PROJECT PROPILE ON

ALUMINIUM PRESSURE DIECASTING (UPTO 0.75KG)

PRODUCT CODE	:	335404006
QUALITY AND STANDARDS	:	This Profile envisages the manufacture of pressure die cast components of Aluminium for engineering use required for automotives, defence and aeronautic space applications. The quality of the component is supposed to be good near net shape with high production, resulting into, low cost and conforming to standard specifications as laid down by Bureau of Indian Standard IS11804:1986 code of Practice for Manufacture of Aluminium Alloy Pressure Die Castings.
MONTH AND YEAR OF PREPARATION	:	MARCH-2021
PREPARED BY	:	Branch MSME Development Institutes, 386, Patel Road, Ram Nagar, Coimbatore – 641 009

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INTRODUCTION

Though tremendous technological advancements in the metalcasting industry have taken place in recent years, the foundry industry faces increasing demands to achieve higher productivity at minimum cost, even while producing high quality cast components of intricate shapes. By proper selection of a casting technique with careful foundry and metallurgical controls, castings of high quality are being commercially manufactured. Amongst a large number of foundry techniques one is low and high pressure die-casting. It has been developed and industrially employed to produce castings of near-net shape components. The near net shape cast parts are famous for their fine details, good surface conditions, complex shapes and economy. Under the present scenario of industrial development, metal casting has moved from an art and craft industry to the industry based on science and technology. The pressure die casting manufacturing processes have been systematically developed so that structure may be controlled and quality may be assured. Diecasting provides the foundry man with one of the fastest means of producing castings with a much higher degree of accuracy than that normally obtained by conventional sand casting. Infact, this method isunexcelled for mass production work as numerous castings can be produced very rapidly at lowcost. The castings can be made to very close tolerances and with a fine surface finish.

Pressure die casting in aluminium alloy offers means for very rapid production of engineering and other related components even or intricate design. The technique has obvious advantages when a component is required in large quantities. However, for engineering components such as those required for aeronautic space, Defence and automotive applications, mechanical properties and durability are of primary importance. It is there for essential that the best features of design should be employed and optimum casting technique with minimum cost be adopted. Pressure die cast products are used in the form of components of various electrical, electronic, mechanical instruments and appliances used in domestic as well as industrial fields.

MARKET POTENTIAL

The popularity of pressure die cast aluminium alloy components arises from the following advantages It offers as compared to the methods of castings:

- HighProductivity
- Good as cast surface finish and appearance.
- Compact casting–soundstrength.
- Do not require furthermachining.
- Canbecastwithinclosedimensional tolerance.
- Very thin section, can be cast with ease.
- Metalwastageinthecastingislow.
- Rejection due to casting defects is low.

Demand mainly arises from the sources like Defence, Telephone industry, Automobile components and fittings, Electrical appliances, Electroniccomponents, Builders hardware and fittings etc. Demandin these areasagain depends upon the primary market, replacement market and substitution market.

The Primary Market is expected to continue as the leading market and, with the trend of demand growth, to cater to the requirement of more and more new industries coming up in the above areas of consumption. The replacement market is also likely to expand with more market ability of new products.

There are very few units in the small scale sector producing pressure die cast components. Hence there is good scope for setting up this industry.

BASIS ANDPRESUMPTIONS

1. The Scheme has been prepared on the basis of 75% efficiency on single shift basis of 8 hours' duration considering 25working days in a month and a total of 300 working days in ayear.
2. The rate of interest in the scheme has been worked out on the basis of 15% upon an average. However, this figure is likely to vary depending upon the financial outlay of the project as well as location of theunit.
3. The break–even point in the scheme has been calculated on the 80% capacity utilization basis.
4. The cost of machinery and equipment as indicated are approximate which are ruling locally at the time of preparation of the scheme. When a tailor cut project is prepared, necessary changes are to be made.
5. The rates quoted in respect of salaries and wages for workers and others are the minimum rates in the state/neighboring states.
6. Margin money required is minimum 30% of Projected investment i.e Rs. 16.75 lakhs. However, it may differ from Project to Project and type of entrepreneurs such as Women, SC/ST, Physically Handicapped etc.
7. Payback period of the Project: After the initial gestation period of one and

hall year sit will require approximately 5 years to pay back the loans.

