

Investment Casting

| | |
|-------------------------------|--|
| PRODUCT CODE | : N.A. |
| QUALITY AND STANDARDS | : As Per Customers' Specifications |
| PRODUCTION CAPACITY | : Qty.: 810 MT (per annum) Value: Rs. 5,89,68,000 |
| MONTH AND YEAR OF PREPARATION | : December, 2002 |
| PREPARED BY | : Small Industries Service Institute Kurla Andheri Road, Saki Naka, Mumbai-400 072 |

INTRODUCTION

Investment Casting is a metal casting process which employs an expendable pattern and one piece non metallic mould. This process is also known as Precision Casting because it eliminates the parting line and reduces the machining cost. Sometimes, this process is also known as lost wax method. Although all metals, namely ferrous as well as non-ferrous can be casted by this process, it is most suitable for expensive, hard and high strength metals and alloys, which are difficult to machine. This also includes Stainless and Tool Steels.

Steel, in general, finds extensive application in each and every sphere of life ranging from domestic use to industrial use. In this project, the casting has been worked out on the basis of Stainless Steel Scrap, which finds tremendous application in Chemical, Pharmaceutical, Dairy, Power Generation, Aircraft Industries such as Screws, Fuel Lines, Engine Parts, Heat Exchangers, Turbine Buckets and Valves. Most of it

conforms to austenitic, ferritic and martensitic grade followed by Heat Treatment.

MARKET POTENTIAL

The units engaged in the manufacturing of Chemical, Pharmaceutical, Power Generation, Aircraft Industries and Dairy Equipment require a number of special castings such as Stainless Steel Castings in different sizes and shapes. In addition, the requirement of tool steels has gone on increasing with the pace of industrial development. The number of units engaged in the Steel Castings by Investment process are negligible. A few which are producing their castings by conventional type of casting process are not of the standards and specifications with respect to chemical composition of steel. In view of the above, there is immense scope for setting up of such units in the Small Scale Sector with induction melting and quality control facilities due to latest industrial policy declared by the Government, so as to cater to the needs of various industries established in the country and overseas.

BASIS AND PRESUMPTIONS

1. The scheme has been based and worked out on single shift basis of 8 hours and 300 working days in a year with a 25% idle time left for breakdown, maintenance, repairs etc. To get production on economic scale, full utilization of capacity in three shift basis is recommended. Initial target has been fixed at 810 MT of casting at 60% capacity utilization on single shift basis for first year of production.
2. Time period for achieving full capacity utilization will be 4 years and 60% to 80% of capacity utilization for 1st, 2nd and 3rd years of production.
3. The Skilled, Semi-skilled and Unskilled labour will be engaged @ Rs. 3,000 , Rs. 2,500 and Rs. 2,000 respectively per month.
4. Interest rate for fixed and working capital is estimated at 18% per annum.
5. Margin Money will be 25% of the total cost of project.
6. Pay back period of 10 years with moratorium period of 1-1/2 years.

