GRAVITY DIE CASTINGS

1. INTRODUCTION:

The term “gravity die casting” refers to castings made in metal molds under a gravity head. It is known as permanent mold casting. Gravity Die Casting is a repeatable casting process used for non-ferrous low melting temperature alloy parts, typically aluminum, zinc, magnesium and copper alloys.

Die casting is a manufacturing process for producing accurate dimension, sharply defined, smooth or textured-surface metal parts. It is accomplished by forcing molten metal into reusable metal dies.

These die casting alloys play important role because of its intrinsic and versatile properties of lightness, strength to weight ratio, corrosion resistance, electrical and thermal conductivity, non-toxicity etc. Die cast parts of are gradually replacing steel, cast iron with high strength alloys.

2. PRODUCT & ITS APPLICATION:

Gravity die cast components of zinc, copper magnesium and aluminum alloys components are used for critical applications and mass produced items. Hot chamber machines are used

primarily for zinc and low melting point alloys which do not readily attack and erode metal pots, cylinders and plungers. Advanced technology and development of new, higher temperature materials has extended the use of this equipment for magnesium alloys.

Automobile components like pistons, gear box housings, crank cases, clutch housing, pump bodies, etc. are made by gravity die casting. Other applications are brackets, arms and hangers, storage tanks and fittings for chemical and marine uses, railways components, flywheel housing and propellers, artificial limbs, ornamental hardware in building industry, ashtrays, water jugs, art metal work, molding flasks, core drying plates and pattern castings, rotor of ceiling fans and many other components in different fields are made of die castings.

Various alloys of aluminum, zinc, magnesium are available for different applications as per BIS, ASTM, DIN specs that may be used by industries.

3. DESIRED QUALIFICATIONS FOR PROMOTER:

The promoter with experience in aluminum casting and having mechanical or metallurgy engineering will be suitable for the project.

4. INDUSTRY OUTLOOK/TREND

The global die casting market was valued at USD 55.47 billion in 2015 and is projected to touch USD 80 billion by 2022. The market is poised to grow at a CAGR of over 6.60% during 2017 to 2022.The end market for die-casting is quite diverse and well entrenched in almost all sectors with steady increase in consumption, demand and production. The market for magnesium, zinc etc. die-casting is expected to grow at a higher CAGR of 10.0% over the coming 5 years.

The global market for die-castings in industrial applications is expected to grow at a faster CAGR of 7.83% during the forecast period. Additionally, the die-casting market in the electrical and electronic applications is expected to witness a steady growth accounting for 11% of the global die-casting market share as of 2016.

India is progressively growing as a hub for the automobile die cast manufacturers, particularly for aluminum, magnesium and zinc die cast auto parts. India and China are expected to boost the global market strongly driven by the rapid growth in automobile industry.Asia-Pacific is the largest market for die-casting and globally accounted for over 50% share in 2015.

India's liberal economic policy and reforms is permanent is a major growth factor for the aluminum die casting industry in the country. This is further aided by skilled, cheaper labor force and the government incentives for small and medium scale industries.

5. MARKET POTENTIAL AND MARKETING ISSUES. IF ANY:

The auto-component industry of India has expanded by 14.3 per cent because of strong growth in the spares or after-market sales to reach at a level of Rs 2.92 lakh crore (US$ 44.90 billion) in the year 2017.

As of today, India boasts of large no of SME units reaching to 400 die casting units, making it one of the major suppliers of die cast parts in the global market. The SME unit clusters are mainly located in North Indian centers like Punjab, Haryana, Delhi and West UP, in Maharashtra around Pune and Bombay and Southern India near Bangalore, Chennai and Hyderabad, in Gujarat around Rajkot and Surendranagar.

There are over 25 organized / large units that produce mostly pressure die cast parts per year, while SME units are producing gravity and low pressure casting. The SME units has lions share of the total as Indian industry consumes over 3 lakh tons of die-castings. Some of the local players who have successfully entered the global market with their product portfolio supplying to Cummins, Ford, General motors, John Deere, Mercedes Benz, Bosch, Toyota and Volkswagen etc. global giants that are sourcing the aluminum die casting parts from India. Demand from automotive sector is likely to spur growth rapidly for domestic as well as export markets.

Considering the wide range of products having mass consumption there is good potential for Aluminum die cast products. The entrepreneur new to this sector may begin with mass consumed simple products produced with Gravity Die Casting.

