

# **TOOL ROOM FOR PLASTIC DIES**

## **1. INTRODUCTION:**

Mass production technology is made possible by dies and tooling industry and contributes majorly to the growth of manufacturing sector and therefore tool room industry is known as "the mother of industry". Plastic molding processes like Injection, compression, Blow molding and Extrusion are used to create many things such as electronic housings, containers, bottle caps, automotive interiors, door and window profiles, trimmings etc., and most other plastic products available today.

Several different types of plastics are processed viz. ABS, Acetal, Acrylic, Polypropylene, HDPE/LDPE, Nylon, PEEK, PET , Polycarbonate, Polyester, Polypropylene, Polystyrene, Polyurethane and Thermoplastic with or without reinforcement fillers like glass fiber, mineral powders, carbon fibers etc. All these materials and processes used require dies and tools for producing high volumes of plastic parts. All most all sectors of industries are using plastic parts and dies for these are designed considering shape, size etc. parameters.

## **2. PRODUCT & ITS APPLICATION:**

The mold or die used to produce plastic parts in molding have to manufacture high-volume production and Molds are typically constructed from hardened steel, pre-hardened steel, aluminum, and/or beryllium-copper alloy. The choice of material to build a mold from is primarily one of economics. Main features of plastic dies are:

- Walls and internal ribs. To properly release the part, taper or draft is provided with good surface finish.
- Molds must have a gate, to allow the molten plastic to be injected into the cavity of the mold. Gate type, design and location affect the part such as part packing, gate removal, cosmetic appearance of the part, and part dimensions & warping.
- Proper wall thickness can have drastic effects on the cost and production speed of

manufacturing. Thinner walls use less material which reduces cost and take less time to cool, reducing cycle time.

- Texturing is a pattern on the mold surface. Texture can be a functional component of design as it hides finger prints, improves grip and reduces wear from friction. This process allows flexibility in creating the final appearance of parts.
- Inserts used in plastic parts provide a place for fasteners such as machine screws. The inserts are often made of brass and give robust design.
- The cost of manufacturing molds depends on a very large set of factors ranging from number of cavities, size of the parts (and therefore the mold), complexity of the pieces, expected tool longevity, surface finishes and many others.

### **3. DESIRED QUALIFICATIONS FOR PROMOTER:**

Any ITI, Diploma or graduate preferably with manufacturing or marketing experience.

### **4. INDUSTRY OUTLOOK/TREND**

The tool and die industry is primarily made up of small businesses using skilled employees with many years of experience. While most plastic industry tool and die production is for making consumer durable goods, It also plays an important role in manufacturing of parts and equipments for auto sector, aerospace, electronics computers and even defense sector.

The Indian tool room industry is contributes to manufacturing sector for the success of automobile, consumer durables, plastic etc. The industries meet their requirement of tooling through three sources – commercial tool room, captive tool room or import. Major Indian units have captive tooling units for in house demand. While many are offering commercial services too. According to an estimate published by the Tool and Gauge Manufacturers Association of India (TAGMA India), 30 % demand is from captive tool rooms, 50 % are from commercial tool makers and 20% is met through imports. The imports mostly originate from Japan, China, Germany and South Korea. Chinese tools and dies have an advantage for high volume, less sophisticated parts manufacturing.

The Indian industry has several prominent players like Godrej & Boyce, JBM Group, Larsen & Toubro Ltd, Nagata India Pvt. Ltd, ACME Tooling's, Alcoa, Alphacraft, Dietech India, Dynacast, Endurance Group, Harindra Industrial, Jaihind Automation, Karthikeya Moulds & Dies, Makino India, Motherson Molds and Die Casting Ltd., Classic Moulds and Dies (CMD), HMT Machine Tools, ITL Industries Ltd., Konarak Industria Pvt. Ltd., Mastercraft Engineers Pvt. Ltd., Premier Machine Tools, Shaily Engineering Plastics Limited, Subros Ltd., Titan Precision Engg, Yamazaki Mazak etc. Over and above there are over 500 small and medium located at major centers are also offering plastic die manufacturing capabilities.

