

FORGINGS



1. INTRODUCTION:

Forging is a manufacturing process involving the shaping of metal using localized compressive forces. The blows are delivered with a power hammer in open or close die. Forging is often classified according to the temperature at which it is performed: cold forging, warm forging, or hot forging.

The metal takes the shape of the die and very strong parts can be produced due to the favorable orientation of the grain. Forging can produce a piece that is stronger than an equivalent cast or machined part.

Forgings are usually selected for applications requiring high ductility, impact toughness, fracture toughness and fatigue strength; therefore, forging alloys with inherently high ductility and tensile strength are generally selected.

2. PRODUCT & ITS APPLICATION:

Forged Metal components are most widely used, in all the products and manufacturing sectors for wide ranging applications. The majority of forging alloys are in one of seven primary alloy groups: Carbon, micro alloy and alloy steels, Stainless steels, Aluminum alloys, Copper alloys, iron, nickel, or cobalt based heat resistant alloys, Titanium and Magnesium alloys.

High-strength alloys have the better tensile strength and fatigue strength. For most load bearing and rotating or high pressure environment components are made from of specific strong steel alloys that provide significant advantages. For industrial application, primarily steel alloys are forged in hot condition. Brass, bronze, copper, precious metals and their alloys are manufactured for special applications. Each metal requires a different forging temperature.

Aluminum, titanium and other nonferrous metal forged parts are mainly used in aerospace, automotive industry and many other fields of engineering, where highest safety standards against failure by abuse, by shock or vibratory stresses are needed. Such parts are for example chassis parts, steering components and brake parts.

3. DESIRED QUALIFICATIONS FOR PROMOTER:

Any ITI, Diploma or graduate preferably with manufacturing experience. The engineering degree and experience in steel forging industry will help. The entrepreneur should specialize in specific product range.

4. INDUSTRY OUTLOOK/TREND

Forging is traditionally considered as the back bone of manufacturing industry. Automotive industry depends significantly on the steel forged metal components for demanding applications, such as crankshafts, transmission gears, and bearings and therefore a major end user segment.

The Indian forging industry is well recognized globally for its technical capabilities. With an installed capacity of around 38.5 lakh MT. There are over 380 forging units operating in the country with a total turnover of Rs.28, 000 crore, of which export revenue is Rs.6, 100 crore. In the year 2014-15, total production of forgings was 22.5 lakh tonne.

Forging industry clusters are located in Western region, in the states of Maharashtra,, Gujarat, having about 150 units, North India cluster in Punjab, Haryana, Delhi, having over 130 units, in south states of Tamil Nadu, Karnataka, Andhra Pradesh have about 75 units, while eastern States of Jharkhand, West Bengal and have over 30 units. The current investment in the plant and machinery by Indian forging companies is worth of INR 27,833 Crore. The Indian forging industry constitutes of about 10 large units followed by 100 medium & small scale units and about 220 plus tiny units. It can be seen that about 83% of the total units are in small and very small.

The domestic forging industry is characterized by fragmented capacities. The unorganized sector has major presence in Open Die Forging segment, which has lower capital costs, while the organized players dominate the Closed Die Forging segment. Out of the total forgings produced in the country, 70% is through Closed Die Forging, 15% by Open Die Forging and the balance 15%. Current share of auto sector is about 58% of total forging production while the rest is with the non-auto sector

The products manufactured by the Forging units range from rough forgings and machined parts like crankshafts, connecting rods, camshafts, shifted fork, steering components, crown propeller shafts, gear box components; crown wheel and pinions, front axle beams, rear axle shafts, earth moving link, railway wheels, flanges, pipe fittings to industrial valves.

The technology trend of induction heating, closed die forging techniques and machines and use of micro alloys will enhance the quality productivity and value addition in this sector. Technology such as computer simulation for die/ tools design etc. are needed to reduce defects and rejection rates. Robotics and automation are increasingly deployed by industries to achieve quality and improve productivity.

5. MARKET POTENTIAL AND MARKETING ISSUES. IF ANY:

The major demand driver of forgings is the economic growth and massive investment in infrastructure and industry. Government's thrust on manufacturing sector with initiatives like 'Make in India' and 'Skill India' has definitely created positive economic impact. An excellent growth of the forging industry that is attributed to the great recovery of the automotive sector in the country as 65% of the forgings produced is utilized by the automotive sector.

The Association of Indian Forging Industry (AIFI), estimated that the Indian forging industry is likely to grow at CAGR of 9.5 percent by 2018, production wise, and reach to 2.97 mn MT in FY 2017-18 from 2.25 mn MT during FY 2014-15. The estimated turnover of the 384 forging units operating in FY 2014-15 was Rs 27,835 crore including Rs 6,100 crore contributed from exports. Overall production of forgings increased to 2.25 mn MT in 2014-15 and estimated to cross 2.5 mn MT soon.

The Indian automotive component market is estimated to grow at around 10-15 per cent to reach US\$ 16.5 billion by 2021 from around US\$ 7 billion in 2016. It has the potential to generate up to US\$ 300 billion in annual revenue by 2026. Other sectors demanding forged components like cement, mining, railways, defense, chemical, pharma etc. And the machinery industry is also growing rapidly from 3% to 12% per year. The forged component export demand is also improving with potential to grow at 10% per year. These augers well for the forging industry.

