PRESSURE DIE CASTING (UPTO 7.5 KG.)

PRODUCT CODE	**:**	**335404006**
QUALITY AND STANDARDS	**:**	**IS: 11804-1986**
MONTH AND YEAR	**:**	**February, 2011**
OF PREPATATION	**:**	
PREPARED BY	**:**	**Branch- M.S.M.E.**
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Introduction

Pressure die casting in aluminum alloy offers means for very rapid production of engineering and other related component even or intricate design. The technique has obvious advantages when a component is required in large quantities. However, for aeronautic space, defence and automotive applications, mechanical properties and durability are of primary importance It is, therefore, 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 field.

Market Potentiality

The popularity of pressure die cast aluminum alloy components areses from the following advantages it offers compared to other methods of castings.

1- High productivity
2. Good as-Cast surface finish and appearance
3. Do not require further machining
4. Can be cast within close dimensional tolerance
5. Very thin section can be cast with ease
6. Metal wastage in the casting process in law
7. Rejection due to casting defects is low

Demand mainly arises from the following sources.

Demand in the above areas again 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 caster to the requirement of more and more new industries coming up in the above areas of consumption the demand is expected to expand in volume at an average

growth rate of 10% to 15% The replacement market is also likely to expand with more marketability 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 & Presumptions

The profile is drawn on the basis of following presumption:

Working Hours/shift	8 hours
No. of shift/day	1
Working days	300
Total No. of working hours	2400
Working efficiency	75%
Time period for achieving max. capacity utilistation	3rd year from the date on which Production will be started
Labour charges	As per minimum wage act of state Govt.
Margin money	25% of capital investment
Rate of interest on Fixed & working capital	15%
Operative period of the Project	10 years

Value of machinery & equipment is estimated on the basis of prevailing cost of the market.

Implementation Schedule

Project implementation will take a period of 8 months from the date of approval of the scheme. Break up of activities with relative time for each activity is shown below:

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 device, which has a close control over the molten metal.

The die temperature should be maintained so that castings of good quality are produced.

The cast components are subjected to fitting operation for removal of getting system and tins, if any.

2. Quality Specification

Alloys, suitable for pressure die casting and their chemical composition and mechanical properties are given below. Alloys 4600 and 4600A are 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 other two alloys namely, Alloy 4420 and 4520 are also held for die casting purpose depending upon the end-use of the component. The die-cast component should be free from below holes and pin holes porosity, shrinkage, cold shut, etc. They should be free from dimensional inaccuracies. No patching or welding shall be allowed to conceal or rectify any defects.

Table 1. Chemical Composition or Aluminium Alloys for Pressure Die Castings (Clause 4.3)

Nature of activities	Time period in month (Estimated)
1. Scheme preparation & approval	0-1
2. SSI provisional registration	1-2
3. Sanction of loan	2-5
4. Clearance from pollution control Board	3-4
5. Placement of order for delivery of M/c	4-5
6. Installation of machines	6-7
7. Power connection	6-7
8. Trial run	7-8
9. Commencement of production	9 onwards

Technical Aspects

1) Production Details & Process of Manufacture

Because of its high melting point, aluminium-silicon alloy is die cast in cold chamber pressure in die casting machine. Metal for a single shot is loaded into a cylindrical chamber through a pouring aperture, a piston 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 injection pressure in the range of 70-140MP is feasible enabling lower metal to be employed land greater intricacy achieved. The castings are less prone to entrapped air and a higher standard of soundness ensues from the smaller amount of liquid and solidification shrinkage occuring within the die.

Table 1. Chemical Composition or Aluminium Alloys for Pressure Die Casting (Clause 4.3)

Alloy Designation	Chemical Composition, Percent (Values Given are in Maximum unless shown in a range)

	Copper	Silicon	Manganese	Iron	Manganese	Nickel	Zinc	Lead	Tin	Titanium	Aluminium
1	2	3	4	5	6	7	8	9	10	11	12
4420	30-40	7.59.5	0.3	1.3	0.5	0.5	3.0	0.3	0.3	0.2	Remainder
4520	0.7-2.5	9.0-11.5	0.3	1.0	0.5	0.5	0.5	0.3	0.2	0.2	Remainder
4600	0.1	10.0-13.0	0.10	0.6	0.5	0.1	0.1	0.1	0.05	0.2	Remainder
4600A	0.4	10.0-13.0	0.2	1.0	0.0	0.1	0.2	0.1	0.1	0.2	Remainder

Table 2. Mechanical Properties of Aluminium Alloys for Pressure Die Castings (Clause 4.3)

Alloy Designation	Condition	Mechanical Properties, Min			
		Tensile strength		Elongation on 5.65 Gauge so or 50 mm Length percent	
		Sand Cast MPa	Chill Cast MP2	Sand Cast	Chill Cast
1	2	3	4	5	6
4420	M	-	180	-	1.5
4520	M	125	150	-	
1 2	3	4	5	6	
4420	M	-	180	-	1.5
4520	M	125	150	-	-
4600	M	165	190	5	7
4600A	M	165	190	5	7

3. Production Capacity

Estimated production capacity -9.5M.T./month

The capacity utilisation will be 80% after three years from the date of connencement of production.

4. Motive Power Requirement

Total motive power requirement = 40 H.P.

5. Pollution Control Needs

The industry does create any pollution hazard. The workshop should be well ventilated and properly lighted fitted with exhaust fans.

