STEEL CASTINGS

1. INTRODUCTION:

Steel is an alloy of Iron and carbon. Carbon content below 2% is termed as steel while that above the limit is termed as cast iron. Steel castings are used when cast irons cannot deliver enough strength or shock resistance.

Carbons steels are graded in to low, medium and high carbon steel. Depending on the carbon content steel achieves different microstructure. This can be further enhanced by controlling cooling rates of molten metal and heat treatment.

This project is focused on value addition in steel castings with consistency in mechanical properties, superior microstructure and precision casting. This is to be achieved by monitoring and adopting best practices for process control of moulding, melt preparation and alloy addition as per requirement.

2. PRODUCT & ITS APPLICATION:

Steel melt with good composition can be cast by melting in medium frequency induction durance. In addition to controlling carbon impurities content, several alloy elements are added. Steel castings quality is ensured with proper process controls. For steel castings addition of alloys is very important to get the desired properties needed for end application, viz manganese, silicon, chromium, nickel, vanadium, molybdenum etc. are added to get different properties. Viz heat, corrosion, wears etc. resistance. Also Stainless and Tool Steels for very high end application are used in most machines.

Steel casting is widely used in all types of industries for critical components. Steel castings applications are common for critical machines such as hydroelectric turbine wheels, forging presses, gears, railroad truck frames, valve bodies, pump casings, mining machinery, marine equipment, turbocharger turbines and engine cylinder blocks.

3. DESIRED QUALIFICATIONS FOR PROMOTER:

Preferably mechanical or metallurgical graduate with experience in this technology.

4. INDUSTRY OUTLOOK/TREND

India is the world's third-largest casting producer after China and the U.S. India produces castings of about 11 and 12 million tonnes per year. The steel foundries in India comprises of various large, medium and small companies that manufacture carbon steel alloys stainless steel and super alloy cast products.

Large players produce bulk of the domestic and export requirements for auto, mining, Power, capital goods, Railways and defense sectors. Few names are Electro steel Castings Ltd, Lanco Industries, Rail Wheel Factory, Hinduja Foundries, Nelcast Ltd., Tata Motors, Brakes India, Dcm Engineering Products, Sakthi Auto Component Ltd., Cooper Foundry, Mahindra- Hinoday, Mahindra Auto, Jayaswals Neco Ltd., NECO Castings, Ashok Iron Works, Kirloskar Ferrous Industries Ltd., Welcast Steels Ltd. etc. compete with various medium and small companies numbering around 1500 units located all around industrial and urban centers in India to provide services to end-user industries.

Large companies dominate the bulk of auto, power, railways and defense market in India with more than 70% share. Small and medium industry are competing in industrial valves pumps, machine tools, mining, mineral processing, cement, chemical, pharma, dairy, food processing etc. industry. The steel foundries in unorganized sector with proper standard specification and approval process are doing quite well in niche markets.

Though Indian steel foundries are dominated by low technology, slow shift can be witnessed with energy efficient furnaces, molding machines and metal quality control systems.

5. MARKET POTENTIAL AND MARKETING ISSUES. IF ANY:

The growth of Indian economy is at 7%, sue to huge population demanding massive industrial and infrastructure investment in automobiles, Railway, cement, power generation and fertilizer Industries etc. core sectors and all associated industries viz Chemical, Pharmaceutical, Dairy, food processing Equipment etc. is the main driver for steel castings.

The global steel casting market is dominated by Asian countries China, Japan, India. India is likely to be leader competing with China in near future with a large number of players. India is emerging in steel casting industry and global demand will augment the growth opportunities for steel foundries in the coming years. Most of the global steel castings demand is with better metallurgy with austenitic, ferritin and martensitic grade steel alloys suitable for Heat Treatment.

Steel Castings units producing their castings with standards and specifications with respect to chemical composition of steel and close tolerances have immense scope. There is good scope for setting up such units in the Small to medium Scale Sector with induction melting and good metallurgical quality control facilities.

