

Design and Simulation of Bonding Press by using Hydraulic system

Kandula Ankamma¹, J Pavan Kumar²

¹*Professor, Department of Mechanical Engineering,
Mahatma Gandhi Institute of Technology, Hyderabad, Telangana, INDIA.*

²*Assistant Professor, Department of Mechanical Engineering,
Mahatma Gandhi Institute of Technology, Hyderabad, Telangana, INDIA.*

Abstract:

Hydraulic components are fabricated to give the control work needed to the activity of a wide scope of system and application. The scientific strategies that are utilized serves to planning the pressure driven segments like supply, reservoir, engine, actuator, control valves. Energy proficiency of hydraulic apparatuses has gotten perhaps the main subjects in system plan, primarily due to expanded fuel costs and more grounded guidelines about burning motor outflows. Expanded by and large system productivity is vital, since this is the best approach to diminish the fuel utilization in hardware. To advance hydraulic systems for hardware there are a few significant issues to consider, for example, segment power thickness, unique valve ideas and variable relocation machine control. The ideal system idea will be unequivocally needy upon the stacking pattern of the machine. In pressure driven applications a reasonable pattern to utilize more electro-hydraulic powered control can be seen. Electro-hydraulic driven systems can be utilized in industry that needs to convey heavier loads effectively. Electrical drives have demonstrated to be dependable and simple to control, however they may have issues with regards to standing firm on a footing under load for an extensive stretch of time. Consequently, electro-water powered systems are acquiring consideration in applications that need great situating and power input. In this paper plan improvement of hydraulic circuit for bonding press machine is arranged and recreated via Autosim-200 programming. A bonding press is used to stick pictures or lettering onto wood or plastic sheets. The working squeezing variable ought to be adjustable to suit the base material and paste used and ought to be good for being kept up for a long time the directional control valve is impelled.

Key words: Bonding press, Hydraulic system, Pressure relief valve, Autosim-200

I. Introduction

In the industry, three strategies are utilizing for communicating power starting with one point then onto the next. Mechanical transmission is through shafts, gears, chains, belts, and so forth Electrical transmission is through wires, transformers, and so forth Water driven transmission is through fluids or gas in a restricted space. Water power is a kind of science and designing that manages mechanical properties of fluids. Hydrodynamics is essential for the more broad control of liquid force. Liquid mechanics gives the establishment to hydraulic power, which centers on designing employments of liquid properties. Hydrodynamics implies investigation of water or different liquids very still or moving, particularly concerning designing application. Hydrodynamics and hydraulic system can be found all over the place. Hydrodynamics can be found at any building site. A few machines that utilization power through pressure are tractors, fork lift, and cranes. Pressure driven is utilized to lift vehicles so mechanics can work under them. Numerous lifts utilize a similar working method. Hydrodynamics is the study of sending power or potentially movement thanks to a restricted fluid. In a water driven gadget, power is communicated by pushing on a restricted fluid. The exchange of energy happens on the grounds that an amount of fluid is liable to pressure. To work fluid fueled frameworks, the administrator ought to know about the fundamental idea of fluids. Different enterprises need moderate frameworks with enormous burden conveying

properties that are smaller and give dependable power where required. The plan and use of water driven frameworks in industry incorporate construction plan and required components, dynamic framework demonstrating and examination, power source, input control, actuators, sensors [1-3]. The essential head behind liquid force transmission is Pascal's law and Bernoulli's law. The liquid framework is utilized in different applications like controlling unit in car application, work vehicles and homestead gear, setting down wheels of plane and helicopters, utilized in rocket dispatching frameworks, route controls, water powered press, CNC machines and so forth The hydraulic system additionally shows a few breaking down during activity and this will influence the exhibition of the system. The greater part of the issues are Pressure Fluctuation, spillage, overheating and so on.[4-6]

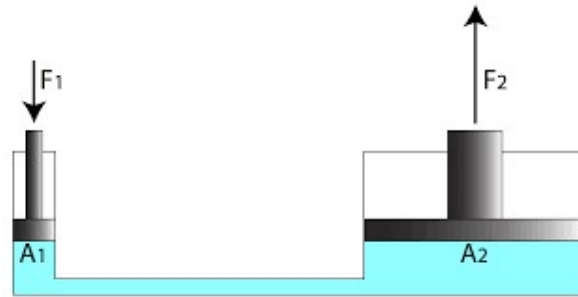


Fig 1. Pascal's law

Hydraulic system:

