

HEAVY FABRICATION

1. INTRODUCTION:

Heavy fabrication consists of building of metal structures and vessels for industry by cutting, bending, and assembling processes usually based on the engineering design drawings. Heavy fab shops will employ a multitude of processes with facilities including welding, cutting, forming and machining.

Heavy fabricated components and equipments consist of Pressure vessels viz boilers, tanks, chemical and petrochemical process vessels, heavy structures of machines, railways, offshore and on shore oil drilling platforms, steel and mineral processing plants, chimney stacks, bridges, earth moving and mining machinery frames, hydro and steam turbines frames, etc.

2. PRODUCT & ITS APPLICATION:

Many industries process, store and transfer gas or liquid under high pressure as well as temperature. Chemical and petrochemical plants require specially designed process vessels with steam coils, reaction vessels with specific material flow and processing systems. Also large ship building activities, offshore oil drilling and other structures, defense items viz submarine shells and gun carriages its parts, aerospace industry require heavy fabrication that are critical in nature. Some of these vessels and components have very large dimensions viz. up to several meters in diameter and length.

Welding is the main focus of steel fabrication. The formed and machined parts will be assembled and tack welded into place then re-checked for accuracy. A fixture is normally used to locate heavy parts for welding. Because of the critical nature of tanks, pressure vessel etc. fabrication for different applications, their fabrication and the quality of weld is critical. These welds have to undergo rigorous quality checks, which can ultrasonic, magnetic and even include X-ray inspection and certification. As a result, proper welding techniques, including surface preparation, are critical to achieving profitable projects and repeat customers.

3. DESIRED QUALIFICATIONS FOR PROMOTER:

Any person with mechanical/ metallurgy engineering degree and experience.

4. INDUSTRY OUTLOOK/TREND

The global metal fabrication market is set to grow significantly in the years to 2020, thanks to rising investments in massive infrastructure and large industrial projects. Heavy industry plays a vital role in promoting economic growth and prosperity of a nation. The equipment manufactured in this industry are further utilized in several other industries such as ship building industry, oil and gas, chemical, Chemical, bridges and dams/ canals and hydro power, mining and mega thermal power plants among others.

The Heavy fabrication industry in India comprises of various large units in EPC sectors or fabrication and supply activities like Larson and Toubro, Thyssen Krup India, Thermax India, Walchandnagar Heavy Engg, HEC Ranchi, TriveniEngg, Hindustan Dorr-Oliver and several ship building, construction of bridge/ etc. heavy structure fabricators.

Most of the large sector units are specialized in specific product range/ industries sectors viz petrochem, oil and gas refineries and platform structures, ship building, Power plant boiler and process vessel for paint, ceramics, sugar, paper, cement, food, pharma, and chemical process machines and vessels. The liquid storage Tanks, gas bottles/ containers/ Tanks, Liquid Tankers for Road, Rail transport, and ISO frame container tanks for shipping etc. are a huge segment of heavy fabrication.

There are more than 600 medium and small sector industries that are working as either feeder units to large EPC companies or have specialized product range for chemical/ pharma/ food / dairy etc. segments. The medium and small companies are located all around industrial and urban centers in India to provide services to end-user industries. The large units compete with small units for civil structural and other vessel fabrication work as viz Tanks / tankers etc. as they are low cost and many units follow specification and test processes.

The technology trend in this sector worth noting are advanced metal cutting bending/ forming processes. But in the forefront is trend of robotic welding, heavy component positioning manipulators. At design stage, the unique approach of Modularization, Unitization and Preassembly of modules in fabrication shop has emerged as the latest advance for large capital projects for creating specialized facilities.

5. MARKET POTENTIAL AND MARKETING ISSUES. IF ANY:

In view of the Indian economic growth of over 7% in last decade and the government policy initiatives to sustain and increase the growth rate, the infrastructure and industrial investments are likely to grow steadily demanding the products/ components from heavy fabricators. Besides the opening of Defense sector is likely to give demand boost for good fabrication shops equipped with latest technologies.

Many large projects are in core sector and require the services of large reliable fabrication shops for their new installations as well as for replacement need. Their demands in the country for many projects have meet immediate needs of critical fabricated components that meet their quality parameters. The auto, commercial/ industrial construction, mining, energy, aerospace, general industrial etc.

Storage Tanks, process vessels and heavy structures etc. Forming a large segment of heavy fabrication work, will see demand upsurge in view if increased transportation across the country and rapid growth in all commodities and liquid products. A new unit can start with these fabrication jobs and create niche in other fabrication jobs.

6. RAW MATERIAL REQUIREMENTS:

The raw materials required are heavy hot rolled plates, billets, blooms, of steel in various grades specified by ASME/ BIS/ DIN/ MIL etc. The welding consumables viz electrodes used by latest technology fabrication machines viz TIG/ MIG/ GMAW/ SAW/ SMAW etc. machine for continuous welding of thick sections. Argon and other such gases are also required for providing shield during welding process.