6. Energy Conservation

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 in the proper temperature.

Financial Aspects

1. Fixed Capital

Land & Building Rented	(Rs.)
Covered area - 300 sft. @ Rs. 1.50 sft. p.m.	20000.00

2. Machinery & Equipments

a) Production unit

SI No. Description	Qty.(No)	Price (Rs.)
1. Horizontal cold chamber pressure die Casting machine with control panel of 60T capacity	1	50,00,000
2. Electrical resistance furnace for melting aluminium, 100 kg capacity	1	500000
3. Centre lathe 900 mm Heavy Duty with 3 HP motor and accessories	1	1,25,000
4. Shaping machine 600 mm stokes with 3 HP motor and accessories	1	1,00,000
5. Pillar Drilling machine complete with 1 HP motor	1	30,000.00
6. Bench Grinder double ended with 1 HP motor	1	25,000.00
7. Prdestal Grinder with 2 HP motor	1	40,000.00
8. Trimming machine (ball press)@ 10,000	3	90,000.00
9. Vice, tables, fixtures, measuring instruments, gauges etc.	L.S.	60,000.00
b) Testing Equipments		
Laboratory comprising chemical testing & physical testing	L.S.	1,00,000
c. 1) Diesel Generation set KVA cap. with standard accessories will Transformer and other	-	-
electrical accessories	-	1,25,000
Electrification & installation @ 10% of above cost		
d) Cost of moulds & fixture	L.S.	3,00,000.00
e) Office equipment Furniture, typewriter, fan etc.	L.S.	1,50,000.00

3. Pre-operative expenses

Like legal expenses, establishment cost travelling start up expenses, consultancy fee, estimate fee, interest during construction trial rum expenses.	1,00,000
Total	6745000.00

4. Working Capital (per month)
i) Personnel
Administration

Designation	No.	Salary (Rs.)	Total (Rs.)
Works Manager	1	25000	25000
Sales executive	1	20000	20000
Supervisor	1	10000	10000
Chemist	1	10000	10000
Store keeper	1	3000	3000
Accountant	1	2500	2500
Steno-typist	1	3000	3000
Peon/Watchman	2	2500	2500

Workshop

Designation	No.	Wages (Rs.)	Total (Rs.)
Skilled Worker	3	3000	9000
Semi-skilled worker	3	2500	7500
Maintenance Fitter	1	3000	3000
Unskilled worker	4	2500	10000
Total Staff & Labour	20		
Total of salary & wages			105000
Add Perquisites @ 15% of above		16200	
Grand total			124200

ii) Raw Materials

Particulars	Indigenous imported	Qty. in Tons.	Rate(Rs.) Per MT	Value(Rs.)
1. Aluminium alloy ingot	Indigenous	10 MT	2,30,000	2300000
2. Less	-	300 kg.	1,50,000	4500
				2345000

iii) Utilities

Power - 4000 unit @ Rs. 5 per unit fuel (Hard coke)		20000
Fuel (Diesel oil)	L.S.	25,00

iv) Other contingent expenses

Rent	2000
Transport expenses	10,000
Stationery, postage, telephone & telegram	5000
Legal & other fees	5000
Packing	5000
Insurance	10,000
Repair @ maintenance @ replacement	10,000
Consumable stores like fluxes, degasser,	25,000
Lubricants etc. @ dies sales expenses	5,000
Misc. expenses	5,000
Advertisement & Publicity	10,000
Total	155000
v) Total recurring expenditure (per month)	2669200
vi) Total working capital (vX 3 months)	8007600

5. Total capital investment

i) Fixed capital	6745000
ii) Working capital	8007600
	14752600

Machinery Utilisation

Financial Analysis

1. Cost of production (Per year)

Total recurring cost		32030400
Depreciation on machinery @ equipment @ 10%		619500
Depreciation on moulds, fixture @ 25%		75000
Depreciation on office equipments @ 20%		30000
Interest on total investment @ 15%		2212890
		34967790
Say	Rs.	34967000

2. Turnover (per year)

Item	Qty.in per/MT	Rate/Rs. per ps/MT	Value (Rs.)
1. Aluminium alloy	91 MT.	435000	39585000

Pressure die cast components

2. Net Profit per year = Total sale-cost of production
   (Before income-tax) = 39585000-34967790
   = 4617210

4. Net Profit Ratio

$$\frac{\text{Net Profit per year}}{\text{Turnover per year}} \times 100 - 11.6\%$$

5. Rate of Return

$$-\frac{\text{Net Profit per year}}{\text{Total investment}} \times 100 - 31\%$$

6. Break even point (% of total production)

i) Fixed cost (F.C.)

	Rs.
a) Depreciation on machines & equipments	724500
b) Interest on total investment	2212890
c) 40% of salary & wages	596160
d) 40% of other contingent exp.	744000
Total	3740550

ii) Net profit per year

$$\text{B.E.P.} - \frac{\text{Fixed cost}}{\text{Fixed cost + Net Profit}} \times 100 - 44\%$$

Additional Information

Nil

Addresses of Machinery & Equipment Suppliers

1. M/s H.M.T. Ltd.
   31, Chowringhee Road
   Kolkatta-700071.

2. Indo japanese Proto Type Training Centre
   Baltikuri
   Dasnagar, Howrah.

Addresses of Raw Material Suppliers

Open Market.