8. Profile life is estimated to be 10 years. The project should be reviewed every 3 to 4 years for modernization of the plant and machinery, technology etc. so that its life is prolonged.

IMPLEMENTATION SCHEDULE

Sl. No.	Activity	Approx. Time	Cumulative Time
1.	Preparation of ProjectReport	6weeks	6weeks
2.	Udyam Registration	2weeks	8weeks
3.	FinancialArrangement	12weeks	20weeks
4.	a) Construction/ Renovation of factory Shed/ Building b) Purchase and Procurement of Machinery and Equipments	20weeks	40weeks
5.	a) Installation of Machinery and Equipments b) Electrification c) Staff Recruitment	4months	14 months
6.	N.O.C from Pollution Control Board	2weeks	14months and 2 weeks
7.	Arrangement of Utilities	6weeks	1 year and 4 months
8.	Procurement of Raw Materials	1month	1 year and 5months
9.	Commissioning, Trial Runs and Commercial Production	1month	1½years

TECHNICAL ASPECTS

Process of Manufacture

Because of its high melting point, aluminum silicon alloy is die castingcold chamber pressure die casting machine. Inpressure die castingthe moltenmetal is introduced under pressure into a metallic die and allowed to solidify to produce near-net-shapes. Two types of die casting machines known as cold chamber and hot chamber are usually used. The production rate depends on casting thickness, specified properties of the cast metal and the complexity of the cast shape. This technique produces castings of very good surface finish with high dimensional accuracy. The process provides high yield due to absence of riser and feeding system. Production rate is high and the casting generates moremetallurgicalintegrity.Finer grainsand absence of porosity make the

casting mechanically compact.Casting size, weight, design and melting point of cast metal limit the use of the process.Cost of die confines the process only to relatively small parts.

The cold chamber machine is used for the alloy which has higher melting point than the zinc-alloy. Higher pressure is applied, solower molten metal feeding temperature is used casting traps lesseramount of air as compared to the air trapped in hot chamber machine. In pressure die casting, die temperature, molten metal pouring temperature, injection pressure and speed are optimised for a special casting.

Metal for a single shot is loaded into a cylindrical chamber through apouring aperture. Apiston then forces the metal into the die, the entire operation being completed in a few seconds, so that iron contamination is virtually eliminated. Using this technique much higher injectionpressureintherangeof70–140 Mpais feasible, enabling lower metal to be employed and greater intricacy achieved. The castings are less prone to entrapped air and a higher standard of soundness ensures from the smaller amount of liquid and solidification shrink age occurring withinthe die.

In cold chamber operations the molten metals is usually maintained at constant temperature in an adjacent holding furnace, where transfer of successive shots to the machine chambers can be accomplished manually. Holding furnaces may be electrically heated types or the one using immersion heating types or the one using immersion heating device, which has a close control over the molten metal.

The molten metal should be thoroughly degased by chlorine gas or hexachloroethane followed by modification with suitable modifier. For thinner sections the working temperature of the molten metal should be 680^{O} C to 690^{O} C and for thicker sections this should be between 650^{O} C to680^{O}C.

The die temperature should be maintained so that castings of good quality are produced. The die cast components are subjected to fettling operation for removal of getting system and fins, if any.

Quality Control and Standards

Alloys suitable for pressure die casting and their chemical composition are given below. Alloys 4420 or LM-24M, 4520orLM-2M, 4600 or LM-20 Mare widely used alloys for general engineering work and are suitable for Pressure die-casting. These alloys have excellent fluidity good corrosion resistance, medium strength and can be cast in intricate shapes. The die cast component should be free from blowholes and Pinholes porosity, shrinkage, cold shut etc. They should be free from dimensional inaccuracies. No patching or welding shall be allowed to cancel or rectify any defects