For sheet metal stampings/ pressed parts, the largest end users are: motor vehicle industry (50%), appliances (5%), other transport vehicles, agricultural equipment (5%), construction industry (4%), and cookware (4%). For industrial molds, 41% of production is sold to the motor vehicle industry, 16% to electronics manufacturers, and 14% to appliance makers. Thus motor vehicle industry is thus the major end user of sheet metal tools and dies in terms of value.

It is estimated that Commercial Tool Rooms Market in India will grow at a CAGR of 17% by 2020. This growth is mainly due to increasing demand from automotive, domestic appliances and international consumer. The low cost of skilled labor, increasing usage of plastics is the driving factor. Plastic Moulds has the largest market share in Indian tools and dies market with expected to grow at a CAGR of 22% till 2020. The increasing demand from industries like packaging, electronics, electrical, healthcare etc., offers huge opportunity in the Die and Mould making industry in India.

The tool room industry is undergoing a technology change in manufacturing practices. Where earlier, only few important components were manufactured using the CNC machine, now the industry is switching over entirely to CNC to gain a competitive edge. The Tool and die makers skills are improving as they have to not only know complex precision machine operations but also other learn about use of other finishing tools, heat-treatment, plating, material behavior, part producing machines, quality checks of dies as well as parts being produced.

The tool makers' work now also involves CAD design conversion for CAM machine instructions to operate CNC machines with help of software etc. These types of training is now necessary for tool and die makers and mostly obtained through machine supplier training, apprentice

ship or provided by Govt. institutes like Indo German, Indo Danish etc. tool room running training courses.

## **5. MARKET POTENTIAL AND MARKETING ISSUES. IF ANY:**

Injection, compression, Blow molding and Extrusion processes are used to manufacture large number of parts for consumer, industrial, domestic, medical etc. appliances, containers, bottle, transport sector, door and window profiles, Automotive components, sports sector, foot wares etc. with simple to complex molding technologies. Even the high tech sectors like electronic goods and gadgets, aerospace etc. use large number of plastic products today requiring products molds. The estimated market size of the Indian tooling industry for the year 2014/15 is 151,000 mn, with imports contributing to 22 per cent or 33,220 mn, according to a report from Tagma.

Major manufacturing clusters Commercial tool room industry in India is concentrated in Mumbai, Bengaluru, Chennai, Pune, Hyderabad and NCR due to the presence of industries like automobile, auto component, plastic, general engineering, tractor etc. The estimated turnover of the Indian tool room industry in 2013-14 was Rs 141,750 million. The sector witnessed a growth of 4 per cent. There is an increased demand for plastic molds and dies with its increasing usage in automobiles, consumer durables and electronics. The imports declined to ` 30,813 Million in 2013 – 14 against ` 34,075 in 2012 – 13. The drop in import is mainly due to domestic commercial tool makers gaining the trust of customers by supplying quality tooling. The import of plastic mould is still high in overall tooling imports

Sourcing of dies and mold from domestic Tool Rooms is increasing to almost to 55 per cent in 2013-14 as per TAGMA and even in-house manufacturing has reduced. TAGMA anticipates that the trend is likely to continue as end-users find it cost effective, time saving. Estimated demand of Indian tool room industry for 2014 – 15 is over Rs 200,000 million.

Globally, there is a general shift in manufacturing of tools and dies in the Asia-Pacific region especially for Plastic dies that have huge demand from injection molding, transfer molding and even advanced multi material moldings of complex application products. In view of the universal nature of plastic use, there is very good potential for a good plastic die and tooling

unit with excellent design and manufacturing capabilities.

## **6. RAW MATERIAL REQUIREMENTS:**

Steel and aluminum are most common mold materials. Steel molds cost more but offer a longer lifespan. Hardened steel molds are heat treated after machining, making them superior in terms of wear resistance and lifespan. Aluminum molds cost substantially less than steel molds, viz aerospace grade can be economical. Aluminum molds also offer quick turnaround and faster cycles because of better heat dissipation. They can also be coated for wear resistance.

Beryllium copper is used in areas of the mold which require fast heat removal or areas that see the most shear heat generated. Martensitic steel with excellent wear resistance and good thermal conductivity suitable for high standards of polishing and surface coatings. All the materials are available easily.

