

HYDRAULIC VALVES

1. INTRODUCTION:

Hydraulic machinery uses hydraulic circuits in which hydraulic oil is pushed, under pressure, through hydraulic pumps, pipes, tubes, hoses, hydraulic motors, hydraulic cylinders, and so on to move heavy loads. This hydraulic circuit works through use of various types of valves that enable control of hydraulic circuit function, as per the need of end application of the system.

Hydraulic control valve is used to control fluid pressure, flow and direction in the hydraulic drive and control system. Hydraulic system, regardless of how simple or complex, must have hydraulic valves. The hydraulic machinery requires various types of valves in different combinations to carry out different actions and achieve control of processes with safety. The hydraulic valves are of many varieties and specifications, and it is the most widely used component, in the hydraulic technology.

2. PRODUCT & ITS APPLICATION:

There are various types of valves required by hydraulic system for different functions and safety. Some of these are covered here below:

Directional control valves:

These are one of the most fundamental parts in hydraulic machinery as well as pneumatic machinery. They allow fluid flow into different paths from one or more sources. They usually consist of a spool inside a cylinder which is mechanically or electrically controlled. The movement of the spool restricts or permits the flow, thus it controls the fluid flow. Spool is of two types namely sliding and rotary. Sliding spool is cylindrical in cross section, and the lands and grooves are also cylindrical. Rotary valves have sphere-like lands and grooves in the form of holes drilled through them.

The spool of sliding type valve consists of lands and grooves. The lands block oil flow through the valve body. The grooves allow oil or gas to flow around the spool and through the valve body. There are two positions of directional control viz. Normal and working position depending on actuating force is application. There is valves with 3 or more positions that can be spring actuated for normal position and two solenoid actuation provided on both ends of spool for two working positions viz. Forward/ reverse motion and one normal position. Directional control valves can be classified according to number of ports, number of positions, actuating methods, type of spool.

Valves can be operated through various actuating system like Manual lever, spring, electrical, pneumatic, and hydraulic. Manually operated valves work with simple levers or paddles where the operator applies force to operate the valve. Spring force is sometimes used to retract manual valves to normal position. Some manual valves utilize pneumatic or hydraulic signal to return the spool. Mechanically operated valves apply forces by using cams, wheels, rollers, etc.; hence these valves are subjected to wear.

A hydraulically operated Directional control valve works at much higher pressures than its pneumatic equivalent. They must therefore be far more robust in nature so are precision machined from higher quality and strength materials.

Solenoid operated valves make use of electric power for sliding of the spool. Because of simple application of electrical power provides control, these valves are used extensively. Often, a low power solenoid valve is used to operate a pilot hydraulic valve that drives a larger hydraulic valve that requires more force.

Servo Valves:

A servo valve transfers the fluid to a hydraulic cylinder at a pressure that is proportional to an actuation signal that it receives. They can continuously vary the pressure/ flow. Servo valves are used in a feedback control where the position or force on the cylinder is measured, and fed back into a controller that varies the electrical control signal sent to the servo valve. Servo valves can provide precise control of position, velocity, pressure, and force with good post movement damping characteristics.

Flow Control Valve:

A flow control valve regulates the flow or pressure of a fluid. Control valves normally respond to signals generated by independent devices such as flow meters or temperature gauges. Valves can also work with hydraulic actuators that will respond to changes of pressure or flow and will open/close the valve. Variants are pressure reducing valves, flow control valves, back-pressure sustaining valves, Level control valves, and relief valves etc.

3. DESIRED QUALIFICATIONS FOR PROMOTER:

Any ITI, Diploma or Graduate with some background in manufacturing or marketing.

4. INDUSTRY OUTLOOK/TREND

The hydraulic valves are essential component of hydraulic systems used in various industries. With growth of market of hydraulics, demand for valves increases for new as well as replacement markets.

The hydraulic system growth is driven by demand of vehicles such as excavators, compactors, backhoe loaders, concrete and cement machines, drilling rigs, and wheel loaders etc. as well as material handling industry. Huge investment in infrastructure, construction, mining, aerospace & defense, railways auto etc. sectors and various infrastructure projects such as roads, bridges, buildings or tunnels will subsequently lead to the growth of the hydraulic equipment market.

The global hydraulic equipment market is highly competitive and has high growth potential. The competition in this market is expected to intensify further with the increase in product extensions and technological innovations.

5. MARKET POTENTIAL AND MARKETING ISSUES. IF ANY:

Demand for hydraulics is steadily growing across many industries, of which the prominent

sectors are Agriculture, Construction, Mining, Material-handling, Industrial equipment, Aerospace, marine industry, Defense sectors. The product segments are pumps, motors, valves, cylinders, transmission, accumulators and filters, and accessories. In industrial sector the rapid growth is witnessed in Machine tools, automotive, plastic processing, packaging, food industry, pharma industry, water and wastewater, hydraulic presses, renewable energy, food and beverage, entertainment and simulators, and others. Hydraulic valves are the critical components for a majority of these applications. All these sectors use hydraulic equipment, thereby fostering the growth of the hydraulic valve market in country. By focusing on kits in which all the hydraulic system components (cylinder, valve, and pump) are available as a single unit, many vendors have been able to improve their client relations and profitability.