6. RAW MATERIAL REQUIREMENTS:

Aluminum alloys of several grades viz LM-5, LM-6, LM 16; LM-24 etc. are required. Similarly Zinc and magnesium alloys are also available. Other consumables like mold release agents, lubricants, die coating, fluxes, ladle coatings etc. Surface treatment materials are also be required.

7. MANUFACTURING PROCESS:

Gravity Die casting process consists of melting of alloy ingots in a furnace. The melt is poured in steel dies through ladle or piston. In the hot chamber machine, the melt injection mechanism is immersed in molten metal in a furnace attached to the machine. As the plunger is raised, a port opens allowing molten metal to fill the cylinder. As the plunger moves downward sealing the port, it forces molten metal through the goose neck and nozzle into the die. After the metal has solidified, the plunger is withdrawn, the die opens, and the resulting casting is ejected.

Once the part has cooled sufficiently, the die is opened. The castings are then processed to remove excess metal of gates, risers and the fins. The part is then ground on belt grinders or tumbled depending on size to achieve the finished cast. The component may be machined and drilled, milled depending on requirement. These die cast components achieve close tolerances and intricate shapes and are very cost effective.

8. MANPOWER REQUIREMENT:

The unit shall require highly skilled service persons. The unit can start from 11 employees initially and increase to 27 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	3	4	6	6	6
2	Semi-Skilled/ Helpers	9000	6	12	12	18	18
3	Supervisor/ Manager	25000	1	1	1	1	1
4	Accounts/ Marketing	18000	0	0	1	1	1
5	Other Staff	8000	1	1	1	1	1
	TOTAL		11	18	21	27	27

9. IMPLEMENTATION SCHEDULE:

The unit can be implemented within 7 months from the serious initiation of project work.

Sr. No.	Activities	Time Required in Months
1	Acquisition of Premises	1
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)	7

10. COST OF PROJECT:

The unit will require total project cost of Rs 119.09 lakhs as shown below:

Sr. No.	Particulars	In Lakhs
1	Land	20.00
2	Building	30.00
3	Plant and Machinery	35.04

4	Fixtures and Electrical Installation	3.25
5	Other Assets/ Preliminary and Preoperative Expenses	1.50
6	Margin for working Capital	29.30
	TOTAL PROJECT COST	119.09

11. MEANS OF FINANCE:

The project will require promoter to invest about Rs 51.75 lakhs and seek bank loans of Rs 67.34 lakhs based on 70% loan on fixed assets.

Sr. No.	Particulars	In Lakhs
1	Promoters Contribution	51.75
2	Loan Finance	67.34
	TOTAL :	119.09

12. WORKING CAPITAL REQUIREMENTS:

Working capital requirements are calculated as below:

Sr. No.	Particulars	Gross Amount	Margin %	Margin Amount	Bank Finance
1	Inventories	19.74	40	7.89	11.84
2	receivables	23.45	50	11.73	11.73
3	Overheads	1.79	100	1.79	0.00
4	Creditors	19.74	40	7.89	11.84
	TOTAL	64.71		29.30	35.41

13. LIST OF MACHINERY REQUIRED:

Sr. No.	Particulars	UOM	Quantity	Rate	Total Value
	Main Machines/ Equipment				
1	Melting Furnace for Alloys	Nos.	2	300000	600000
2	Gravity/ low pressure Die casting machine 1000 gr / shot	Nos.	2	950000	1900000
3	Conveyor / Manipulator	Nos.	2	75000	150000
4	Trimming Press 8T capacity	Nos.	2	12000	24000
5	Reciprocating Mold spray unit	Nos.	2	45000	90000
6	Surface Finish Tumbling machine		2	45000	90000
7	Polishing Belt grinder		2	15000	30000
8	Heat Treatment oven		1	180000	180000
9	Lathe machine		3	55000	165000
10	Drilling / Milling machine		2	40000	80000
	subtotal :				3309000
	Tools and Ancillaries				
1	Die Repair tools and Grinders	LS	1	120000	120000
2	Misc. tools Trolleys etc.	LS	1	75000	75000
	subtotal :				195000
	Fixtures and Elect Installation				
	Storage racks	LS	1	25000	25000
	Other Furniture	LS	1	20000	20000
	Telephones/ Computer	LS	1	40000	40000
	Electrical Installation	LS	1	240000	240000
	subtotal :				325000
	Other Assets/ Preliminary and Preoperative Expenses	LS	1	150000	150000
	TOTAL PLANT MACHINERY COST				3979000