Chemical Compositions -% of

Grade	Cu	Si	Mg	Fe	Mn	Ni	Zn	Pb	Sn	Ti	Al
4420 or LM-24M	3.0–4.0	7.5–9.5	0.3	1.3	0.5	0.5	3.0	0.3	0.2	0.2	Balance remainder
4520 or LM-2 M	0.7–2.5	9.0–11.5	0.3	1.0	0.5	0.5	0.5	0.3	0.2	0.2	Balance remainder
4600 or LM-20M	0.4	10.0-13.0	0.2	1.0	--	0.1	0.2	0.1	0.1	0.2	Balance remainder

Production Capacity

Estimated production capacity - 10 MT per month.
The capacity utilization will be 90% Quantity (perannum): 108MT
Value: Rs. 2,,43,00,000 (243Lakhs)

Motive Power (per month)

Total motive power requirement = 4500 kW

Pollution Control

The industry does not create extensive pollution hazard. The workshop should be well ventilated, properly lighted and fitted with exhaust fans.

EnergyConservation

There is little scope for energy conservation in this industry except in the melting practice where the furnace should be properly insulated to reduce radiation loss and should be fitted with automatic pyrometric control to maintain the furnace at the proper temperature.

FINANCIAL ASPECTS

Fixed Capital (per month)

i)	Land and Building	Rent (Rs.)
	Land and Built up area including workshop, office, store etc. Total covered area 300 sq. metres @ Rs. 100/-per sq. mtr. on rent with sufficient open space for storing of raw materials and creating greenaries for pollution abatement.	30,000

ii) Machinery and Equipments

(a) Production Unit

SI. No.	Description	Qty (No.)	Amount (Rs.)
1.	Horizontal cold chamber pressure diecasting machine with control panel of 60T capacity with 7.5 HP motor	1	15,60,000
2.	Electrical resistance furnace kg capacity	1	1,20,000
3.	Centre lathe 900mm Heavy duty with 3 HP motor and accessories	1	50,000
4.	Shaping machine 600mm stroke with 3HP motor and accessories (Cone Pulley drive, all geared)	1	60,000
5.	Pillar Drilling machine complete with 1 HP motor	1	84,000
6.	Bench Grinder double ended with 1HPmotor	1	24,000
7.	PedestalGrinderwith2HPmotor	1	36,000
8.	Trimming machine(bell Press) @ Rs. 12,000 each	3	36,000
9.	Weighing Machine	1	40,000
10	Hand Tools and Fixture		50,000
11.	Vice, tables, fixtures, measuring instruments, gauges etc. Testing Equipments Laboratory comprising chemical testing and physical testing	L.S.	2,00,000
	b)Diesel Generation set 125 KW Cap. With standard accessories	1	1,50,000
	c) Electrification and above cost	2,41,000@ 10% of	
	Total		26,51,000
	d)Cost of moulds	L.S.	2,00,000
	e) Office Equipment, Furniture, typewriter, fan etc.,	L.S.	1,00,000
	Pre- operative Expenses-Like legal expenses, establishment cost, travelling, start-up expenses, consultancy fees, estimate fee, ,interest during construction trial run expenses etc..		50,000
		Total	**30,01,000**
		Say	**30,00,000**

Working Capital (per month)

i)	Personnel	No.	Salary (Rs.)
1.	Works Manager	1	25,000
2.	Sales Executive	1	20,000
3.	Supervisor	1	12,000
4.	Chemist	1	12,000
5.	Store Keeper-cum Accountant	1	12,000
6.	Steno-Typist	1	10,000
7.	Maintenance Fitter	1	10,000
8.	Skilled Worker @ Rs. 10,000	3	30,000
9.	Semiskilled Workers @ Rs.8000	3	24,000
10.	Unskilled Workers @ Rs.6,000	4	24,000
11.	Peon/Watchman @ Rs. 6,000	2	12,000
	Total		**1,91,000**
	Staff welfare @ Rs.15%		28,650
	Total		**2,19,650**
	Say		**2,20,000**

(ii) Raw Material Requirements (per month) (Rs.)

