

Sintered Metal Bush

PRODUCT CODE	: 37431004
QUALITY AND STANDARDS	: IS 3980
MONTH AND YEAR OF PREPARATION	: February, 2003
PREPARED BY	: Branch Small Industries Service Institute Mangalore-8.

INTRODUCTION

Sintering is the process in which the green compact metal powder is subjected to heat at a temperature below the melting point of the solid metal. It is one of the two operations of powder metallurgical technology through which an ordinary shape to a complicated one can be manufactured at reasonable cost. The other operation is compacting or pressing which consists of subjecting the suitably prepared powder mixture at normal or elevated temperature to considerable pressure. The resulting powder compact is known as briquette and is said to be the form known as green.

In this process metal powder at a required ratio is blended, then pressed to desired level at a high pressure with precision tools and finally bonded or fused at elevated temperature in a furnace under a protective atmosphere as a high quality finished part, with mechanical properties more or less equal to parts manufactured under conventional method.

This profile deals with the manufacturing of sintered bronze bush

bearing which can be useful for any prospective entrepreneur.

MARKET POTENTIAL

Porous metal bearings were manufactured using Powder metallurgy techniques as early as 1909. But the growth rate of powder metallurgy has increased very rapidly from 1950s. Self lubricated bearings (bronze) are used in the industries of automobile, textile, agricultural and home appliances manufacturing and to a small extent in aircraft industry. Self lubricated bronze bearings are used to a great extent in small motors of fractional HP capacities. As the application of sintered metal bushes is increasing in many areas, particularly in automobile sectors and home appliances such as washing machines, refrigerators, electric clocks manufacturing industry, the demand is also steadily increasing for this item.

BASIS AND PRESUMPTIONS

1. The scheme is worked out on a single shift basis of 8 hours in a day for 25 working days in a month.
2. At 75% capacity utilization of installed capacity of plant and

machinery to achieve the production target 90000 no. of bronze bushes per annum.

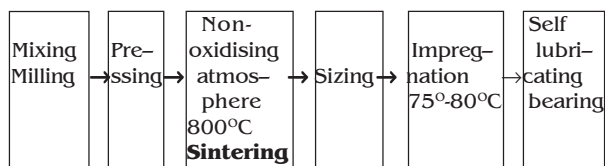
- Interest rates and land prices are as per the prevailing market prices. Salary and utility charges are as per local rates.

IMPLEMENTATION SCHEDULE

Sl. Activity No.	Perion (in Months)									
	1	2	3	4	5	6	7	8	9	10
1. Preparation of Project report	x									
2. SSI Registration (PRC)	x									
3. Identification of site	x	x								
4. Statutory clearance	x	x								
5. Arranging finance			x	x						
6. Building construction					x	x	x	x		
7. Arranging utilities						x	x			
8. Selection and ordering for machine					x	x				
9. Erection/installation of machine							x	x		
10. Recruiting manpower									x	
11. Procuring raw material/trial production									x	x
12. Production										x

TECHNICAL ASPECTS

Process of Manufacture



The basic steps in the production of Porous self-lubricating metal bushes are:

- Blending and mixing of metal powder

- Pressing–Die compaction (green briquettes)
- Pre-sintering and sintering
- Repressing
- Sizing
- Oil impregnation

The metal powder of copper, tin and graphite is mixed in a pre-determined ratio and blended in a ball mill by using organic lubricants by few percentage in weight for easing the moulding operation. The blended metal powder mix is compacted by subjecting to die compaction press briquetting. Before sintering the green briquettes at 800°C in a mesh belt conveyor of continuous furnace, pre sintering is carried out in the low temperature zone of the furnace at 440-450°C. The pre-sintering operation allows this powdered particles to liquidify and completely diffused into copper. The entire sintering operation is done in a furnace under a protective atmosphere creating a high quality finished product, otherwise the bonding between particles will be affected by surface films such as oxides. For applications that require higher density or close dimensional tolerances, sintering is followed by a cold working operation known as Coining or repressing.