All the machines and equipment are available from local manufacturers. The entrepreneur needs to ensure proper selection of product mix and proper type of machines and tooling to

have modern and flexible designs. It may be worthwhile to look at reconditioned imported machines, dies and tooling. Some of the machinery and dies and tooling suppliers are listed here below:

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. S. G. Profile
   Plot No. 201/1, Gala No. 56, Morya Industrial Estate, MIDC, Bhosari, Bhosari Midc,
   Pune-411026, Maharashtra, India

Other well known machine are ACME TOOLINGS, Ace Manufacturing Systems Ltd., Batliboi Ltd. Mumbai, Bharat Fritz Werner Ltd., HMT Machine Tools Ltd., Advani Oerlikon Ltd, Bombay, Lakshmi Machine Works Ltd., Lokesh Machines Ltd., Praga Tools Ltd., Toolcraft Systems Pvt. Ltd.

The above list of machine supplier is illustrative. There are many machinery, dies and tools suppliers and consultants at several industrial clusters all over India where you may find

suppliers of services and machinery for a chosen product mix. Other well-known machine manufacturers can be searched from directories/ internet.

14. PROFITABILITY CALCULATIONS:

Sr. No.	Particulars	UOM	Year Wise estimates				
			Year 1	Year 2	Year 3	Year 4	Year 5
1.	Sales	Rs Lakhs	281.40	361.80	482.40	562.80	643.20
2.	Raw Materials & Other Direct Inputs	Rs Lakhs	236.84	304.51	406.02	473.69	541.36
3.	Gross Margin	Rs Lakhs	44.56	57.29	76.38	89.11	101.84
4.	Overheads Except Interest	Rs Lakhs	12.02	12.02	12.02	12.02	12.02
5.	Interest	Rs Lakhs	9.43	9.43	9.43	9.43	9.43
6.	Depreciation	Rs Lakhs	8.37	8.37	8.37	8.37	8.37
7.	Net Profit Before Tax	Rs Lakhs	14.73	27.46	46.56	59.29	72.02

The basis of profitability calculation:

The Unit will have capacity of 300 MT of gravity castings per year of assorted types/ designs. The sales prices of die cast parts range from Rs 150 to Rs 400 per kg depending on type, metal, alloy composition, and volumes. The raw material cost of is ranging from 130 to 250 per kg depending on alloy grades. The material requirements are considered with wastage/ scrap/burnouts etc. of 8 % of finished products as most of generated scrap is reused. The unusable scrap is sold at @ Rs 15 ~ 30 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 breakeven capacity at 23.43 % of the installed capacity as depicted here below:

Sr. No.	Particulars	UOM	Value
1	Sales at Full Capacity	Rs Lakhs	804.00
2	Variable Costs	Rs Lakhs	676.70
3	Fixed Cost incl. Interest	Rs Lakhs	29.83
4	Break Even Capacity	% of Inst Capacity	23.43

16. STATUTORY/ GOVERNMENT APPROVALS

The unit will require state industry unit registration with District Industry center. No other procedures are involved. For export, IEC Code and local authority clearances. The industry registration and approval for factory plan, safety etc. is required as per factory inspectorate and labor laws. Other registration are as per Labor laws are ESI, PF etc. 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, however the unit will have to ensure safe environment through installation of chimney etc. as per rules. 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 other consumer and industrial parts/ components and parts. The unit can utilize the spare capacities of furnace and machining capabilities. As such there is not much scope for organic backward or forward integration. The entrepreneur needs to ensure proper selection of product mix and also be careful in maintaining key product parameters in terms of dimensions, tolerances and

geometric profiles along with final weights of products. The material selection, processes including heat treatment and achievement of final properties are key to quality and success of project.

18. TRAINING CENTERS/COURSES

There are no specific training centers for production technology. However foundry technology can be obtained by joining as apprentice in foundry units. The Prototype Development Centers can provide some assistance and for foundry technology, casting, machining, dies and Tools development, courses run by centers of excellence viz Indo German Tool Room at Ahmedabad, Rajkot, Chennai, etc. shall be helpful.

The most important scope of learning is in new product design and development by study of the new product designs, product range, features and specifications of leading Brands / competitors across the world by scanning the Internet and downloading data from websites of 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.