Hydraulic system utilized for modeling and simulation, which can be utilized as applications, for example, tractor activation system for a can, water driven press, lift system. The hydraulic system comprises of: a supply which gives liquid through line to a pump, a fixed-removal pump driven by an electric engine, directional control valve, a hydraulic cylinder, and a pressure relief valve. Fixed positive relocation pump is utilized to change the mechanical energy contribution from engine to compressed liquid energy for example hydraulic energy. Compressed liquid actuated through directional control valve towards hydraulic cylinder. The function of a directional valve is to move liquid between the circuits. Generally ports are set apart with P, A, B, T, and liquid way associations are: P-A and B-T; or P-B and A-T. Port P represents compressed port or pump, A and B stream out of directional valve to channel or outlet of the hydraulic cylinder, while T ports represents tank. Stream from the pump to the pressure relief valve and to tank is optional. Hydraulic systems are utilized in applications where interest for high force and quick reaction is required[7-9]. Such applications incorporate pressure driven mechanical portable apparatus, aviation water power, wind turbines, and so forth Recreation and demonstrating of hydraulic systems is acquiring interest in academic local area. Disadvantages in hydraulic systems are seen through energy dissemination and unwavering quality which sets another issue in pressure driven framework plan. The numerical model of a framework is contrasted and the model planned by block charts in autosim-200, which is utilized to simulate liquid force system conduct like hydraulic or pneumatic system. Results got from demonstrating in autosim-200 show errors contrasted with the overall numerical portrayal of a pressure driven system. One of the fundamental advantages identified with the use of electrohydraulic system in enterprises is smoother development than in the comparative electromechanical setups. Since every actuator must have its own servo valve, required cylinders, ideal pressing factor control, and back drivability decline. Besides, any hydraulic system needs an outside accumulator and a pump, all associated with a channeling system and servo valves for proficient control. Hydrostatic Transmission is a strategy created to empower better control in circumstances of high force,

nonlinear erosion properties, and helpless kickback identified with speed decline. It depends on a water driven pump and hydraulic actuator, combined with a simple control framework with better power guideline and an advanced compensator for more precise situating. An example of one hydraulic transmission circuit is given in Fig. 2 [10-12].

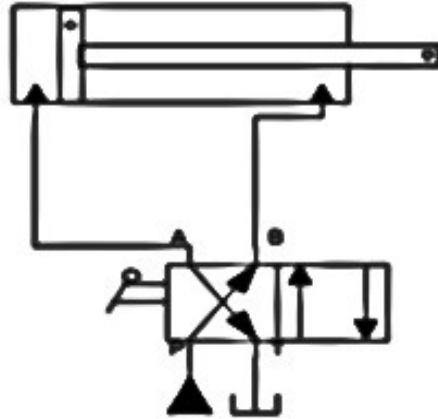


Fig 2. Hydraulic circuit

Simulation software:

autoSIM-200 is product for organizing the hydraulic circuits, which allows the customer to endeavor programs on a virtual system prior to applying them to an actual system. It addresses the ideal enhancement to getting ready equipment which, accordingly, enables an inexorably capable usage of the stuff. With autoSIM-200, it is possible to pass on out remarkable, multicolor re-institutions using pneumatic, electro pneumatic, hydraulic, electro pressure driven, electrical and electronic circuits. It is in like manner possible to finish logical models of system and acquire and measure electrical signs.

Hydraulic oil:

Hydraulic oil expressly proposed for hydraulic system on unpleasant territory device, for instance, the yellow machines. For extra firm introduction, judgments need at any rate 900 segments every snapshot of zinc from the counter wear added substance. This is far past the zinc levels for current foe of wear water fueled oils. SAE 10 is astoundingly figured distinctly for harsh landscape equipment. They meet every one of the conclusions for zinc content and various essentials [13]. Pressing factor driven SAE 10 will give you better water fueled execution at an on a very basic level lower cost than 10 weight engine oils. Benefits of oil are excellent oxidation resistance, excellent thermal stability, excellent anti-wear protection, excellent additive stability, fantastic rust protection, superior wet or dry filterability, good hydrolytic stability, low pour point for all season use, low cost of operation.