In some cases resintering after repressing will increase mechanical properties. Despite increase in strength, resintering may result in large grain size and loss of dimensions due to shrinkage and to rectify this, sizing is done. Special sizing process similar to powder process and sizing dies gives the final dimensions. Finally, oil impregnation is done to fill the porous in the sintered parts by dipping them into hot non-

gumming petroleum oil for 10–15 minutes at 110°C, complete impregnation which is done primarily to improve anti-friction properties.

The final product, self lubricating bushes are checked as per IS 3980 and packed for despatching.

Quality Control and Standards

As per IS 3980.

Production Capacity

90,000 nos. of bronze bush for pumps of size O.D. 43 mm × I.D. 38 mm × height 40 mm.

Pollution Control

Sintering furnace should be provided with the fume outlet chimney of suitable height and the floor should be well ventilated and provided with exhaust fans.

Energy Conservation

Power factor should be monitored, at least once in a month it should be measured. If required additional capacitors can be installed to improve power factor. When any equipment is not in use it should be disconnected from the supply. Insulation should be provided where ever heat loss will occur.

FINANCIAL ASPECTS

A. Fixed Capital

(i) Land and Building	Amount (Rs.)
i. Land 500 sq.mts. @ Rs.400 per sq.mtr.	2,00,000
ii. Office/store and working shed average of 2000 sq.ft. @ Rs.300 per sq.ft.	6,00,000
Total	8,00,000

(ii) Machinery and Equipments

Sl. No.	Description	Qty.	Rate (In Rs.)	Amount (In Rs.)
1.	Sintering machine 8.2 kW with other accessories	1	20,25,000	20,25,000
2.	Mechanical Power Press 20 T capacity	1	3,80,000	3,80,000
3.	Repressing power press 10 T	1	2,60,000	2,60,000
4.	Briquetting press 1 T cap	1	1,25,000	1,25,000
5.	Air compressor with 3 HP motor	1	20,000	20,000
6.	Ball mill 500 kg capacity	1	70,000	70,000
7.	Oil quenching tank 4'×2'×2'	2	8,000	16,000
8.	M.S. Water tank	1	10,000	10,000
9.	Mould and other tools	-	-	25,000
10.	Heater 1.5 KW	1	4,000	4,000
11.	Exhaust Fan	1	10,000	10,000
12.	Chemical testing equipment and chemicals		-	30,000
13.	Hardness testing machine	1	40,000	40,000
14.	Measuring tools		-	35,000
15.	Power factor meter	1	5,000	5,000
16.	Tong tester	1	18,000	18,000
17.	Universal testing machine	1	3,75,000	3,75,000
18.	Office equipment/ furniture			1,00,000
19.	Pre-operative expenses			50,000
20.	Material handling equipments			10,000
21.	Installation and Electrification			3,09,430
	Total			39,17,230

B. Working Capital (per month)**(i) Raw Materials**

Sl. No.	Description	Qty.	Rate (In Rs.)	Amount (In Rs.)
1.	Atomized tin powder (kg)	36	220	7,920
2.	Electrolytic grade copper powder (kgs)	404	175	70,700
3.	Graphite powder	7.5	160	1,200
4.	High grade non gumming petrol oil (in lts.)	12	36	432
Total				80,252

(ii) Salaries and Wages

Sl. No.	Description	Qty.	Rate (In Rs.)	Amount (In Rs.)
1.	Work Manager	1	8,000	8,000
2.	Supervisor	1	5,000	5,000
3.	Skilled Workers	10	4,000	40,000
4.	Unskilled workers	10	2,000	20,000
5.	Lab. Technician	1	4,000	4,000
6.	Accountant/store Incharge	1	2,500	2,500
7.	Clerk/typist	1	2,500	2,500
8.	Watchman	1	2,000	2,000
Total				84,500

(iii) Utilities (per month)