6. RAW MATERIAL REQUIREMENTS:

MS and SS steel alloy billets, bars, rods and flats of special forging grade are required for different product to be manufactured by the unit. Carbon steel is available in Grades from C1006 up to C1095, with the carbon increasing from 0.06% to 0.95%. For other alloys specifications are available from BIS and other international bodies.

The hot forging products range is considered here. Unit may need to source the quality material sources from appropriate quality suppliers to ensure end quality of products.

7. MANUFACTURING PROCESS:

Drop forging is a forging process where a hammer is raised and then “dropped” onto the work piece to deform it according to the shape of the die. Press forging is used for closed die forging and it works by slowly applying a continuous pressure or force, which differs from the near-instantaneous impact of drop-hammer forging. The unit can consider both manufacturing processes one after another. The plant investment may range from 80 to 1500 lakhs depending on forging equipment selection. The process involves cutting of blanks from billet, rods or flats in desired sizes, heating in furnace or with help of induction heating system to a required temperature and forging to the required shape under a drop hammer or press with help of dies.

The forged component are to be cooled in controlled atmosphere or heat treated by heat soaking to achieve metallurgical properties. The unit can also machine the components as per the required to achieve the finished product.

8. MANPOWER REQUIREMENT:

The unit shall require highly skilled persons. The unit can start from 25 employees and increase to 75 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 | 10 | 10 | 20 | 25 | 30 |
| 2 | Semi-Skilled/ Helpers | 8000 | 15 | 15 | 25 | 30 | 35 |
| 3 | Supervisor/ Manager | 25000 | 2 | 2 | 3 | 3 | 3 |
| 4 | Accounts/ Marketing | 18000 | 2 | 2 | 2 | 4 | 4 |
| 5 | Other Staff | 7000 | 1 | 1 | 2 | 2 | 2 |
| | TOTAL | | 30 | 30 | 52 | 64 | 74 |

9. IMPLEMENTATION SCHEDULE:

The unit can be implemented within 6 months from the serious initiation of project work. The unit should be located near a major industrial center with good road connectivity.

| 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 | 2 |
| 4 | Arrangement of Finance | 2 |
| 5 | Manpower Recruitment and start up | 1 |
| | Total Time Required (Some Activities run concurrently) | 6 |

10. COST OF PROJECT:

The unit will require total project cost of Rs. 242.69 lakhs as shown below:

| Sr. No. | Particulars | In Lakhs |
|---------|---|----------|
| 1 | Land | 25.00 |
| 2 | Building | 40.00 |
| 3 | Plant and Machinery | 95.00 |
| 4 | Fixtures and Electrical Installation | 7.15 |
| 5 | Other Assets/ Preliminary and Preoperative Expenses | 3.50 |
| 6 | Margin for working Capital | 72.04 |
| | TOTAL PROJECT COST | 242.69 |

11. MEANS OF FINANCE:

The project will require promoter to invest about Rs 114.70 lakhs and seek bank loans of Rs 127.99 lakhs based on 70% loan on fixed assets.

| Sr. No. | Particulars | In Lakhs |
|---------|------------------------|----------|
| 1 | Promoters Contribution | 114.70 |
| 2 | Loan Finance | 127.99 |
| | TOTAL : | 242.69 |

12. WORKING CAPITAL REQUIREMENTS:

Working capital requirements are calculated as below:

| Sr. No. | Particulars | Gross Amount | Margin % | Margin Amount | Bank Finance |
|---------|-------------|--------------|----------|---------------|--------------|
| 1 | Inventories | 41.46 | 40 | 16.58 | 24.87 |
| 2 | receivables | 52.95 | 50 | 26.48 | 26.48 |
| 3 | Overheads | 12.39 | 100 | 12.39 | 0.00 |
| 4 | Creditors | 41.46 | 40 | 16.58 | 24.87 |
| | TOTAL | 148.26 | | 72.04 | 76.22 |

13. LIST OF MACHINERY REQUIRED:

| Sr. No. | Particulars | UOM | Quantity | Rate | Total Value |
|---------|--------------------------------|------|----------|-------------|-------------|
| | Main Machines/ Equipment | | | | |
| 1 | Induction Heater for blanks | Nos. | 2 | 100000 0 | 200000 |
| 2 | Blank/ Billet cutting machines | Nos. | 3 | 150000 | 450000 |
| 3 | Pneumatic Forging Hammer | Nos. | 2 | 450000 | 900000 |
| 4 | Mech Forging Hammer | Nos. | 2 | 145000 | 290000 |
| 5 | 800 T Hydraulic Forging Press | Nos. | 1 | 450000 0 | 450000 |
| 6 | Die Repair/ Finishing Tools | LS | 1 | 200000 | 200000 |
| 7 | Milling Machine | Nos. | 1 | 200000 | 200000 |
| 8 | Pillar drilling machine | Nos. | 1 | 25000 | 25000 |