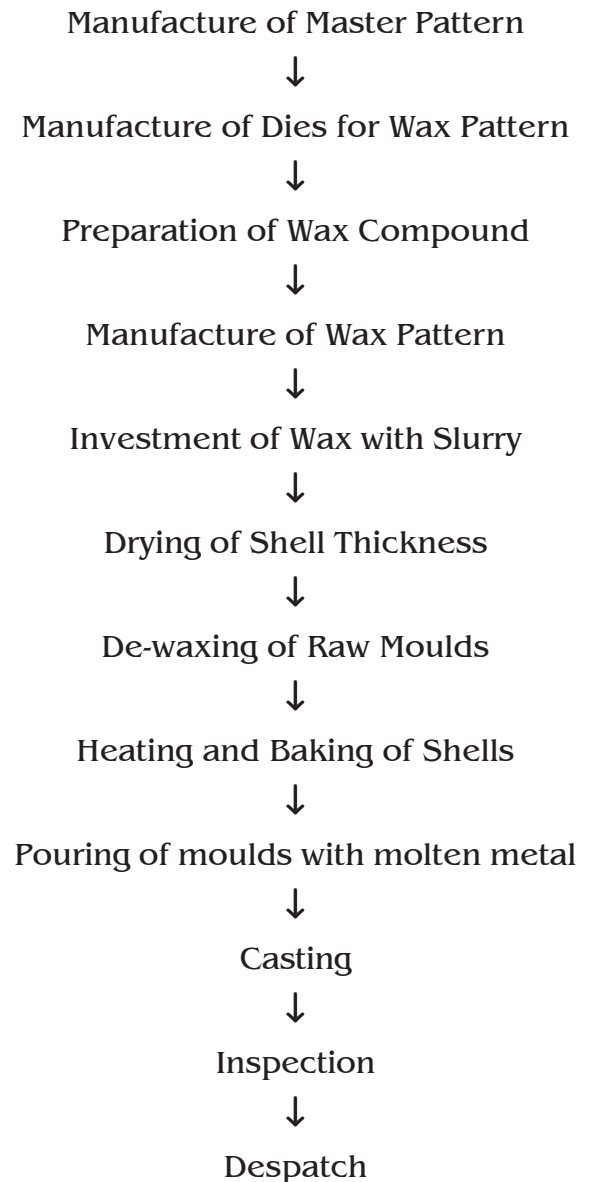
IMPLEMENTATION SCHEDULE

| Activity | Period |
|--|---|
| 1) Time required for preparation of Project Report | 4 Weeks |
| 2) Selection of Site | 4 Weeks |
| 3) Provisional Registration as SSI Unit | 1 Day |
| 4) Availability of Finance/Loan | Within 3 months of submission of the Project Report |

| | |
|---|-----------------|
| 5) Machinery procurement, erection and commissioning and trial runs | 4 Months |
| 6) Recruitment of Labour | 3 Weeks |
| 7) Start of Commercial Production | Within one year |

TECHNICAL ASPECTS

Process of Manufacture



Metal Scrap is melted in induction furnace and tapped in ladles. Invested moulds are poured with the molten metal

to get the desired castings. Castings are cooled down and are fettled. The casting is investigated and despatched. If desired the ferro-alloys are added in the ladle itself to get desired composition.

Quality Control and Standards

In the present scheme the inclusion of chemical testing will enable the unit to adopt quality control measures starting from selection and grading of scrap to conformation of standards for the final casting.

Casting alloys selected are mainly those conforming to austenitic or non-magnetic and austenitic grades like AISI 405, 406, 430, 430F, 466, 403, 410, 414, 416, 420, 440A, 440B, 440C respectively.

Production Capacity

| | |
|----------|---------------------|
| Quantity | : 810 MT (per year) |
| Value | : Rs. 5,89,68,000 |

Motive Power

Approximate motive power will be 700 K.W. per ton of castings manufactured.

Pollution Control

The requirements of Rule 10 of the Air (Prevention and Control of Pollution) U.T. Rules, 1983 and Rule 33 of the (Prevention and Control of Pollution) Rule, 1976 are to be observed.

Energy Conservation

There is a scope to conserve the energy by installing energy conservation equipment, so as to have minimum heat losses from melting induction furnace. With the use of energy server power economiser, electrical circuit and energy

efficient right energy circuit neutral lighting, electrical energy can be conserved.

FINANCIAL ASPECTS

A. Fixed Capital

| (i) Land and Building | Amount (In Rs.) |
|--|-----------------|
| Land 1000 M ² @ Rs. 60/M ² | 60,000 |
| Built-up Area 60 M ² @ Rs. 2,500/M ² | 1,50,000 |
| Working Shed 100 M ² @ Rs. 2,000/M ² | 2,00,000 |
| Total | 4,10,000 |

