

TOOL ROOM FOR SHEET METAL DIES

1. INTRODUCTION:

Sheet metal forming processes are complex and have interaction several parameters of material like geometry, surface topology, with properties of material being processed and forming processes, tooling design, machines used, etc. Process steps are planned based on ductility, thicknesses, micro-structure, etc. material parameters.

Sheet Metal processing involves various processing steps ranging from most common to advanced system of multiple stages depending on size, shape, and other complexities, precision of components as well as volume to be produced.

The process variants are to be carried out by dies and tools for sheet metal involves, cutting or blanking by shearing of sheets with help of punches/ blades etc., bending carried out with simple or complex die shapes as per need, and Punching or trimming to remove unwanted materials.

Complex die operations are combined with help of jigs and fixtures that are built in to die and perform multiple operations in die block also known as progressive or transfer dies. Sheet metal die design and manufacturing, therefore demands understanding of the materials and forming steps involved in the processing. Designing sheet metal dies and tooling will require planning, calculations and probably some in house testing.

2. PRODUCT & ITS APPLICATION:

The main components for die tool sets are:

- Die block – Main part that all the other parts are attached to.
- Punch plate – The plate that holds and supports the different punches in place.

- Blanking punches and Die - It produces the blank of parts for further processing.
- Pierce punch and die - This is a punch die that removes material from the blanked or processed finished part.
- Stripper plate - A plate that holds punched out scrap material down and unclogs die.
- Pilot - It is a locator pin that helps to place the sheet accurately for subsequent stage of operation in same or another die.
- Guides, back gauge, or finger stop - These parts are all used to make sure that blank always goes in the same position, within the die.
- Setting - Stop Pins/ block - These are used to control the depth of punch travel into the die.
- Shank - It is used to hold in the Die block in press. It is aligned at the center of the plate.

It is always advantageous to perform multiple operations on the part to achieve precision and cost advantages. This is called compound operation implementing more than one operation during the single stroke of press cycle. The sheet metal is fed through as a coil strip, and a different operation such as punching, blanking, and notching is performed at the same station of the machine with each stroke of a series of punches.

Many a times, Dies are also designed with for sequential/ progressive forming operations to be performed. The material moves through the die and it is progressively modified at each station until the final operation ejects a finished part.

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. Sheet metal tools and die production is for making industrial manufacturing sector and 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 contributes to manufacturing sector in automobile, consumer durables, machines, construction industry etc. The industries meet their requirement of tooling mostly through three sources viz commercial tool room, captive tool room or import. Most of the sheet metal dies and tools are offered to end users through the sheet metal machinery manufacturers. However Major Indian units also have captive tooling units for sectors like auto components/ sheet metal stampings/ pressed body part suppliers etc. in house. While sheet metal processor units in general, electrical, electronics and consumer products procure tooling from commercial tool rooms. The Tool and Gauge Manufacturers Association of India (TAGMA India), estimated that 30 % of tools and dies are met by 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 lower price.

The Indian industry has several prominent players like Godrej & Boyce, JBM Group, Larsen & Toubro Ltd, Nagata India Pvt. Ltd, ACME Tooling's, Alcoa, Alpha craft, 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.

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. Auto Components industry in Indian Commercial Tool Rooms (CTRs) market is expected to grow at a CAGR of

25% till 2020. Sheet Metal Dies currently control the second largest market share in Indian commercial tool rooms market. And the Sheet Metal Dies market is expected to grow at a CAGR of 16% till 2020. The increasing demand from industries like industrial equipments, electronics, electrical, healthcare etc. enclosures and panel manufacturers etc., offers huge opportunity in the Die and Mould making industry in India.

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. This type of training is now necessary for tool and dies 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:

Major manufacturing clusters of 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, general engineering, tractor etc. The estimated turnover of the Indian tool room industry in 2013-14 was Rs 141,750 million.

The tool room sector witnessed a growth of 4 per cent. There is an increased demand for 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. 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.

Sheet Metal processors are constantly in need of Dies and tooling suppliers and many of the Dies and tools are exported by our industry to developing countries. In view of this, there is very good scope for new unit with design and processing capabilities for new as well as spares for the dies and tooling.

6. RAW MATERIAL REQUIREMENTS:

Selection of material is very critical for dies and tools production. Tool steel is high carbon and high alloy steels with distinctive hardness, resistance to abrasion, shock and deformation, and ability to hold a cutting edge at elevated temperatures. The presence of carbides in tool steel plays the dominant role in the qualities of tool steel. The four major alloying elements that form carbides in tool steel are tungsten, chromium, vanadium and molybdenum. Martensitic steels have excellent wear resistance and good thermal conductivity suitable for high standards of polishing and surface coatings.

Various grades of tool steels are chosen depending on cost, working temperature, required surface hardness, strength, shock resistance, and toughness requirements. The more severe the service condition (higher temperature, abrasiveness, corrosiveness, loading), the higher the alloy content and consequent amount of carbides required for the tool steel. All Tool steels are available from local and imported sources.

7. MANUFACTURING PROCESS:

The process starts with detailed designing of tools and dies. Various computer aided design software's are used to arrive at economical designs. Dies and tooling manufacturing requires very high dimensional accuracies and subsequent heat treatment and surface treatment processes for the components of die and tool. 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 integrated tooling shop, requires Solid Works etc. software's for Design, Precision Milling machine, Precision Lathe, surface grinding, cylindrical grinding, Wire EDM, Drill EDM, and outsourced tool steel heat treating facilities.