Aluminium alloy ingot 10 MT @ Rs. 140 per kg 1400000

SI. No.	Utilities and Other Contingent Expenses (per month)	(Rs.)
1.	Rent	25,000
2.	Electric Power(4500 KWH) @ Rs7.00Per KWH	31,500
3.	Water	1,000
4.	Postage and Stationery	3,000
5.	Repair, Maintenance andReplacement	20,000
6.	Consumable Stores like Fluxes, Degasser, Lubricants dies etc.	1,00,000
7.	Transport Expenses	10,000
8.	Misc. Expenses	10,000
9.	Advertisement and Publicity	5,000
10	Insurance	5,000
	Total	**2,10 ,500**
	Say	**2,11,000**

Sl. No.	Total Recurring Expenses	(Rs.)
1.	Raw Materials	**14,00,000**
2.	Salaries and Wages	2,20,000
3.	Other Expenses	2,11,000
	Total	**18,31,000**

C. Total Capital Investment

1.	Machinery and Equipments and 30,00,000	30,00,000
2.	Working capital for 3 months	54,93,000
	Total	**84,93,000**

FINANCIAL ANALYSIS

1)	Cost of Production (per annum)	(Rs.)
1.	Raw Materials	1,68,00,000
2.	Staff and Labour	26,40,000
3.	Other Expenses	25,32,000
4.	Depreciation on furnace @ 20%	24,000
5.	Depreciation on Machinery	2,24,000
6.	Depreciation on office Equipment @ 20%	20,000
7.	Depreciation on moulds and Tools @ 25%	62,500
8.	Interest on total Capital	10,19,160
	Total	**2,33,21,660**
	Say	**2,33,22,000**

(2) Turnover (per annum) (Rs.)

108 MT Aluminium alloy Pressure 2,43,00,000
Die-cast components @Rs 2,25,000 per MT
Aluminium alloy scrap10 Tons 6,00,000
@ 60,000 per MT
Total 2,49,00,000

3) Net Profit (peryear)

= Sales – Production Cost

= 2,49,00,000 – 2,33,22,000

= **Rs.15,78,000**

4) Net Profit Ratio(onSale)

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

$$= \frac{15,78,000 \times 100}{2,49,00,000}$$

= 6.34%

5) Rate of Return

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

$$= \frac{15,78,000 \times 100}{84,93,000}$$

= 18.58%

(6) Break-even Point

	Fixed Cost (per annum)	**(Rs.)**
a	**Rent (Annual)**	**3,00,000**
b..	40% of Salary and Wages	10,56,000
c.	40% of Other Expenses	**8,68,800**
d.	Dep. on Furnace and	24,000
e.	Dep. on Machinery and Equipments	2,44,000
f.	Interest on Total Capital	10,19,160
g.	Depreciation on Office Equipments	62,500
h.	Insurance	60,000
	Total	**36,34,460**
	Say	**36,35,000**

B.E.P. $= \frac{\text{Fixed Cost} \times 100}{\text{Fixed Cost + Profit}}$

$$= \frac{36,35,000 \times 100}{36,35,000 + 15,78,000}$$

$$= \frac{36,35,000}{52,13,000}$$

= 69.7**%**

ADDRESSES OF MACHINERY AND EQUIPMENT SUPPLIERS

1. SS Engineering Works, AshcharyaKanna, Plot no. 100, sector-6, IMT Manesar, Gurugram, Haryana-122050, Sales@ssnggworks.com Mob. No.8287908726, 9810078209
2. M/s. HMT Ltd. 31, Chowringhee Road, Kolkata—700071
3. M/s. Indo Japanese Proto Type Training Centre, Baltikuri, Dasnagar, Howrah, Kolkata.
4. M/s. Hindustan Machine Tools, Jeevan Tara Building, Parliament Street, New Delhi-110001
5. M/s. Wesman Engineering Co.(P) Ltd. B-99, Mayapuri Indl. Area, New Delhi
6. M/s. Batliboy and Co. Ltd. Jeevan Vihar, Parliament Street, NewDelhi-110001
7. M/s.Perfect Machine Tools, 44E, Connaught Circus, NewDelhi-1.
8. M/s. Pioneer Equipment Co. (P) Ltd., 36/8 Nizammudin West, New Delhi.

ADDRESSES OF RAW MATERIAL SUPPLIERS

1. M/s. Hindustan Aluminium CO. United Commercial Bank Building, Parliament Street, New Delhi-110001
2. M/s. Indian Aluminium Bank Building, Parliament Street, New Delhi-110001
3. Local Market .