6. RAW MATERIAL REQUIREMENTS:

The raw materials – are Steels viz. Stainless Steel, Heat Resistant, Corrosion Resistant, Tool Steel & even High-Speed Steel. The basic raw material is assorted steel scrap or ingots for melting. Other materials are fluxes micro alloying additives and Ferro alloy elements. Other consumables are molding sand and pattern making materials. Certain additives for molding, viz. refractory powder, graphite etc. And melt additives for cleaning, metal composition control is used to get desired quality and finish of castings.

7. MANUFACTURING PROCESS:

Steel Castings with controlled chemical composition can be made by induction melting process. Depending on furnace capacity large castings can be manufactured in variety of Materials - viz. Stainless Steel, Heat Resistant, Corrosion

Resistant, Tool Steel & even High-Speed Steel. The main stages Process are as below:

- Precision pattern Development as per Customer drawing & Foundry practice. Manufacture of Pattern and cores is critical as ensure close tolerances.
- Preparation of mold for casting.
- Assembling of patterns may be required for complex shapes and sizes.
- Covering of mold with the various materials viz refractory or graphite, silicon or other additive mixed sand.
- Baking of mold and core inserts
- Melting of metal with desired composition in furnace and chemical/ physical testing of melt samples prior to casting.
- Pouring the required Metal in molds.
- Removal of moulds and allowing casting to cool at required rate to achieve microstructure.
- The gates risers are cut-off and grinding is done with flexible shaft grinders. The casting is then sand or shot blasted to maintain metal skin properties and finish.
- Casting may be machined as per customer drawing and heat treated before or after machining. Surface treatments may be carried out.
- Final Inspection, Packing & Dispatch

8. MANPOWER REQUIREMENT:

The unit shall require highly skilled service persons. The unit can start from 20 employees initially and increase to 42 or more depending on business volume.

Sr No	**Type of Employees**	**Monthly Salary**	**No of Employees**				
			Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
1	Skilled Operators	18000	4	6	8	10	12
2	Semi-Skilled/ Helpers	8000	12	18	24	24	24
3	Supervisor/ Manager	30000	1	2	2	2	2

4	Accounts/ Marketing	16000	1	2	2	2	2
5	Other Staff	8000	2	2	2	2	2
	TOTAL		20	30	38	40	42

9. IMPLEMENTATION SCHEDULE:

The unit can be implemented within 8 months from the serious initiation of project work.

Sr No	Activities	Time Required in Months
1	Acquisition of Premises	2
2	Construction (if Applicable)	2
3	Procurement and Installation of Plant and Machinery	3
4	Arrangement of Finance	2
5	Manpower Recruitment and start up	2
	Total Time Required (Some Activities run concurrently)	8

10. COST OF PROJECT:

The unit will require total project cost of Rs 210.33 lakhs as shown below:

Sr. No	Particulars	In Lakhs
1	Land	30.00
2	Building	45.00
3	Plant and Machinery	72.33
4	Fixtures and Electrical Installation	12.20
5	Other Assets/ Preliminary and Preoperative Expenses	4.00
6	Margin for working Capital	46.80
	TOTAL PROJECT COST	210.33

11. MEANS OF FINANCE:

The project will require promoter to invest about Rs 87.68 lakhs and seek bank loans of Rs 122.65 lakhs based on 70% loan on fixed assets.

Sr. No	Particulars	In Lakhs
1	Promoters Contribution	87.68
2	Loan Finance	122.65
	TOTAL :	210.33

12. WORKING CAPITAL REQUIREMENTS:

Working capital requirements are calculated as below:

Sr. No	Particulars	Gross Amount	Margin %	Margin Amount	Bank Finance
1	Inventories	29.63	40	11.85	17.78
2	Receivables	26.56	50	13.28	13.28
3	Overheads	9.82	100	9.82	0.00
4	Creditors	29.63	40	11.85	17.78
	TOTAL	95.63		46.80	48.83

