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Carbon Bonded Silicon Carbide Crucibles

PRODUCT CODE	:	29129
QUALITY AND STANDARDS	:	IS 12847:1989
PRODUCTION CAPACITY	:	Quantity : 300 M.T. Value : Rs. 1,65,00,000
MONTH AND YEAR OF PREPARATION	:	December , 2002
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Introduction

Silicon Carbide crucibles are made out of silicon carbide and graphite utilizing tar pitch or other synthetic resins as bonding materials. These are highly refractory products used for melting ferrous and non-ferrous metals and alloys in the foundries due to their superb inherent properties such as good thermal conductivity, low thermal expansion, resistance to thermal shocks, resistance to wetting to molten metals, etc. when compared to clay bonded graphite crucibles. These crucibles are mostly used for melting non-ferrous precious metals such as brass, copper, nickel, chromium as well as their alloys.

Market Potential

In view of the fast development in the industrial activity in the fields of foundry and engineering, the demand for these crucibles is ever increasing particularly from mines, Railways, aeronautics, Defence Production units and other precious metals and alloys manufacturing units in the country, which, in turn, are creating wider scope for setting up new units.

Basis and Presumptions

It has been taken into consideration that the unit will work on single shift basis for 300 days in a year. The firing operations are, however, to be carried out continuously on three-shift basis till particular firing cycle is complete in all respects.

The cost of land, construction charges, cost of machinery and equipment, raw materials and consumables, salaries and wages, other contingent expenses etc. indicated in the profile are based on the prices prevailing at the time of

preparation. Therefore, they are subject to necessary charges from time to time based on local conditions.

The bottleneck operation of the process is the kiln capacity and firing cycle. The efficiency of the kiln and time duration of its each firing cycle entirely depends upon the design and type of kiln proposed to be used. In this case, intermittent type oil-fired shuttle kiln has been taken into consideration so as to cope with the production, which is well suited particularly for setting up a small scale unit.

It is expected that the profiles will accrue only when the unit achieves its production beyond its break-even point and is subject to the stability of costs and prices of inputs as well as demand forecast and marketability.

Implementation Schedule

The time schedule of implementation of the project in the initial stages and generation period for achieving optimum production levels in the unit etc. will be entirely depending upon the entrepreneur's capabilities and his capacity in availing facilities from different agencies involved in the development of small scale industries. Taking an optimistic view, the following schedules have been drawn which are barest minimum requirements for successful launching of the project:

Sl.No.	*Activity*	*Period*
1.	Selection of site and construction	3 to 6 months
2.	Preparation of project report and provisional registration under SSI	1 to 2 months
3.	Availing of finances	3 to 4 Months
4.	Procurement of machinery and equipment, raw materials and consumables etc.	2 to 3 months
5.	Erection and Commissioning, construction of kilns, dries etc.	4 to 5 months
6.	Trial runs and Commissioning of regular production	1 to 2 months

Technical Aspects

Process of Manufacture

The raw materials, graphite and silicon carbide with additives such as ferro-silicon-ferro managanese etc., are graded to the required sizes and mixed with bounding materials like molten pitch or other suitable synthetic resins in suitable proportions. The mixing is done in a kneading mill, namely through U-mixer when the bonding materials are in molten condition. The kneaded homogenous mixture is charged into ejection type crucible die fitted on hydraulically operated roller press. While pressing operation is carried the total mass of mixture in the mould is kept in uniform hot condition to avoid manufacturing defects while pressing. The shaped articles are left for few days for setting and cooling. The ware are inspected for laminations, cracks, etc. and then loaded into shuttle kilns for firing at 1350°C-1400°C under reducing atmosphere to avoid oxidation of graphite and carbon. To create reducing atmosphere, the products should be loaded into fire boxes called saggers tightly packed with reducing agents like coke/coal dust, sometimes even graphite powder. The

fired ware are unloaded from the kiln after cooling. These are inspected and cooled with a suitable glaze, which has inherent properties of protecting the crucible from oxidation at operating temperature. The glazed wares are charged into flashing furnace for the purpose of flashing the crucibles at red-hot temperature utilizing coke. The finished crucibles are then suitable packed for disposal.

Quality Control and Standards

The quality of the crucibles mainly depends upon the number of heats/melts it can withstand in the foundry operations. The Bureau of Indian Standards has formulated and published the following specifications for maintaining the quality of crucibles:

IS 1748:1991	Sizes of Graphite Crucible
IS 11321:1985	Graphite for Graphite crucible
IS 12817:1989	Carbon Bonded Silicon Carbide Crucibles

Production Capacity

The profile envisages setting up a unit for manufacture of 300 tonnes of carbon bonded Silicon Carbide Crucibles valued at Rs.1.65 crores per annum.

Motive Power 60 kW.

Pollution Control

As this project is based on latest shuttle type intermittent kilns provided with oil firing system, there may not be much of pollution due to spread or emission of hazardous smoke etc.