The global hydraulic valves market size is projected to grow to US D 34.7 billion by 2021, at a CAGR of close to 4%. The global hydraulic valves market is characterized by well-diversified international, regional, and local vendors. Substantial demand for hydraulic valves has created an environment of high competition among the vendors in the market.

6. RAW MATERIAL REQUIREMENTS:

Hydraulic valves are made from carbon and alloy steels. Valve body is usually made by die casting of aluminum alloy, bronze etc. or investment casting and forging of steel. Spools are made from round rods. All materials are available easily.

7. MANUFACTURING PROCESS:

The process consists of manufacturing of processing of components valve body and spools as per the standard designs and keeping them ready for further processing. This production system is designed to meet the customers' requirements for product, optimization of operations and ensure short lead times. Besides the production equipment can be adapted to both long and short production runs.

- Preprocessing is done by cutting blanks from rods for spools and castings/ forgings for valve body, followed by various stages of machining to semi-finished stage. These

semi-finished parts that are controlled and kept ready.

- All standard parts of valves are finished by chamfering, drilling, milling, tumbling, boring, turning, threading grinding, lapping on automates.
- These are then finished by machining, grinding, boring, honing, lapping to required tolerances and surface finish. Spools are heat treated to achieve wear resistance and ensure longer life. The strict quality control of dimensional measurements is done while finish grinding and lapping of spools and body to achieve close tolerances.
- All components are then washed and cleaned thoroughly to remove metal particles dust and moisture. The cleaned parts are then sent to "Clean Room" facility for assembly testing and packing.
- Painting of body and labeling is done with High Gloss spray Painting to customer specified colors and paint specification.

Special purpose automates, turret lathes, CNC machine tools, Robotic Welding etc. are required for ensuring tight quality control and guaranteeing consistency and accuracy for volume product lines.

8. MANPOWER REQUIREMENT:

The unit shall require highly skilled service persons. The unit can start from 11 employees initially and increase to 28 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	4	6	8	10	12
2	Semi-Skilled/ Helpers	9000	4	6	8	10	12
3	Supervisor/ Manager	30000	1	1	1	1	1
4	Accounts/ Marketing	20000	1	2	2	2	2
5	Other Staff	8000	1	1	1	1	1

	TOTAL		11	16	20	24	28
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9. IMPLEMENTATION SCHEDULE:

The unit can be implemented within 6 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	3
	Total Time Required (Some Activities run concurrently)	6

10. COST OF PROJECT:

The unit will require total project cost of Rs 135.13 lakhs as shown below:

Sr No	Particulars	In Lakhs
1	Land	25.00
2	Building	45.00
3	Plant and Machinery	51.25
4	Fixtures and Electrical Installation	4.85
5	<i>Other Assets/ Preliminary and Preoperative Expenses</i>	2.50
6	Margin for working Capital	6.53
	TOTAL PROJECT COST	135.13

11. MEANS OF FINANCE:

The project will require promoter to invest about Rs 38.68 lakhs and seek bank loans of Rs 96.45 lakhs based on 70% loan on fixed assets.

Sr No	Particulars	In Lakhs
1	Promoters Contribution	38.68
2	Loan Finance	96.45
	TOTAL:	135.13

12. WORKING CAPITAL REQUIREMENTS:

Working capital requirements are calculated as below:

Sr No	Particulars	Gross Amount	Margin %	Margin Amount	Bank Finance
1	Inventories	1.42	40	0.57	0.85
2	Receivables	6.06	50	3.03	3.03
3	Overheads	2.36	100	2.36	0.00
4	Creditors	1.42	40	0.57	0.85
	TOTAL	11.26		6.53	4.73

13. LIST OF MACHINERY REQUIRED:

Sr No	Particulars	UOM	Quantity	Rate	Total Value
	Main Machines/ Equipment				
1	Blank cutting machines	Nos	1	75000	75000
2	Precision Lathes	Nos	1	250000	250000
3	CNC Machining Center	Nos	1	900000	900000
4	CNC Turret Lathes	Nos	1	650000	650000
7	Milling Machine	Nos	1	350000	350000
8	Shot blasting/ Tumbling	Nos	1	150000	150000
9	Cylindrical Grinder	Nos	1	500000	500000
11	Pillar Drilling Machine	Nos	1	150000	150000
12	On Line laser Measuring Machines	Nos	1	250000	250000
13	5 axis Measuring m/c CNC	Nos	1	650000	650000
14	Clean Room Air handling plant	LS	1	350000	350000
15	Air compressor Plant	Nos	1	250000	250000
14	MIG Welding Machine	Nos	1	150000	150000