II. Experimental setup and Method

In Hydraulic machine, water controlled fluid is dealt with through the water fueled chambers and gets compressed by the deterrent present. The fluid is controlled thus by control valves and appropriated through hoses and cylinders. The pervasiveness of water driven equipment is a direct result of the tremendous proportion of power that can be traveled through little chambers and versatile hoses, and the amazing thickness and wide display of actuators that can use this power. Pressing factor driven contraction is worked by the usage of hydrodynamics, where a liquid is the powering medium. Since the pressing factor driven machines manages the reason of Pascal's Law, its working resembles the one of the water fueled system. A hydraulic system involves Hydraulic squeezing factor source, control valves and cylinders. The genuine working of the system is replicated using autoSim-200 programming.

Pressure relief valve:

Pressure relief valve (PRV) is a kind of security valve used to control or restrict the pressing factor in a system; pressing factor may somehow develop and make an interaction upset, instrument or hardware disappointment, or fire. Pressure is eased by permitting the compressed liquid to move from an assistant section out of the system. The help valve is planned or set to open at a foreordained set strain to shield pressure vessels and other hardware from being exposed to pressures that surpass their plan limits[14].

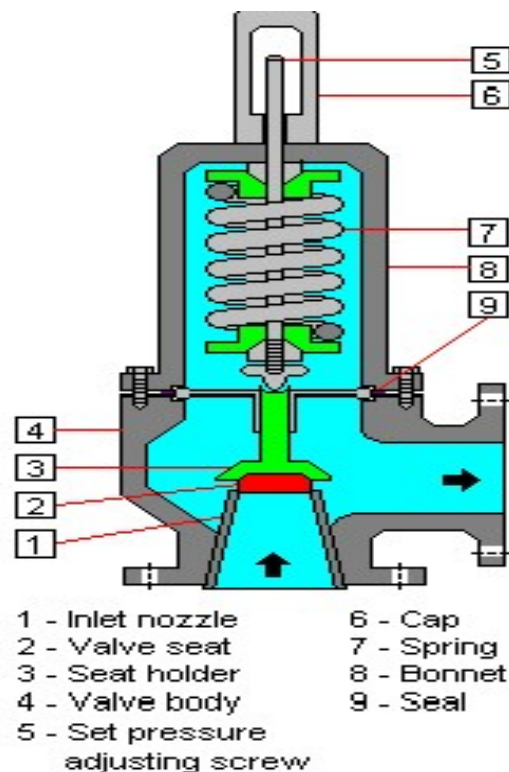


Fig 3. Pressure relief valve

4/3 direction control valve

The 4-Way Directional Valve block addresses a directional control valve with four ports and three positions, or stream ways. The ports interface with what in a common model are a hydraulic pump (port P), a tank (port T), and a double acting cylinder (ports A and B). Liquid can move from the pump to the actuator by means of way P-A or P-B and from the actuator to the tank through way A-T or B-T—contingent upon the working side of the actuator. In the default arrangement, one valve position compares to the P-A and B-T stream ways maximally open and the P-B and A-T stream ways maximally shut. Another valve position relates to the backwards arrangement, with P-B and A-T maximally open and P-A and B-T maximally shut (position II). The third valve position relates to all stream ways maximally shut (position III)[15-16].