Energy Conservation

Refractory products of this nature are mostly manufactured by the small scale units utilising coal-fired down draft kilns which are prone to emit thick smoke with Fly ash and other pollutants. Firing cycle in such kilns was also quite longer taking more time. BY introduction of shuttle kiln in the present process replacing coal-fired down draft kiln, the small scale units can be able to produce quality products in shorter firing cycle consuming less fuel and maintaining pollution free clean environment.

General precautions for saving energy particularly electricity and fuel oils are required to be followed by the unit by adopting energy conservation techniques not only to conserve and power and fuels but also to save considerable expenditure on their consumption in its own interest and also in the interest of the nation as a whole.

FINANCIAL ASPECTS

A. Fixed Capital

(i) Land and Building	
Land 1000 Sq.mt. @ Rs.500 per Sq.mt.	5,00,000

Particular	Area in Sq.mt.	Rate per q.mt.	Cost (Rs.)
Office block.	40	2,200	88,000
Raw material Godown	50	2,200	1,10,000
Manufacturing shed	250	1,500	3,75,000
Kiln shed.	100	1,500	1,50,000
Toilet	20	2,200	44,000
		Total	7,67.000
+ Sanitary fitting and electrification @ 15%			1,15,050
		G. Total	8,82,050

(i) Machinery and Equipments

Description	Nos.	Value (Rs.)
Jaw crusher 150x75 mm size with 3 HP electric motor and fittings	1 No.	30,000
Disintegrator 350 mm size with 5 HP motor and fittings	1 No.	40,000
Electro/permanent magnet	1 No.	10,000
Ball mill 900x900 mm size with 7.5 HP motor and other fittings	1 No.	60,000
Miscellaneous tools and equipment like heating kettle, mixing showels etc.		10,000
Ejection type steel dies for different standard sizes of crucibles.		1,00,000
Vibrating screen with dust accumulator 900x600 mm with 3 HP motor and different mesh netting	1 No.	25,000
Weighing scales 10 Kgs. Capacity and 30 Kgs. Capacity platform type	2 Nos.	10,000
'U' Trough mixer/kneader 600x900 mm size with 7.5 HP motor and other fittings	1 No.	40,000
Hydraulically operated Roller press 100 tonnes capacity imported/indigenous with hydraulic accumulator, pump, pipe fittings, control valves, pressure gauges and other accessories etc.		4,50,000
Oil firing equipment such as burners-8 Nos, Blowers-2 Nos. cash with 3 HP motor, pipe line fitting-2 Nos. of pre-heaters, oil filters-2 Nos. storage and servicing tanks-2 Nos., pump etc. including thermocouples with pyrometers etc.		1,00,000
Testing equipment.		17,000
Office equipment and furniture, workshop table, racks, cupboards etc.		32,000
Flashing furnaces.		13,000
Shuttle kilns 19x10 ft and 12x10 ft with common chimney	2 Nos.	27,00,000
Errection, installation and electrification charges		15,000
Pre-operative Expenses		20,000
Cost of machinery and equipment		36,72,000
+ 10% CST cartage and Installation charges		3,67,200
	Total	40,39,200
	or Say	40,40,000
	Total fixed capital	54,22,000

B. Working Capital

(i) Staff and Labour (per month)

Description	Nos.	Salary	(Rs.)
Works Manager.	1 No.	10,000	10,000
Supervisor	2 Nos.	4,000	8,000
Electrician-cum-Mechanic	1 No.	3,000	3,000
Accountant.	1 No.	4,000	4,000
Clerk-cum-Typist.	1 No.	3,000	3,000
Storekeeper.	1 No.	3,000	3,000
Peon and watchman	4 No.	2,500	10,000
Skilled workers	3 Nos.	3,000	9,000
Furnace operators	3 Nos.	2,500	7,500
Unskilled workers	15 Nos.	2,500	37,500
	Perquisites @ 25%		22,500
	Total		1,14,000

(ii) Raw Material (per month)	Value (Rs.)
Graphite imported/ indigenous 13 tonnes @ Rs.25,000 per tonne	3,25,000
Silicon Carbide 9 tonnes @ Rs.22,000 per tonne	1,98,000
Ferro-Manganese and Ferro silicon 3.5 tonnes @ Rs.11,000 average per tonne	38,500

Raw Material (per month)	Value (Rs.)
Bonding materials such as tar and pitch synthetic resin etc. 5 tonnes @ Rs.6000 average per tonne.	30,000
Fire clay ball clay, china clay and other minerals like silimanite, bauxite, kyanite etc. for saggers and kiln furniture.	10,000
Misc. such as Lubricants, Chemicals etc.	7,000
Coke 10 tonnes @ Rs, 2,500 per tonne	25,000
Total	6,35,000

(iii) Utilities	(Rs.)
LDO/7.5K.L. @ 18,000/K.L.	1,35,000
Power 60x0.8x8x25x4	38,400
Water	1,000
Total	1,74,400

(iv) Other Contingent Expenses (per month)	(Rs.)
Postage and stationery.	1,000
Transport and conveyance	20,000
Repair and Maintenance.	10,000
Telephones	2,000
Packing materials and other consumables	3,000
Insurance	2,000
Total	38,000
Total Recurring Expenditure (per month)	9,59,900
Say	9,60,000