| | | | | | |
|----------------|---|------------|-----------------|-------------|--------------------|
| 9 | Air Compressor System | Nos. | 1 | 200000 | 200000 |
| Sr. No. | Particulars | UOM | Quantity | Rate | Total Value |
| 10 | Lathes | Nos. | 3 | 75000 | 225000 |
| | subtotal : | | | | 8990000 |
| 1 | Tools and Ancillaries | | | | |
| 2 | Bench and Belt Grinders | LS | 1 | 15000 | 15000 |
| 3 | Forging Dies and Tools | Nos. | 15 | 20000 | 300000 |
| 4 | Portable Tools | LS | 1 | 50000 | 50000 |
| 5 | Gauges, Testing Machines and tools | LS | 1 | 145000 | 145000 |
| | subtotal : | | | | 510000 |
| | Fixtures and Elect Installation | | | | |
| | Storage racks | LS | 1 | 15000 | 15000 |
| | Other Furniture | LS | 1 | 10000 | 10000 |
| | Telephones/ Computer | LS | 1 | 40000 | 40000 |
| | Electrical Installation | LS | 1 | 650000 | 650000 |
| | subtotal : | | | | 715000 |
| | Other Assets/ Preliminary and Preoperative Expenses | LS | 1 | 350000 | 350000 |
| | TOTAL PLANT MACHINERY COST | | | | 10565000 |

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 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. Pmp Machine Tools
Behind Raj Kamal Petrol Pump,
Punit Nagar Road, Kotharia,
Raj Nagar, Rajkot-360004

2. Shree Mayur Engineering Company
1New LaL Bahadur Nagar, Virani Aghat,Dhebar Road,
Rajkot-360002 Gujarat(India)
3. Eddy Melt
C 70, M. I. D. C., Hingna Industrial Estate,
Nagpur - 440025 Maharashtra, India
4. Electrotherm India Ltd.,
Survey No. 72, Village Palodia,
Taluka Kalol Via Thaltej
Ahmedabad- 382115, Gujarat
5. Thermotec Furnaces
Plot No. 1, Sector 16-18,
Dividing Road Opposite Jain Mandir,
Faridabad-121001, Haryana, India
6. Forward Engineers (regd.)
No. 2594, Kalsian Street No. 3, Sewak Pura Millerganj,
Ludhiana-141003, Punjab, India
7. Nikhil Hydraulics
No. J-10, K. B. M. Compound, Marol Military Road,
Mumbai-400059, Maharashtra, India
8. Jupiter Mech Works & Services LLP
Mandar Joshi(Director)
No. 311, M. P. J. Chambers,
Wakadewadi Mumbai-Pune Road,
Pune - 411003,
9. Charika Industries
Plot No. 495, Industrial Area- B,

Ludhiana-141003, Punjab, India

14. PROFITABILITY CALCULATIONS:

| Sr. No | Particulars | UOM | Year Wise estimates | | | | |
|--------|-------------------------------------|----------|---------------------|--------|---------|---------|---------|
| | | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
| 1 | Sales | Rs Lakhs | 635.40 | 847.20 | 1059.00 | 1270.80 | 1482.60 |
| 2 | Raw Materials & Other Direct Inputs | Rs Lakhs | 497.50 | 663.33 | 829.16 | 994.99 | 1160.82 |
| 3 | Gross Margin | Rs Lakhs | 137.90 | 183.87 | 229.84 | 275.81 | 321.78 |
| 4 | Overheads Except Interest | Rs Lakhs | 81.24 | 81.24 | 81.24 | 81.24 | 81.24 |
| 5 | Interest | Rs Lakhs | 17.92 | 17.92 | 17.92 | 17.92 | 17.92 |
| 6 | Depreciation | Rs Lakhs | 17.48 | 17.48 | 17.48 | 17.48 | 17.48 |
| 7 | Net Profit Before Tax | Rs Lakhs | 21.27 | 67.24 | 113.20 | 159.17 | 205.14 |

The Unit will have capacity of 1200 MT per year of forged components of different grades/ types/ ratings. The bulk sale/ distribution sales prices of forged parts ranges from Rs 80 per Kg for simple items to Rs 400 per kg for high alloy steels products depending on type, size/ rating and order volumes. For very critical alloy products, prices range from 600 per kg to Rs 800 per kg with test certifications.

The raw material cost ranges from 45 to 250 per kg for steel alloys and that of super alloys range from Rs 300 to 600 per Kg. The material requirements are considered with wastage/ scrap etc. of 10 % of finished products. The unusable scrap is sold at @ Rs 18 ~ 50 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 25.37 % of the installed capacity as depicted here below:

| Sr. No. | Particulars | UOM | Value |
|---------|---------------------------|-----------------------|---------|
| 1 | Sales at Full Capacity | Rs Lakhs | 2118.00 |
| 2 | Variable Costs | Rs Lakhs | 1658.32 |
| 3 | Fixed Cost incl. Interest | Rs Lakhs | 116.64 |
| 4 | Break Even Capacity | % of Inst Capacity | 25.37 |

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 variety of part from different metals like brass, aluminum, titanium, copper etc. The unit may take up import substitution of several components in appliance and consumer products 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