7. MANUFACTURING PROCESS:

Heavy Fabrication manufacturing process starts with design drawings specifying the shapes, pressure, and temperature of final vessel. Materials to be used are also normally prescribed in design drawing. Each sub assembly and components will have details precise dimensions; tolerances, etc. weld joint quality parameters. Based on design drawings, the fabrication job is broken in to parts or components. Raw materials like steel plate etc. are obtained as per specification.

The process steps involved are as below:

- **Cutting to Size:** This is a critical operation to get the precise shape and size of components to be welded. Plate steel is loaded on a table and the parts are cut out to required size and shape. This is done with a variety of cutting machines having gas torches, Plasma, Laser, and Water jet cutters, as cutting heads and the control of cutting head may be equipped with manual, mechanical or automatic PLC/ CNC programmable controls for 2D and 3D movement controls.
- **Forming:** The cut material is given curvature / shape and various operations are carried out like roll bending in to shell, edge flaring, dish end forming etc with machines like press, roller bending machine dish spinning machine etc.
- **Machining:** Some of the components like flanges and large vessel covers etc. are machined as per specs. In heavy machine frames, the holes of bearing houses etc. of and mating edges of frame are machined. Sub-assemblies are prepared.
- **Tack Welding:** The formed materials and sub-assemblies are assembled and tack welded to correct dimension and position prior to final welding.
- **Welding :** The welding technology is chosen depending on material, thickness to be weld, etc. and the weld machines with continuous electrode wire feeding and guiding rails are used for MIG/ flux cored wire welding/ Submerged arc welding, TIG welding etc. machines. Some manipulators/ welding gun/ work piece positioners etc. are used for ensuring an interrupted welding of complete joint peripherally or longitudinally.
- **Weld joints** are cleaned with brushes and inspected. Some of the joints may be tested by nondestructive testing methods viz dye penetration test, ultrasonic or magnetic particle test systems. Very critical joints are inspected.

- The final welded structure is inspected and tested for all specification parameter and sometimes tested for leakage/ pressure etc. prior to dispatch.

8. MANPOWER REQUIREMENT:

The unit shall require highly skilled service persons. The unit can start from 26 employees initially and increase to 58 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	8	10	12	12	12
2	Semi-Skilled/ Helpers	8000	12	15	18	24	28
3	Supervisor/ Manager	30000	3	4	5	6	6
4	Accounts/ Marketing	20000	2	4	4	5	6
5	Other Staff	7000	1	3	4	6	6
	TOTAL		26	36	43	53	58

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	3
4	Arrangement of Finance	2
5	Manpower Recruitment and start up	2
	Total Time Required (Activities run concurrently)	8

10. COST OF PROJECT:

The unit will require total project cost of Rs 211.83 lakhs as shown below:

Sr No	Particulars	In Lakhs
1	Land	25.00
2	Building	30.00
3	Plant and Machinery	94.90
4	Fixtures and Electrical Installation	7.75
5	<i>Other Assets/ Preliminary and Preoperative Expenses</i>	3.00
6	Margin for working Capital	51.18
	TOTAL PROJECT COST	211.83

11. MEANS OF FINANCE:

The project will require promoter to invest about Rs 91.34 lakhs and seek bank loans of Rs 120.49 lakhs based on 70% loan on fixed assets.

Sr No	Particulars	In Lakhs
1	Promoters Contribution	91.34
2	Loan Finance	120.49
	TOTAL :	211.83

12. WORKING CAPITAL REQUIREMENTS:

Working capital requirements are calculated as below:

Sr No	Particulars	Gross Amount	Margin %	Margin Amount	Bank Finance
1	Inventories	48.45	40	19.38	29.07
2	Receivables	24.32	40	9.73	14.59
3	Overheads	7.48	100	7.48	0.00
4	Creditors	36.49	40	14.59	21.89
	TOTAL	116.74		51.18	65.55