(ii) Machinery and Equipments

| Sl. No. | Particulars | Qty. | Amount (In Rs.) |
|----------------------------|---|---------|-----------------|
| <i>(a) Production Unit</i> | | | |
| (1) | 1000 kg. 450 KW Medium Frequency Coreless Melting Induction Furnace alongwith Crucible, Generator, Hydraulic System and Electrical Control complete | 1 No. | 40,00,000 |
| 2) | Pump for pumping Furnace Oil | 1 No. | 25,000 |
| 3) | Auxiliary Transformer | 1 No. | 2,50,000 |
| 4) | Cooling Tower | 1 No. | 45,000 |
| 5) | Water Softening Plant | 1 No. | 50,000 |
| 6) | 20 MHz Oscilloscope | 1 No. | 20,000 |
| 7) | 5 Ton capacity Crane | 1 No. | 3,00,000 |
| 8) | Water and Pipe Line | 1 No. | 50,000 |
| 9) | Ladle Heating Burner with Heating Pumps etc. | 1 No. | 30,000 |
| 10) | Plate type Heat Exchanger | 1 No. | 55,000 |
| 11) | Mould Coolers | 1 No. | 60,000 |
| 12) | Die Making Machine | 1 No. | 8,000 |
| 13) | Wax Injection Machine | 1 No. | 10,000 |
| 14) | Air Compressor with 5 H.P. Motor | 1 No. | 9,600 |
| 15) | Metal Spraying Equipment complete with accessories | One Set | 25,000 |
| 16) | Compressed Air Spray Gun for Preliminary Investment | 1 No. | 2,500 |

| Sl. No. | Particulars | Qty. | Amount (In Rs.) |
|---|---|-------|-----------------|
| 17) | Special purpose machine for sprinkling the wax pattern with key in grey factory (Self Fabricated) | 1 No. | 11,000 |
| 18) | Dough Mixer used for preparing the Investment Slurry | 1 No. | 12,000 |
| 19) | Electric drying oven with uniform air circulation with 55 shelves | 1 No. | 12,000 |
| 20) | Core Baking Oven (Self Constructed, Coke Fired) | 1 No. | 11,000 |
| 21) | Moulding Boxes of assorted sizes | L.S. | 18,000 |
| 22) | Moulding Hand Tools | L.S. | 1,200 |
| 23) | Weighing Scale with weights (Platform Type) | 1 No. | 12,000 |
| 24) | Gravity Die Mould | 1 No. | 12,000 |
| 25) | Motorised Grinder, double ended | 1 No. | 4,000 |
| 26) | Pyrometer Emersion Type thermo couple) | 1 No. | 2,500 |
| 27) | Arc Welding Machine | 1 No. | 12,000 |
| 28) | Bench Drilling Machine | 1 No. | 5,000 |
| 29) | Transformer | 1 No. | 4,20,000 |
| 30) | Material Handling Equipment i.e. Hand Trolley | 1 No. | 12,000 |
| 31) | Fettling and Cutting Tools | L.S. | 8,500 |
| 32) | Measuring/Inspecting Tools as required | L.S. | 12,000 |
| <i>(b) Testing Equipment</i> | | | |
| 33) | Tensile Tester | 1 No. | 11,000 |
| 34) | Hardness Tester | 1 No. | 9,000 |
| 35) | Universal Tester | 1 No. | 35,000 |
| 36) | Centrifugal Testing | 1 No. | 700 |
| 37) | Chemical Testing Lab Equipt. | 1 No. | 50,000 |
| <i>(c) Pollution Control Equipments</i> | | | |
| 38) | Dust Precipitators | | |
| 39) | Fume Extractor | — | 3,00,000 |
| 40) | Exhaust Fans | | |
| 41) | Hoods | | |

| Sl. No. | Particulars | Qty. | Amount (In Rs.) |
|---|---|-------|------------------|
| <i>(d) Energy Conservation Equipments</i> | | | |
| 42) | Energy Server Power Economiser Electronic Circuit | 1 No. | 45,000 |
| 43) | Energy efficient lighting energy server circuit of neutral lighting | 1 No. | 20,000 |
| (e) | <i>Electrification and Installation Charge @ 10% of Cost of the Machinery and Equipment</i> | — | 5,97,600 |
| Total | | | 65,73,600 |
| (f) | <i>Cost of Moulds/Other Fixtures 10 Nos. of Ladles</i> | | 40,000 |
| (g) | <i>Office Equipment</i> | — | 15,000 |
| Total | | | 66,28,000 |