8. MANPOWER REQUIREMENT:

The unit shall require highly skilled service persons. The unit can start from 13 employees initially and increase to 34 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	25000	3	4	6	10	14
2	Semi-Skilled/ Helpers	10000	4	4	6	8	10
3	Supervisor/ Manager	40000	2	3	3	4	4
4	Accounts/ Marketing	18000	2	2	2	3	4
5	Other Staff	8000	2	2	2	2	2
	TOTAL		13	15	19	27	34

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 222.54 lakhs as shown below:

Sr No	Particulars	In Lakhs
1	Land	30.00
2	Building	60.00
3	Plant and Machinery	113.25
4	Fixtures and Electrical Installation	4.00
5	Other Assets/ Preliminary and Preoperative Expenses	3.50
6	Margin for working Capital	11.79
	TOTAL PROJECT COST	222.54

11. MEANS OF FINANCE:

The project will require promoter to invest about Rs 64.48 lakhs and seek bank loans of Rs 158.06 lakhs based on 70% loan on fixed assets.

Sr No	Particulars	In Lakhs
1	Promoters Contribution	64.48
2	Loan Finance	158.06

	TOTAL:	222.54
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12. WORKING CAPITAL REQUIREMENTS:

Working capital requirements are calculated as below:

Sr No	Particulars	Gross Amount	Margin %	Margin Amount	Bank Finance
1	Inventories	2.87	40	1.15	1.72
2	Receivables	8.93	50	4.47	4.47
3	Overheads	5.03	100	5.03	0.00
4	Creditors	2.87	40	1.15	1.72
	TOTAL	19.70		11.79	7.91

13. LIST OF MACHINERY REQUIRED:

Sr No	Particulars	UOM	Quantity	Rate	Total Value
	Main Machines/ Equipment				
1	Hacksaw machine	Nos	2	100000	200000
2	CNC Lathe machine	Nos	2	500000	1000000
3	Precision CNC Milling m/c center and all attachment	Nos	1	1600000	1600000
4	Heavy Duty Milling Machine	Nos	2	650000	1300000
5	Wire cut EDM / Spark erosion Machine	Nos	2	750000	1500000
6	Heavy duty Radial Drill machine	Nos	1	300000	300000
7	Precision Hydraulic Grinding M/cs	Nos	3	750000	2250000
8	Belt grinding Polishing machine	Nos	2	80000	160000
9	Welding Brazing set	Nos	1	60000	60000
10	Lapping machine	Nos	2	140000	280000
11	Heat treatment facility		1	750000	750000
11	Air Handling/ Clean room facility	Nos	1	250000	250000
12	Air Compressor	LS	1	200000	200000
13	CNC measuring machine with granite block 5 axis		1	500000	500000

14	Hydraulic Press		1	450000	450000
	<u>Sub Total:</u>				10800000
	Tools and Ancillaries				
1	Tools and gauges	LS	1	450000	450000
2	Misc. tools etc.	LS	1	75000	75000
	<u>Sub Total:</u>				525000
	Fixtures and Elect Installation				
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>				400000
	Other Assets/ Preliminary and Preoperative Expenses	LS	1	350000	350000
	TOTAL PLANT MACHINERY COST				12075000

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 Limited W-381/395/R879,
MIDC, T. T. C. Industrial Area Near Golden Garage,
Rabale, Navi Mumbai-400701, Maharashtra, India

5. Sunrise Enterprises, Bengaluru No. 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., and Tool craft Systems Pvt Ltd etc.

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 machineries 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	Capacity Utilization	%	35	45	55	65	70
2	Sales	Rs Lakhs	107.16	137.78	168.40	199.02	214.33

3	Raw Materials & Other Direct Inputs	Rs Lakhs	34.43	44.27	54.10	63.94	68.86
4	Gross Margin	Rs Lakhs	72.73	93.52	114.30	135.08	145.47
5	Overheads Except Interest	Rs Lakhs	18.11	18.11	18.11	18.11	18.11
6	Interest	Rs Lakhs	22.13	22.13	22.13	22.13	22.13
7	Depreciation	Rs Lakhs	18.08	18.08	18.08	18.08	18.08
8	Net Profit Before Tax	Rs Lakhs	14.42	35.20	55.98	76.77	87.16

The basis of profitability calculation:

The Unit will have capacity of 200 MT per year of sheet metal dies and tools of different grades/ types/ ratings. The bulk sale/ distribution sales prices of standard tools ranges from Rs 100 per Kg to Rs 600 per kg for high end products depending on type, size/ rating and volumes.

The raw material cost ranges from Rs 85 for high carbon alloys to Rs 450 per kg for high grade tool and die steels. The material requirements are considered with wastage/ scrap etc. of 10 % of finished products. The unusable scrap is sold at @ Rs 40~ 100 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 break-even capacity at 28.06 % of the installed capacity as depicted here below:

Sr No	Particulars	UOM	Value
1	Sales at Full Capacity	Rs Lakhs	306.18
2	Variable Costs	Rs Lakhs	98.37

3	Fixed Cost incl. Interest	Rs Lakhs	58.31
4	Break Even Capacity	% of Inst Capacity	28.06

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 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