1.	Aluminium Bushar (25 x 5 mm)	100	125	12,500
2.	Ammeter (0 to 150 A with shunt)	50	700	35,000
3.	Bross nut and Bolt with washers			5,000
4.	Dimmerstate (10 A single phase)	50	1,800	90,000
5.	Diode (150 A / 100V)	200	500	100,000
6.	E and T Core stamping (8 C grade 12 sq. Inch)	2	55,000	110,000
7.	Enamelled copper wire (10 guage)	600	180	108,000
8.	Indicating Lamp	50	25	1,250

9. Insulation material like varnish, glass paper, sleeves and Tape			37,500
10. M.S. Angle and CRC Steel Sheet (10 guage)	3	20,000	60,000
11. Name plate and sticker etc			500
12. On-off selector switch	50	200	10,000
13. Red - oxide and Paints	25	180	4,500
14. Voltmeter 0 to 20 V	50	300	15,000
Total			**5,89,250**

(ii) Salaries and Wages (per month)

Sl. No.	**Designation**	**No.**	**Salary (Rs.)**	**Total (Rs.)**
1.	Clerk-cum-Typist	1	2,000	2,000
2.	Manager	1	5,000	5,000
3.	Peon/Chowkidar	2	1,500	3,000
4.	Semi-Skilled Workers	4	2,000	8,000
5.	Skilled Workers	4	2,500	10,000
6.	Store-keeper	1	1,500	1,500
7.	Supervisor	1	3,000	3,000
Total				**32,500**

(iii) Utilities (per month)

Sl. No.	**Description**	**Amount (Rs.)**
1.	Power 2500 kWH @ Rs. 5	12,500
2.	Water	500
Total		**13,000**

(iv) Other Contingent Expenses (per month)

Sl. No.	**Description**	**Amount (Rs.)**
1.	Consumable Stores	1,500
2.	Insurance	750
3.	Miscellaneous Expenditure	1,000
4.	Postage and Stationery	2,000
5.	Rent	6,250
6.	Repairs and maintenance	1,000

7. Telephone	2,000
8. Transport Charges	2,000
Total	**16,500**

(v) Working Capital (per month)

589,250+32,500+13,000+16,500 =Rs. 651,250

(vi) Working Capital (for 3 Months)

651,250 × 3 = Rs. 1,953,750

C. Total Capital Investment

(i) Fixed Capital	Rs. 285,000
(ii) Working Capital (for 3 Months)	Rs. 1,953,750
Total	**Rs. 2,238,750**

Financial Analysis

(1) Cost of Production (per annum)

Sl. No.	**Description**	**Amount (Rs.)**
1.	Depreciation on Dies and Fixtures @ 25%	6,250
2.	Depreciation on Office furniture @ 20%	5,000
3.	Depreciation on plant and machinery @ 10%	28,500
4.	Recurring expenditure	7,815,000
5.	Interest on capital investment @ 14%	313,425
Total		**8,168,725**

(2) Sales (per annum)	**(Rs.)**
By sale D.C. Rectifier set 600 Nos. @ Rs. 15,300/	91,80,000

(3) Profit (per annum)	**(Rs.)**
Sales	9,1,80,000
Cost of Production	8,1,68,725
Total	**1,011,825**

(4) Profitability Analysis

(a) Profit on Sales

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

$$= \frac{1{,}011{,}825 \times 100}{9{,}180{,}000} = \mathbf{11.02\%}$$

(b) Profit on Investment

$$= \frac{\text{Profit per annum} \times 100}{\text{Total Capital investment}}$$

$$= \frac{1{,}011{,}825 \times 100}{2238750} = \mathbf{45.2\%}$$

(5) Break-even Point

(i) Fixed Cost (per annum)	**(Rs.)**
Depreciation	34,750
Rent	75,000
Interest on investment	402,975
40% of salary and wages	156,000
40% of other contingent expenses and Utilities excluding Insurance and Rent	1,11,600
Total	**690,775**
(ii) Profit (per annum)	**Rs. 10,11,825**

B.E.P.

$$= \frac{\text{Fixed Cost per annum} \times 100}{\text{Fixed cost per annum + profit per annum}}$$

$$= \frac{690{,}775 \times 100}{690{,}775 + 1{,}011{,}825}$$

= **40.57%**

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. Prem Engineering Works

Okhla Industrial Estate, New Delhi-110020

2. M/s. Manjeet Engineering Works

71/1, Najafgarh Road, New Delhi

3. M/s. Sivamani and Co.

Vivekananda Road, Ramnagar,

Coimbatore - 9

4. M/s. Equipment Agencies

P.N. Palayam, Coimbatore - 37

5. M/s. Toshniwal Bros.

Mumbai.