13. LIST OF MACHINERY REQUIRED:

Sr No	Particulars	UOM	Qty	Rate	Total Value
	Main Machines/ Equipment				
1	Heavy duty Saw Machine	Nos	1	200000	200000
2	Laser/Plasma Plate Cutting m/cs	Nos	1	800000	800000
3	Hydraulic Press brake 800 T	Nos	1	800000	800000
4	3 Roller Plate Bending Machine	Nos	2	250000	500000
5	TIG/ MIG/ SAW Welding M/c	Nos	6	250000	1500000
6	Positioners for Weld M/c	Nos	3	80000	240000
7	Shot Blasting Machine	Nos	1	450000	450000
8	Weld Heat treatment Plant	Nos	1	200000	200000
9	Radial Drill Machine	Nos	1	600000	600000
10	Vertical Lathe 2.5 mtrdia Table	Nos	1	1000000	1000000
11	Heavy Duty Lathe 3 mtrs Bed	Nos	1	750000	750000
12	Ultrasonic/ Magnetic Particle test systems	Nos	2	250000	500000
13	X Ray Test System	Nos	1	600000	600000
14	Jib crane/ Hoists	LS	1	200000	200000
15	Air Compressor and Air Handling	Nos	1	250000	250000
16	EOT Cranes	Nos	1	450000	450000
	<u>subtotal :</u>				9040000
	Tools and Ancillaries				
1	Misc. equipment Dies tools etc.	LS	1	300000	300000
2	Hand Tools and gauges	LS	1	150000	150000
	<u>subtotal :</u>				450000
	Fixtures and Elect Installation				
	Storage and transport trolley	LS	1	150000	150000
	Office Furniture	LS	1	75000	75000
	Telephones/ Computer	LS	1	150000	150000
	Electrical Installation	LS	1	400000	400000
	<u>subtotal :</u>				775000
	Other Assets/ Preliminary and Preoperative Expenses	LS	1	300000	300000
	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. Parksons Engineering Corporation
Great Western Compound,
37 Maharashtra Chamber Of Commerce Road, Fort,
Mumbai-400001, Maharashtra, India
2. Broadway Foundry & Engineering Works
Raghav Aggarwal
G. T. Road, ASR Bypass Batala - 143505, Punjab
3. Toss Weldtronics
Sachin Deshmukh (Manager)
Sector No. 21, S. C. H. No. 6, Building No. 17,
Flat No. 6 Yamunanagar,
Nigdi, Pune – 411044, Maharashtra
4. Omega Weld Rod System
No. 1/455-G, Aachankulam Road Neelambur
Coimbatore- 641062, Tamil Nadu, India
5. SANTEC Group
UNIT III - SANTEC EXIM PVT. LTD. (Hydraulic Presses, Cylinders , SPMS)
Plot No. 193, Sector - 8, IMT Manesar
Haryana - 122050, INDIA
Phone: +91 - 0124 – 4058135
6. Sahajanand Laser Technology Limited
E-30, Electronics Estate, G. I. D. C., Sector 26

Gandhinagar, Ahmedabad-382028, Gujarat, India

7. Ate Welding Engineering Robotics & Automation Private Limited

ArunabhMajumdar(Technical Sales) Plot No. A-12, H Block, M. I. D. C. Pimpri, Pune -
411018, Maharashtra, India

14. PROFITABILITY CALCULATIONS:

Sr No	Particulars	UOM	Year Wise estimates				
			Year 1	Year 2	Year 3	Year 4	Year 5
1	Capacity Utilization	%	30	40	50	60	70
2	Sales	Rs. Lakhs	437.83	583.78	729.72	875.66	1021.61
3	Raw Materials & Direct Inputs	Rs. Lakhs	387.57	516.76	645.96	775.15	904.34
4	Gross Margin	Rs. Lakhs	50.26	67.01	83.76	100.52	117.27
5	Overheads Except Interest	Rs. Lakhs	28.01	28.01	28.01	28.01	28.01
6	Interest	Rs. Lakhs	16.87	16.87	16.87	16.87	16.87
7	Depreciation	Rs. Lakhs	13.57	13.57	13.57	13.57	13.57
8	Net Profit Before Tax	Rs. Lakhs	-8.18	8.57	25.32	42.08	58.83

The Unit will have capacity of 10000 MT per year of fabrication jobs for Tankers/ Tanks/ vessels / piping etc. different application/ types/ sizes. The fabrication quote prices without materials, range from Rs 15 per Kg for simple jobs to Rs 40 per kg for high end products depending on type, size/ complexity and job volumes.

The raw material costs are charged at actual, for the job and these costs may be added to sales turnover if fabrication job is with material cost. The price of raw materials range from Rs 30 to 250 per Kg depending on the steel grades. The material requirements are considered with wastage/ scrap etc. of 10 % of finished products. The unusable scrap is sold at @ Rs 20 ~ 80 per Kg. and the income of same is added. Energy Costs are considered at Rs 7 per

Kwhand 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 34.88 % of the installed capacity as depicted here below:

Sr No	Particulars	UOM	Value
1	Sales at Full Capacity	Rs. Lakhs	1459.44
2	Variable Costs	Rs. Lakhs	1291.91
3	Fixed Cost incl. Interest	Rs. Lakhs	58.44
4	Break Even Capacity	% of Inst Capacity	34.88

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 range of fabrications from structural to machine building industry products. The unit may take up import substitution for several machines/ automatic/ robotic systems, material handling

equipment. The unit can also of other consumer and industrial wire products / components etc. 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) 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.