Sl. No.	Description	Qty.	Rate (In Rs.)	Amount (In Rs.)
1.	Fuel combusted Hydro carbon gas cylinder	15	260	3,900
2.	Power 1250 kw units @ Rs. 4 per unit			5,000
3.	Water 10 kl @ Rs. 200 per kl			2,000
Total				10,900

(iv) Other Contingent Expenses

Sl. No.	Description	Amount (In Rs.)
1.	Advertisement and Publicity	5,000

2.	Consumables	10,000
3.	Insurance	15,000
4.	Postage, Stationery/Telephone	3,000
5.	Repairs & Maintenance	3,000
6.	Sales Expenses	2,000
7.	Taxes	5,000
8.	Transport	20,000
9.	Miscellaneous	5,000
Total		43,000
Working Capital per month (a+b+c+d) =		2,18,652
Say		2,18,650

(v) Working Capitalfor 3 Months $3 \times 2,18,650$ **Rs. 6,55,950****C. Total Capital Investment**

Fixed Capital	Rs. 47,01,230
Working Capital (for 3 months)	Rs. 6,55,950
Total	Rs. 53,57,180

FINANCIAL ANALYSIS**(1) Cost of Production (per annum)**

Sl. Description No.	Amount (Rs.)
1. Depreciation on building 5%	30,000
2. Depreciation on furnace @ 20%	4,05,000
3. Depreciation on machinery and equipment @ 10%	1,39,180
4. Depreciation on moulds and fixtures @ 25%	6,250
5. Depreciation on office equipment @ 20%	20,000
6. Recurring Expenditure	26,23,800
7. Interest on Capital Investment @ 13%	6,96,433
Total	39,20,663

(2) Sales (per annum)**(Rs.)**

By sale of 90,000 Nos. of bronze bush for pumps of size

D 43 mm× ID 38 mm×height 40 mm
@ Rs. 85/ piece**Total** **76,50,000**

(3) Profit (per annum)	(Rs.)
Sales	76,50,000
Cost of Production	39,20,663
Total	37,29,337

(4) Break-even Point**(i) Fixed Cost (per annum)**

Sl. Description No.	Amount (In Rs.)
1. Depreciation	6,00,430
2. Insurance	1,80,000
3. Interest on investment	6,96,433
4. 40% of salary and wages	33,800
5. 40% of other expenses and utilities excluding insurance	2,92,320
Total	18,02,983

(ii) Profit (per annum) Rs. 37,29,337

B.E.P.

$$\begin{aligned}
 &= \frac{\text{Fixed Cost} \times 100}{\text{Fixed Cost/annum} + \text{Profit per annum}} \\
 &= \frac{18,02,983 \times 100}{18,02,983 + 37,29,337} \\
 &= \mathbf{32,58\%}
 \end{aligned}$$

Addresses of Machinery and Equipment Suppliers

1. M/s. Benco Hydraulics Ltd.
7/2, Nangambakkam High Road,
Chennai-34.

2. M/s. Heaters India
252, SIDCO Industrial Estate,
Ambattar,
Chennai-98.
3. M/s. Industrial Pyrotech Engineers
20 Bashym, Ist Street,
Chennai-23.
4. M/s. Murugappa Morzan Thermal
28, Rajaji Road, 5th Floor,
Chennai.
5. M/s. Thermochem Engineers
455, 12th Cross,
4th Phase, Penya,
Bangalore-58.
6. M/s. Ruia Resistance Wires Pvt. Ltd.
Hari Nivas,
Riya House,
Malviya Road, Vile Parle (E),
Mumbai - 57.

Addresses of Raw Material Suppliers

1. M/s. Bhandari Metallurgical Corporation Ltd.
829, Mount Road,
Chennai.
2. M/s. Bombay Metal Depot
Anugraha, 19 NH Road,
Chennai - 34.
3. M/s. Padmavathy Metal and Alloy Pvt. Ltd.
447/2, Puonthamalli High Road,
Chennai - 106.