13. LIST OF MACHINERY REQUIRED:

Sr. No	Particulars	UOM	Quantity	Rate	Total Value
	Main Machines/ Equipment				
1	Medium Frequency Induction Furnace 1500 kg	Nos	1	3500000	3500000
2	Cooling tower, Water softening plant, heat exchanger auxiliaries	Nos	1	850000	850000
3	Molding Machines	Nos	3	250000	750000
4	Sand mixer, sieves etc.	Nos	1	150000	150000
5	Core molding Machine	Nos	2	25000	50000
6	Sand reclamation System	Nos	1	200000	200000
Sr. No	**Particulars**	**UOM**	**Quantity**	**Rate**	**Total Value**
7	Core Baking oven with accessories	Nos	1	70000	70000
8	Mold/core coating material mixer / spray gun	Nos	1	35000	35000
9	Ladle with heating system	Nos	2	30000	60000

10	EOT Crane	Nos	1	350000	350000
11	Shot blasting machine	Nos	1	200000	200000
12	Lathe Machine	Nos	2	75000	150000
13	Drilling Machine	Nos	1	50000	50000
14	Milling Machine	Nos	1	300000	300000
15	Mold Boxes and tools	LS	1	250000	250000
16	Bench/ Flexible shaft grinders	Nos	4	12000	48000
17	Metallurgical Microscope	Nos	1	80000	80000
18	Sample grinding / polishing M/c	Nos	1	200000	200000
19	Physical testing Lab	LS	1	350000	350000
20	Chemical Test Lab	LS	1	150000	150000
	subtotal :				7013000
	Tools and Ancillaries				
1	Patterns tools and gauges	LS	1	150000	150000
2	Misc. tools etc.	LS	1	70000	70000
	subtotal :				220000
	Fixtures and Elect Installation				
	Storage racks and trolleys	LS	1	30000	30000
	Other Furniture	LS	1	40000	40000
	Telephones/ Computer	LS	1	150000	150000
	Electrical Installation	LS	1	1000000	1000000
	subtotal :				1220000
	Other Assets/ Preliminary and Preoperative Expenses	LS	1	400000	400000
	TOTAL PLANT MACHINERY COST				8853000

All the machines and equipment are available from local manufacturers. The entrepreneur needs to ensure proper selection of product mix and proper type of dies and tooling to have modern and flexible designs. It may be worthwhile to look at reconditioned imported machines, dies and tooling.

1. Techno Machines
   Chikkanahalli Road,
   Opp. Shahi Exports (Unit No 6),
   Near Annapoorneshwari Temple,

Bommanahalli,
BENGALURU-560 068, INDIA

2. S. S. Engineering Works
Ajit Khanna(Proprietor)
Plot No. 100, Sector 6 IMT Manesar,
Gurgaon - 122050, Haryana, India

3. Taurus Private Ltd Co
No. 24, D 2 / E 3, Kiab Industrial,
Area At Pivele
Kiab Industrial Area,
Bengaluru – 560100 Karnataka, India

4. Micro Engineering Works;
No. 6/140, Gandhi Nagar,
Nallampalayam Road Nanjai Gounden,
Pudur, G. N. Mills Post,
Coimbatore - 641029, Tamil Nadu, India

5. Electrotherm India Ltd.,
Survey No. 72, Village Palodia,
Taluka Kalol Via Thaltej
Ahmedabad- 382115, Gujarat

Other well-known machine are Acme Tooling’s, Ace manufacturing systems, Batliboi Ltd., Bharat Fritz Werner, HMT Machine Tools Ltd., Advani Oerlikon Ltd, Lakshmi Machine Works Ltd., Lokesh Machines Ltd., Praga Tools Ltd., Toolcraft Systems Pvt. Ltd. Etc. The above list of machine supplier is illustrative.