## **7. MANUFACTURING PROCESS:**

Starting with design of components to be molded, various computer aided design software's are used to arrive at economical dies and tool design. Most plastic molds are produced out of aluminum alloys except the high pressure injection molded parts. Various shapes and intricate geometry can be designed and built using CNC machines or Electrical Discharge Machining processes. Beryllium copper is often used for parts that require fast heat removal. Hardened steel molds are heat treated after machining, making them superior in terms of wear resistance and lifespan.

Main process steps are machining of tool steel like turning, shaping, milling, drilling, grinding, lapping, etc. Each component undergoes heat treatment processes like through hardening, skin or case hardening, nitriding, etc. The facilities in an integrated tooling shop, requires software's for Design, Precision Milling machine, Precision Lathe, surface and cylindrical grinding, Wire EDM, spark erosion/Drill EDM, and tool steel heat treating facilities.

## 8. MANPOWER REQUIREMENT:

The unit shall require highly skilled service persons. The unit can start from 12 employees initially and increase to 26 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	20000	3	4	6	8	10
2	Semi-Skilled/ Helpers	8000	3	4	6	8	8
3	Supervisor/ Manager	40000	2	3	3	3	3
4	Accounts/ Marketing	18000	2	2	2	3	3
5	Other Staff	8000	2	2	2	2	2
	TOTAL		12	15	19	24	26

## 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	4
4	Arrangement of Finance	2
5	Manpower Recruitment and start up	4
	Total Time Required (Some Activities run concurrently)	8

## 10. COST OF PROJECT:

The unit will require total project cost of Rs 194.96 lakhs as shown below:

Sr No	Particulars	In Lakhs
1	Land	30.00
2	Building	60.00
3	Plant and Machinery	89.35
4	Fixtures and Electrical Installation	4.00
5	<i>Other Assets/ Preliminary and Preoperative Expenses</i>	2.50
6	Margin for working Capital	9.11
	<b>TOTAL PROJECT COST</b>	<b>194.96</b>

## 11. MEANS OF FINANCE:

The project will require promoter to invest about Rs 55.57 lakhs and seek bank loans of Rs 139.39 lakhs based on 70% loan on fixed assets.

Sr No	Particulars	In Lakhs
1	Promoters Contribution	55.57
2	Loan Finance	139.39
	TOTAL:	194.96

## 12. WORKING CAPITAL REQUIREMENTS:

Working capital requirements are calculated as below:

Sr No	Particulars	Gross Amount	Margin %	Margin Amount	Bank Finance
1	Inventories	2.08	40	0.83	1.25
2	Receivables	6.52	50	3.26	3.26
3	Overheads	4.19	100	4.19	0.00
4	Creditors	2.08	40	0.83	1.25
	TOTAL	14.87		9.11	5.76

### 13. LIST OF MACHINERY REQUIRED:

Sr No	Particulars	UOM	Quantity	Rate	Total Value
	<b>Main Machines/ Equipment</b>				
1	Hacksaw machine	Nos	2	80000	160000
2	CNC Lathe machine	Nos	1	500000	500000
3	Precision Lathes	Nos	2	300000	600000
3	Precision CNC m/c center with attachment	Nos	1	1200000	1200000
4	Heavy Duty Milling Machine	Nos	1	650000	650000
5	Wire cut EDM / Spark erosion Machine	Nos	2	900000	1800000
6	Heavy duty Radial Drill machine	Nos	1	300000	300000
7	Precision Hydraulic Grinding M/cs	Nos	2	500000	1000000
8	Belt grinding Polishing machine	Nos	2	80000	160000
9	Welding Brazing set	Nos	1	60000	60000
10	Lapping/ polishing machine	Nos	2	140000	280000
11	Heat treatment facility		1	300000	300000
12	Air Handling/ Clean room facility	Nos	1	150000	150000
13	Air Compressor	LS	1	200000	200000
14	Injection molding machine		2	600000	1200000
	<u>Sub Total:</u>				<u>8560000</u>
	<b>Tools and Ancillaries</b>				
1	Tools and gauges	LS	1	300000	300000
2	Misc. tools etc.	LS	1	75000	75000
	<u>Sub Total:</u>				<u>375000</u>
	<b>Fixtures and Elect Installation</b>				
1	Storage racks and trolleys	LS	1	35000	35000
2	Other Furniture	LS	1	25000	25000
3	Telephones/ Computer	LS	1	40000	40000
4	Electrical Installation	LS	1	300000	300000
	<u>Subtotal:</u>				<u>400000</u>
	Other Assets/ Preliminary and Preoperative Expenses	LS	1	250000	250000
	<b>TOTAL PLANT MACHINERY COST</b>				<b>9585000</b>