Total Fixed Capital (I + II) Rs. 70,38,60000

B. Working Capital (per month)

(i) Personnel

| Sl. No. | Designation | Salary (Rs.) | No. | Amount (In Rs.) |
|--|------------------------------------|--------------|---------|-----------------|
| 1) | Metallurgist/ Foundry Technologist | 8,000 | 1 No. | 8,000 |
| 2) | Shop Supervisor | 6,000 | 1 No. | 6,000 |
| 3) | Laboratory Assistant | 3,500 | 1 No. | 3,500 |
| 4) | Skilled Workers | 3,000 | 12 Nos. | 36,000 |
| 5) | Helpers | 2,000 | 15 Nos. | 30,000 |
| 6) | Clerk-cum-Accountant | 3,000 | 1 No. | 3,000 |
| 7) | Storekeeper | 2,000 | 1 No. | 2,000 |
| 8) | Peon | 1,500 | 1 No. | 1,500 |
| 9) | Watchman | 1,500 | 1 No. | 1,500 |
| Total | | | | 91,500 |
| Say | | | | 1372500 |
| <i>Add Perquisites @ 15% of Salaries</i> | | | | 14,000 |
| Grand Total | | | | 1,05,500 |

(ii) Raw Material Including Packaging Requirement (per month) (Rs.)

| | | |
|--|-------|------------------|
| 1) Graded Stainless/Alloy Steel @ Rs. 40,000/T | 81 MT | 32,40,000 |
| 2) Wax @ Rs. 20,000/T | 10 MT | 2,00,000 |
| 3) Ferro-Alloy | L.S. | 1,50,000 |
| Total | | 35,90,000 |

(iii) Utilities (per month) (Rs.)

| | | |
|--|--|-----------------|
| 1) Power 54,000 KWH @ Rs. 3 per unit | | 1,62,000 |
| 2) Furnace Oil 12 Kilo Litre @ Rs. 5,000 | | 60,000 |
| Total | | 2,22,000 |

(iv) Other Contingent Expenses (per month) (Rs.)

| | | |
|---|--|-----------------|
| 1) Foundry Consumables | | |
| i) Ramming Mass | | |
| ii) Bentonite | | 40,000 |
| iii) Silica/Zircon Films | | |
| iv) Foundry Sand, Fluxes, Coats and Chemicals | | |
| 2) Telephone | | 2,500 |
| 3) Laboratory Consumables | | 42,000 |
| 4) Repairs and Renewals | | 70,000 |
| 5) Postage and Stationery | | 2,500 |
| 6) Advertisement and Publicity | | 4,000 |
| 7) Transport Charges | | 1,500 |
| 8) Insurance | | 2,500 |
| 9) Sales Expenses | | 2,500 |
| 10) Miscellaneous | | 1,500 |
| Total | | 1,69,000 |

(v) **Total Recurring Expenditure (per month)**
(i + ii + iii + iv) **Rs. 40,86,500**

(vi) **Total Recurring Expenditure (for 3 Months)**
40,86,500 × 3 = **Rs. 1,22,59,500**

C. Total Capital Investment

| | |
|---------------------------|------------------------|
| i) Total Fixed Capital | Rs. 70,38,600 |
| ii) Total Working Capital | Rs. 1,22,59,500 |
| Total | Rs. 1,92,98,100 |

MACHINERY UTILIZATION

Machine shall be utilised fully.

FINANCIAL ANALYSIS**(1) Cost of Production (per year) (Rs.)**

| | |
|--|--------------------|
| i) Total Recurring Cost | 4,90,38,000 |
| ii) Depreciation on Building @ 5% | 17,500 |
| iii) Depreciation on Machinery and Equipment @ 10% | 2,57,360 |
| iv) Depreciation on Furnace @ 20% | 8,00,000 |
| v) Depreciation on Moulds and Fixtures @ 20% | 8,000 |
| vi) Depreciation on Office Equipment @ 20% | 3,000 |
| vii) Interest on Total Investment @ 18% | 34,73,658 |
| Total | 5,35,97,578 |
| Say | 5,35,98,000 |

(2) Turnover (per year) (Rs.)

| | | |
|-----------------|--------|-------------|
| Steel Casting | 810 MT | 5,89,68,000 |
| @ Rs. 72,800/MT | | |

(3) **Net Profit (per year) (Before Income Tax)**
Turnover – Cost of Production = **Rs. 53,70,000**