14. PROFITABILITY CALCULATIONS:

Sr. No	**Particulars**	**UOM**	**Year Wise estimates**				
			Year 1	**Year 2**	**Year**	**Year 4**	**Year 5**

					3		
1	Capacity Utilization	%	35	45	55	65	75
2	Sales	Rs Lakhs	318.70	409.75	500.81	591.87	682.92
3	Raw Materials & Other Direct Inputs	Rs Lakhs	237.01	304.72	372.44	440.15	507.87
4	Gross Margin	Rs Lakhs	81.69	105.03	128.37	151.71	175.05
5	Overheads Except Interest	Rs Lakhs	61.38	61.38	61.38	61.38	61.38
6	Interest	Rs Lakhs	17.17	17.17	17.17	17.17	17.17
7	Depreciation	Rs Lakhs	13.35	13.35	13.35	13.35	13.35
8	Net Profit Before Tax	Rs Lakhs	-10.21	13.13	36.47	59.81	83.15

The Unit will have capacity of 1000 MT per year of Steel Castings of different grades/ types. The bulk sale/ distribution sales prices of steel castings ranges from Rs 50 per Kg to Rs 300 per kg for super alloy, intricate and high end metal products depending on type, size, ratings/ specifications and testing requirements and volumes/ order.

The raw material cost ranges from 45 to 70 per kg for steel scrap. The melt additives costs range from Rs 30 to 460 per Kg. The material requirements are considered with wastage/ scrap etc. of 6 % of finished products. The unusable scrap is sold at @ Rs 18 ~ 50 per Kg. and the income of same is added. Energy Costs are considered at Rs 7 per Kwh and fuel cost is considered at Rs. 65 per liter. The depreciation of plant is taken at 10 % and Interest costs are taken at 14 -15 % depending on type of industry.

15. BREAK EVEN ANALYSIS

The project is can reach break-even capacity at 42.02 % of the installed capacity as depicted here below:

Sr. No	Particulars	UOM	Value
1	Sales at Full Capacity	Rs Lakhs	910.56
2	Variable Costs	Rs Lakhs	677.16
3	Fixed Cost incl. Interest	Rs Lakhs	91.90
4	Break Even Capacity	% of Inst Capacity	39.38

16. STATUTORY/ GOVERNMENT APPROVALS

The unit shall have to get state industrial unit registration from DIC, IEC Code for Export and local authority clearance. Depending on structure of finance the company shall need to register company with registrar of companies. The registration and approval for factory plan, safety for Fire etc. requirement, registration as per Labour laws ESI, PF etc. shall be required as per rules and applicability. Before starting the unit will also need GST registration for procurement of materials as also for sale of goods. As such there is no pollution control registration requirements, except installation of chimney/ blowers for heat treatment furnace / pickling line and ensure safe environment as per rules of factory safety. Solid waste disposal shall have to meet the required norms. Entrepreneur may contact State Pollution Control Board where ever it is applicable.

17. BACKWARD AND FORWARD INTEGRATION

The machines and equipment offer scope for diversification in to producing the continuous flux cored and coated electrode range of products and also take up import substitution for welding electrodes by ensuring metal and flux compositions. The unit can also of other consumer and industrial wire products / components etc. by using the spare capacities and machine capabilities. As such there is not much scope for organic backward or forward integration.

18. TRAINING CENTERS/COURSES

There are no specific training centers for wire drawing technology. There are training for dies and tools development run by several centers of excellence viz Indo German Tool Room at Ahmedabad, Rajkot, Chennai, and CTTC Bhubaneswar etc. shall be helpful.

The most important scope of learning is in new product design and development by associating with institutes like NID etc. Entrepreneur may also study the new product designs, product range, features and specifications of leading Brands / competitors across the world by scanning the Internet and downloading data. Viz. North American, Europe, China etc. markets.

Udyamimitra portal (link : www.udyamimitra.in) can also be accessed for hand-holding services viz. application filling / project report preparation, EDP, financial Training, Skill Development, mentoring etc.

Entrepreneurship program helps to run business successfully is also available from Institutes like Entrepreneurship Development Institute of India (EDII) and its affiliates all over India.

Disclaimer:

Only few machine manufacturers are mentioned in the profile, although many machine manufacturers are available in the market. The addresses given for machinery manufacturers have been taken from reliable sources, to the best of knowledge and contacts. However, no responsibility is admitted, in case any inadvertent error or incorrectness is noticed therein. Further the same have been given by way of information only and do not carry any recommendation.

Source:- Udyami Mitra/Sidbi