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 is worthwhile to look at reconditioned imported machines, dies and tooling. Some of the machinery and dies and tooling suppliers are listed here below:

1. Berlin Machine Corporation  
Bhairavnath Industrial Estate, Gate No.  
2/1, Plot No. 15, Dehu-Alandi Road,  
Chikhali, Near Paras Weighing Bridge, Pune – 412114
2. Bezel Industries Limited  
B- 260, Naraina Industrial Area, Phase 1,  
Delhi-110028, India
3. Sanki Machine Tools (india) Pvt. Ltd.  
Abhijeet Purandare(Director)  
No. 301/302, Deepali Darshan,  
Jayprakash Nagar, Road No.5  
Goregaon (East), Mumbai – 400063,
4. Syndicate Machines Private LimitedW-381/395/R879,  
MIDC, T. T. C. Industrial Area Near Golden Garage, Rabale,  
Navi Mumbai-400701, Maharashtra, India
5. Sunrise Enterprises, BengaluruNo. 1/1,  
Yakoob Complex, 4th Cross, S. P. Road,  
Bengaluru-560002, Karnataka, India
6. SPM Machines (INDIA)  
Plot No. D-133, T.T.C., M.I.D.C.  
Industrial Area, Nerul,Navi Mumbai-40070

Other well-known machine manufacturers can be searched from directories/ internet. ACME TOOLINGS, Ace Manufacturing Systems Ltd., Batliboi Ltd., 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 etc.

#### 14. PROFITABILITY CALCULATIONS:

Sr No	Particulars	UOM	Year Wise estimates				
			Year 1	Year 2	Year 3	Year 4	Year 5
1	Capacity Utilization	%	40	50	60	70	75
2	Sales	Rs Lakhs	78.29	97.86	117.43	137.01	146.79
3	Raw Materials & Other Direct Inputs	Rs Lakhs	24.93	31.17	37.40	43.63	46.75
4	Gross Margin	Rs Lakhs	53.36	66.69	80.03	93.37	100.04
5	Overheads Except Interest	Rs Lakhs	13.98	13.98	13.98	13.98	13.98
6	Interest	Rs Lakhs	19.51	19.51	19.51	19.51	19.51
7	Depreciation	Rs Lakhs	15.59	15.59	15.59	15.59	15.59
8	Net Profit Before Tax	Rs Lakhs	4.27	17.61	30.95	44.29	50.96

The basis of profitability calculation:

The Unit will have capacity of 100 MT per year of Dies and tools for extrusion and injection molding of different types. The sales prices of dies and tools from Rs 150 per Kg simple products to Rs 800 per kg for high end products depending on type, size / rating and volumes.

The raw material cost for carbon steel ranges from Rs 50 to 85 per Kg, aluminum alloys ranges from Rs 120 to Rs 250 per Kg, tool steels price ranges from Rs 150 to Rs 400 per kg and that of beryllium copper alloys is Rs 2500 to Rs 3500 per kg. The material requirements are considered with wastage/ scrap etc. of 8 % of finished products. The unusable scrap is sold at @ Rs 80 ~ 120 per Kg or more. 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 36.80 % of the installed capacity as depicted here below:

Sr No	Particulars	UOM	Value
1	Sales at Full Capacity	Rs Lakhs	195.72
2	Variable Costs	Rs Lakhs	62.34
3	Fixed Cost incl. Interest	Rs Lakhs	49.08
4	Break Even Capacity	% of Inst Capacity	36.80

## **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 all types of dies

and tools. The unit can also of other consumer and high value precision industrial components 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 Bhubaneswaretc. 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](http://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.