(4) Net Profit Ratio

$$= \frac{\text{Net Profit per year} \times 100}{\text{Turnover per year}}$$

$$= \frac{53,70,000 \times 100}{5,89,68,000}$$

$$= 9\%$$

(5) Rate of Return

$$= \frac{\text{Net Profit per year} \times 100}{\text{Total Investment}}$$

$$= \frac{53,70,000 \times 100}{1,92,98,100}$$

$$= 29\%$$

(6) Break-even Point**Fixed Cost (Rs.)**

| | |
|---|-----------|
| a) Depreciation on Machinery and Equipment, Tools and Fixtures and Office Equipment | 10,68,360 |
| b) Depreciation on Building | 17,500 |

| | |
|-------------------------------------|------------------|
| c) Interest on Total Investment | 34,73,658 |
| d) Insurance | 30,000 |
| e) 40% of Salary and Wages | 5,06,400 |
| f) 40% of other Contingent Expenses | 7,99,200 |
| Total | 58,95,118 |
| Say | 58,95,000 |

$$\begin{aligned} \text{B.E.P.} &= \frac{\text{Fixed Cost} \times 100}{\text{Fixed Cost} + \text{Profit}} \\ &= \frac{58,95,000 \times 100}{58,95,000 + 53,70,000} \\ &= \frac{58,95,000 \times 100}{1,12,65,000} \\ &= 52\% \end{aligned}$$

Addresses of Machinery and Equipment Suppliers

1. M/s. Electrotherm (India) Ltd.
414, MIDC, Phase - II,
Opp. Visol Crossing, Vatva,
Ahmedabad - 382 445.
2. M/s. General Electric Co. of India Limited
Magnet House, 6,
Chittaranjan Avenue,
Kolkata - 13.
3. M/s. Hindustan Brown Boverly Limited
20, Grashani Road,
Ballard Estate,
Mumbai - 1.

Addresses of Raw Material

(I) Suppliers of Scrap

1. M/s. Metal Scrap Trading Corporation.
2. M/s. Mishra Dhatu Nigam.
3. M/s. S.A.I.L.

(II) Ferro-alloys and Other Consumable Stores

1. M/s. Global Linkers (P) Ltd.
2992, Ajmeri Gate,
Kamala Market,
Delhi - 6.
2. M/s. Ferro-Alloys Corporation
122, Jorbagh, New Delhi and
Tumsar (M.S.)
3. M/s. Chemical and Scientific Corpn.
2133, Tilak Bazar,
Khari Baoli,
Delhi - 6.
4. M/s. Metonim Alloys
3992, Ajmeri Gate,
Delhi - 6.
5. M/s. Nav Bharat Ferro Alloys Ltd.
Erramanjil,
Hyderabad.

(III) Foundry Fluxes and Chemicals

1. M/s. Achme Foundry Flux and Co.
Hadapsar, Pune - 13.
2. M/s. Greaves Ferro Ltd.
Penjugutta,
Hyderabad - 34.
3. M/s. ABC Metallurgicals Pvt. Ltd.
12, Belighuta Road,
Kolkata - 15.
4. M/s. Ferro Alloy Corporation
122, Jorbagh,
New Delhi - 110 003.
5. M/s. Greaves Cotton Co. Ltd.
201, Nirmal Tower,
26, Brasa Khambi Road,
New Delhi.
6. M/s. Bhagwati Silicate and Chemical Works
Dehradun Road,
Saharanpur (U.P.)

7. M/s. Chemic Industries
Bulandghar Indl. Area,
Gaziabad.
8. M/s. Frontier Chemical Industries
G.T. Road, Shahdara.
9. M/s. N.K. Hookers Ltd.
4, Midland Crescent,
London - KW - 3.
10. M/s. B.S.A. Precision Casting
Foundry, Stanley Road,
Waras, England.
11. M/s. British Information Centre
British High Commissioner,
New Delhi - 110 021.
12. M/s. Ratankar Industries
15, Tatel, Block 10/2,
Erandvana, Karve Road,
Pune - 3.

(IV) For Wax Injection

1. M/s. Spares and Equipment Ltd.
62-64, Milk Street,
Bristol, (England)