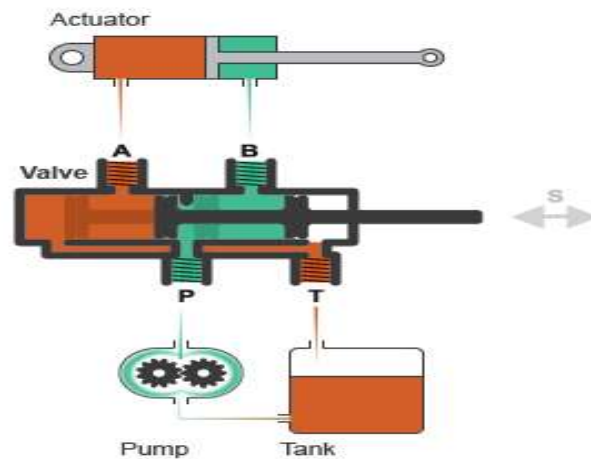


Fig 4.4/3 direction control valve

Double-acting hydraulic cylinder

A double acting hydraulic cylinder is a cylinder wherein the working liquid demonstrates on the other hand on the two sides of the cylinder. To interface the cylinder in a double acting cylinder to an outer component, like a driving rod, an opening should be given in one finish of the chamber for the cylinder bar, and this is fitted with an organ or "stuffing box" to forestall break of the working liquid. Double acting cylinder is basic in steam motors yet strange in other motor sorts. Numerous pressure driven and pneumatic chambers use them where it is expected to create a power in the two ways. A double acting hydraulic cylinder has a port at each end, provided with water driven liquid for both the withdrawal and augmentation of the cylinder[17].

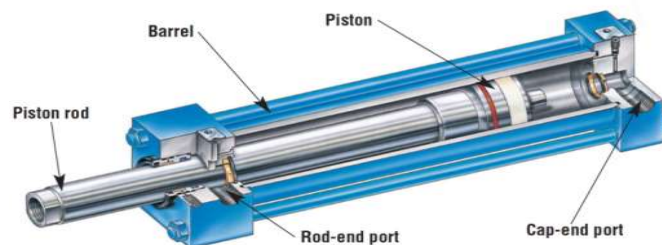


Fig 5. Double acting hydraulic cylinder

Bonding press:

A bonding press is utilized to stick pictures or lettering onto wood or plastic sheets. The working pressing variable should be flexible to suit the base material and glue utilized and should be useful for being kept up for quite a while the directional control valve is actuated. The water driven press depends upon Pascal's standard the squeezing factor all through a shut framework is steady. One piece of the system is a cylinder going probably as a guide, with an unpretentious mechanical force circling back to a little cross-sectional domain; the other part is a cylinder with a greater zone which makes a correspondingly colossal mechanical force. Simply little estimation tubing which even more adequately contradicts pressure is required if the pump is disconnected from the press chamber. Pressure on a bound fluid is sent undiminished and acts with comparable force on identical areas and at 90 degrees to the holder divider. A little effort power circles back to a little cylinder. This makes a squeezing factor which is traveled through the pressing factor driven fluid to a tremendous chamber. The hydraulic system for the operation of bonding press is shown in fig 6.

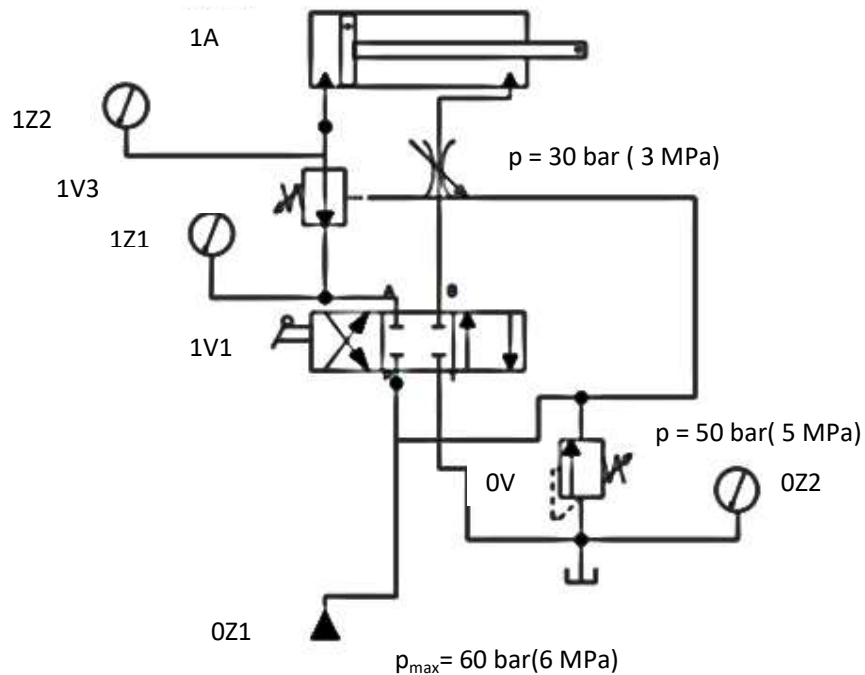


Fig 6. Experimental setup

Table 1. Components list

Item Number	Quantity	Description
OZ1	1	Hydraulic power pack
OZ2,1Z1,1Z2	3	Pressure gauge
OV,1V3	2	Pressure relief valve
1V1	1	4/3-way valve, manually operated
1A	1	Double acting hydraulic cylinder