C. Total Capital Investment

Recurring Expenditure for 3 months.	Rs. 28,80,000
Fixed Capital	Rs. 54,22,000
Total	Rs. 83,02,000

FINANCIAL ANALYSIS

(1) Cost of Production (per annum)	(Rs.)
Total recurring expenditure	1,15,20,000
Interest on capital investment @ 14%	11,62,280
Depreciation on machinery and equipment @ 10%	1,34,000

(1) Cost of Production (per annum)	(Rs.)
Depreciation on Kilns @ 20%	5,40,000
Depreciation on Building @ 5%	4,41,025
Unforeseen expenses	5,000
Total	1,38,02,305

(2) Total Sales (per annum)	(Rs.)
300 tonnes of assorted sizes and shapes of Crucibles @ Rs. 54,308	1,62,92,450

(3) Profitability (per annum)

Profit = 16,29,2450 – 1,38,02,305 = 24,90,145
Say = 24,90,000

(4) Profit on Sales

$$= \frac{\text{Profit x 100}}{\text{Sales}}$$

$$= \frac{24,90,000 \times 100}{1,62,00,000}$$

$$= 15.4\%$$

(5) Profit on Capital

$$= \frac{\text{Profit x 100}}{\text{Total capital Investment}}$$

$$= \frac{24,90,000 \times 100}{83,02,000}$$

$$= 29.9\%$$

(6) Break-even Point

Fixed Cost	(Rs.)
Total deprecation	11,15,025
Interest on capital	11,65,080
Insurance	24,000
40% of staff and labour	5,35,200
40% of other expenditure	1,72,800
Total	30,12,160
or Say	30,12,000

B.E.P.

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

$$= \frac{30,12,000 \times 100}{30,12,000 + 24,90,000}$$

$$= 54.74\%$$

Addresses of Machinery and Equipment Suppliers

Ceramic Machinery

1. M/s. Kusum Engg. Co. Ltd.
   25, Swallow Lane,
   Kolkata.
2. M/s. Batliboi and Co.
   R. P. Road,
   Secunderabad-500003.
3. M/s. National India Engg.Co. Ltd.
   7/10, Elphinston Circle,
   Mumbai.
4. M/s. Amic Industries (P) Ltd.
   10, B.T.Road,
   Kolkata.
5. M/s. D.K. Engg. Works
   8, Panchanantala,
   New Road, Balgharia,
   Kolkata.
6. M/s. Hydraulic Roller Presses.
7. M/s. New Bence Engg. Products
   Industrial Area,
   Belgaum-590001
8. M/s. Maiman (P) Ltd.
   B-12, Indl. Area, Uppal,
   Hyderabad-500039
9. M/s. Quality Machine Tools
   25, Ambalal Joshi Marg,
   Mumbai-25
10. M/s. Machine Tool Traders
    P.B. No. 1260,
    57A, Lingichatty St.,
    Chennai-1

Raw Material Suppliers

Graphite

1. M/s. Patna State Graphite Minerals Co.
   Titagarh P.O. Orissa.
2. M/s. T. P. Mineral Industries
   Hospital Road,
   Sambalpur P.O.,
   Orissa
3. M/s. Lakshmi Narayan Agarwal
   Sambalpur P.O., Orissa.
4. M/s. Hindustan Graphite Refining Products Co.
   Opposite to Petrol Pump,
   G.N.T. Road, Kovvur,
   W.G. Distt. (A.P.)
5. M/s. East India Minerals
   Firyalal Building,
   Firyalal Chowk,
   Md. Road, Ranchi,
   Jharkhand.
6. M/s. Aswin Mineral
   Deogarh, Baria,
   Panchamahal Dt. Gujarat

Silicon Carbide

1. M/s. Cambata Ferro-Manganese Ltd.
   42, Queen Road,
   Mumbai
2. M/s. Ferro Alloys Corpn.
   Garividi-532, 126,
   Chipurupali Taluk,
   Srikakulam Distt. A.P.
3. M/s. Universal Ferro Alloys and Allied Chemicals
   Thannsar,
   Maharashtra.
4. M/s. Indian Metals and Ferro Alloys Ltd.
   P.B.No.94,
   Bhubaneswar.

Tar and Pitch

1. M/s Durgapur Project Ltd.
   Durgapur, West Bengal.

2. M/s. Hindustan Steels Ltd.
Bhilai, M.P.

3. M/s. Saw Wallace and Co. Ltd.
8/9, Thambuchetty St.,
Chennai

4. M/s. Imperial Chemical Industries (P) Ltd.
Mumbai Mutual Building,
Chennai-1

China Clay, Ball Clay, Fire Clay etc.

1. M/s. Kerala Government Ceramic Works,
Kundara, Kerala.

2. M/s. Hindustan China Clay Works
Papinaseri, Kerala.

3. M/s. Dr. N. Gangaish
Balakrishna Mineral Industries,
Ramavaram, E.G.Distt., A.P.