Sr No	Particulars	UOM	Quantity	Rate	Total Value
	<u>Subtotal:</u>				<u>4675000</u>
	Tools and Ancillaries				
1	Die tools and gauges	LS	1	300000	300000
2	Misc. tools etc.	LS	1	150000	150000
	<u>Subtotal:</u>				<u>450000</u>
	Fixtures and Elect Installation				
	Storage racks and trolleys	LS	1	75000	75000
	Other Furniture	LS	1	50000	50000
	Telephones/ Computer	LS	1	60000	60000
	Electrical Installation	LS	1	300000	300000
	<u>Subtotal:</u>				<u>485000</u>
	Other Assets/ Preliminary and Preoperative Expenses	LS	1	250000	250000
	TOTAL PLANT MACHINERY COST				5860000

All the machines and equipment are available from local manufacturers. The entrepreneur needs to ensure proper selection of product mix and proper type of machines 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. Techno Machines
Chikkanahalli Road, Opp. Shahi Exports (Unit No 6),
Near Annapoorneshwari Temple, Bommanahalli,
BENGALURU-560 068, INDIA
2. S. S. Engineering Works
Plot No. 100, Sector 6 IMT Manesar, Gurgaon - 122050, Haryana, India
3. Taurus Private Ltd Co
No. 24, D 2 / E 3, Kiab Industrial, Area AtPivele
Kiab Industrial Area, Bengaluru – 560100 Karnataka, India

4. Micro Engineering Works;
No. 6/140, Gandhi Nagar,
Nallampalayam Road NanjaiGounden, Pudur,
G. N. Mills Post, Coimbatore - 641029, Tamil Nadu, India
5. S. G. Profile
Plot No. 201/1, Gala No.
56, Morya Industrial Estate, MIDC, Bhosari, BhosariMidc,
Pune-411026, 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	55	60
2	Sales	Rs Lakhs	72.75	97.00	121.25	133.37	145.50
3	Raw Materials & Other Direct Inputs	Rs Lakhs	17.02	22.70	28.37	31.21	34.04
4	Gross Margin	Rs Lakhs	55.73	74.30	92.88	102.17	111.46
5	Overheads Except Interest	Rs Lakhs	14.87	14.87	14.87	14.87	14.87
6	Interest	Rs Lakhs	13.50	13.50	13.50	13.50	13.50
7	Depreciation	Rs Lakhs	12.43	12.43	12.43	12.43	12.43
8	Net Profit Before Tax	Rs Lakhs	14.92	33.50	52.08	61.36	70.65

The basis of profitability calculation:

The Unit will have capacity of 25,000 nos per year of hydraulic valves, connectors etc. including the auto hydraulic valve components. Depending on the type/ size the bulk price range is taken from Rs. 200 per pc for smaller poppet valves to Rs 3500 or more per pc for large block valves used in heavy earth moving machines, steel plant etc.. Normally supply of complete system/ solution is offered to customers.

The material requirements are high Carbon alloy steel, and HCHC etc. special alloys etc. They cost in range of Rs 60 per Kg to Rs 200 per kg. The cost of forged rods/ bars ranges from Rs 60 per kg to Rs 140 per kg. Seals and gaskets cost ranges from Rs 30 to Rs 850 or more per set for valves. The unit may generate scrap which is to be sold at @ Rs 20 ~ 80 per Kg depending on type. The income of same is added. Consumables costs also considered based on prevailing rate. Energy Costs are considered at Rs 7 per Kwh. 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 21.97 % of the installed capacity as depicted here below:

Sr No	Particulars	UOM	Value
1	Sales at Full Capacity	Rs Lakhs	242.50
2	Variable Costs	Rs Lakhs	56.74
3	Fixed Cost incl. Interest	Rs Lakhs	40.80
4	Break Even Capacity	% of Inst Capacity	21.97

16. STATUTORY/ GOVERNMENT APPROVALS

The unit will require state industry unit registration with District Industry center. No other procedures are involved. For export, IEC Code and local authority clearances. The industry registration and approval for factory plan, safety etc. is required as per factory inspectorate and labor laws. Other registration are as per Labor laws are ESI, PF etc. 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 requirement, however the unit will have to ensure safe environment through installation of chimney etc. as per rules. 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 several industrial parts/ components and parts of hydraulic systems and auto components. The unit can utilize the spare capacities. As such there is not much scope for organic backward or forward integration. The entrepreneur needs to ensure proper selection of product mix and also be careful in maintaining product parameters in terms of dimensions, tolerances and geometric profiles along with final weights of products.

The business needs building up reputation, ensuring reliability and quality of services rendered. Also personal rapport of key persons can generate good business volumes from OEM units and ancillary component unit. The location with good catchment area ensures good market potential to new business units.

18. TRAINING CENTERS/COURSES

There are no specific training centers for production technology. The Prototype Development Centers can provide some assistance for precision machining, Tools development, etc. Other centers of excellence viz Indo German Tool Room at Ahmedabad, Rajkot, Chennai, etc. shall be helpful. The most important scope of learning is in new product design and development by study of the new product designs, product range, features and specifications of leading Brands / competitors across the world by scanning the Internet and downloading data from websites of 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.

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.