III. Conclusions

In bonding press hydraulic system if a pressure relief valve is fitted in the bypass, the generally speaking system pressure will tumble to 30 bar during the development stroke. If a pressure controller is utilized, the system pressing factor of 50 bar is maintained, and just the chamber is provided with the diminished pressing factor of 30 bar. This permits further actuators to be provided with full system pressure by similar water driven force pack. The pressure help valve gives a favorable position in this application, since on account of long stop periods with the directional control valve impelled, the siphon need just build up the set pressing factor 30 bar.

REFERENCES:

1. Dasgupta, K., 2000. Analysis of hydrostatic transmission system using low-speed-high-torque motor, *Mechanism and Machine Theory*, vol. 35, pp. 1481–1499.
2. Watton, J., 1989. Closed-loop design of an electro-hydraulic motor drive using open-loop steady state characteristics, *The Journal of Fluid Control and Fluidics*, Quarterly 20 (1), pp. 7–30.
3. Manring, Noah D., 2000. The discharge flow ripple of an axial-piston swash-plate type hydrostatic pump, *journal of dynamic systems, measurement, and control*, ASME, Vol.122, pp. 263-268.
4. Rydberg, K. E., 2009. Hydraulic hybrids – the new generation of energy efficient drives, in *Proceedings of the 7th International Conference on Fluid Power Transmission and Control ICFP'2009*, 7–10 April 2009, Hangzhou, China, pp. 899–905.
5. Pourmovahed, A., Otis, D. R., 1990. An Experimental thermal time-constant correlation for hydraulic accumulators, *ASME*, Vol.112, pp. 116- 121.
6. Adam Burecek, Lumir Hruzik, Martin vasina, Simulation of Accumulator Influence on hydraulic Shock in long Pipe, *Journal of Manufacturing and Industrial Engineering 2015* ISSN 1339-2972.
7. M.Kbarnwal, N.Kumar, Ajit Kumar and J.das, Effect of hydraulic Accumulator on the system parameter of an open loop Transmission system, 5th international & All India Manufacturing Technology, Design 7 research conference 2014.
8. R.Wang et al, Water hammer Assessment techniques for water distribution systems, 12th International Conference on Computing and Control for the water Industry, CCW12013.
9. Gregov.G&Siminitai.D, Computer simulation of laboratory hydraulic system with MATLAB-Simulink, *Advanced Engineering* 4(2010), ISSN 1846-5900.
10. C. Cristescu, P. Drumea, D.I. Guta, S. Anghel, M. Crudu: Experimental measurements for determination of frictional forces within the rod seals of hydraulic cylinders, in: *Proceedings of the the 7 th International Conference on Tribology*, 03- 05.10.2011, Thessaloniki, Greece, pp. 163-170.
11. Tan, K.K.; and Putra, A.S. (2010). *Drives and control for industrial automation (advances in industrial control)*. Springer, 15-16.
12. Chiang, M.H.; Yang, F.L.; Chen, Y.N.; and Yeh, Y.P. (2005). Integrated control of clamping force and energy-saving in hydraulic injection molding machines using decoupling fuzzy sliding-mode control. *International Journal of Advanced Manufacturing Technology*, 27(1-2), 53-62.
13. Liu, S.; and Yao, B. (2008). Coordinate control of energy saving programmable valves. *IEEE Transactions on Control Systems Technology*, 16(1), 34-45.
14. Cheng, Chi-Neng. *Design and Control for The Pneumatic Cylinder Precision Positioning Under Vertical Loading* (2005).
15. *Feedback and control systems*, JJ Di Steffano, AR Stubberud, IJ Williams. Schaums outline series, McGraw-Hill 1967
16. Omega High Pressure Solenoid Valve SVH-111/SVH-112 Series, Omega, December 2015
17. Brady, Ian. Programmable logic controllers - benefits and applications February 2014.