

Manufacture & Analysis of Hydraulic Cylinder Rod

Sachin Kumbhar, Rohit Gharat, Romil Warade, Pratik Amrale

ABSTRACT: As automation technology continues to be integrated into industrial and mobile machinery, more precise control of hydraulic cylinders will assist in the achievement of desired response characteristics. The approach to estimating the life-stress model and the model parameters for X-series hydraulic cylinders was studied, and the theories and statistical methods related to the reliability index under normal stress were reproduced precisely through the accelerated life test. With temperature and velocity as the accelerated stress, the accelerated life test for hydraulic cylinders was implemented, and data acquisition was conducted. Statistician, assessment and transformation were performed on the test data with statistical models related to the theory. **Keywords:** Hydraulic Cylinder Rod

1. INTRODUCTION:

A hydraulic cylinder is the actuator or "motor" side of this system. The "generator" side of the hydraulic system is the hydraulic pump which delivers a fixed or regulated flow of oil to the hydraulic cylinder, to move the piston. The piston pushes the oil in the other chamber back to the reservoir. If we assume that the oil enters from cap end, during extension stroke, and the oil pressure in the rod end / head end is approximately zero, the force F on the piston rod equals the pressure P in the cylinder times the piston area A : $F = P \cdot A$. This paper proposes a polynomial fit based simulation method to build nonlinear model in hydraulic actuator control system. This method is use to simulate two kinds of typical hydraulic actuator control system. Contrastively, a simulation with traditional linear model is also executed. Through comparison among the result of two kinds of simulation and the test data, it is proved that this polynomial fit based method is more accurate than the traditional method and it can perform more effectively for fault detection in hydraulic actuator control system. Shop air is just use for boosting. In addition electric booster and hydraulic pump is use to air operated booster system.

¹Assistant Professor, D.D. Jadhav, Department of Mechanical Engineering, Vishwaniketan's iMEET, Khalapur-410202, India

Email: romilwarade786@gmail.com

Department of Mechanical Engineering, Vishwaniketan's iMEET, Khalapur-410202, India

(This paper is presented in National Conference ETAT-2019 held at VIMEET, Khalapur)

Hydraulic Pump is use for larger applications. Accumulator is installed between clamps and power source which maintain the necessary pressure when power is disconnected.

2. LITERATURE REVIEW:

The main purpose of literature review is that discuss on important point regarding matter of fixture which is represented by different researcher. Hydraulic cylinders are used extensively in industry to provide linear motion control. These cylinders are composed of cylindrically shaped metal case with a piston rod assembly that moves back and forth within the case. The piston and rod assembly separates two different volumes inside the cylinder case. For a single rod cylinder, these two volumes are called: the rod end volume, where the rod end is the end of the cylinder from which the rod protrudes, and the cap end volume, where the cap end does not have a rod. As these volumes are pressurized, hydrostatic forces due to the pressurized fluid act on the surfaces of the vessel containing the fluid. Thus, the forces acting on the piston-rod assembly cause it to move, extending the rod out of the cylinder case or retracting the rod into the cylinder case. An external load can be attached to cylinder rod, and as the piston-rod assembly moves, a force is exerted on the load causing the load to move along a linear path. For a cylinder in retraction, the flow leaving the cap end exits through the cushioning cavity E before returning to the rest of the hydraulic circuit through the cylinder port I. The cylinder stops when the piston reaches the end of its stroke, or when the piston makes contact with the end cap, H. The components labeled F and G are the cylinder cushion spear and collar that decelerate the piston before

it contacts the end cap in either retraction or extension, respectively.

3. METHODOLOGY:

Study of hydraulic cylinder, it's purpose, type of hydraulic cylinder manufacture in company. Analyze the manufacturing method, Material & tool use during manufacturing. Analyze the cost of manufacturing (per piece) & also cost of whole batch. During the manufacturing, analyze the rejection rate of the product, loss of material, & cost of rejection piece. Maintain the quality of the product after production. Find the solution for rejection piece occur during production. Then get the data analysis of manufacturing after getting the solution. Get the quotation for method used as solution. Compare cost, rejection rate, & time of production.

4. DISCUSSIONS:

Copy turning machine

A copying lathe is a semi automatic machine which produces components in large quantities, of specific shape and dimensions from a template of the required object. A copying attachment, which could be a hydraulic unit, is incorporated in the machine. It has a stylus or a tracer which is in constant contact with the replica template (of the object to be produced) . The feed movements, (viz, longitudinal, cross and angular, if any) are all linked to the copying attachment (so there is no manual feed). When the machine is started, the stylus/ tracer starts copying the template and its movements is transferred to the slides / tool by the copying attachment. After completion , the machine stops, the tracer/ stylus returns to the initial starting position.

Piston:

The piston is a short, cylindrical metal component that separates the two parts of the cylinder barrel internally. The piston is usually machined with grooves to fit elastomeric or metal seals. These seals are often O-ring, U-cups or cast iron rings. They prevent the pressurized hydraulic oil from passing by the piston to the chamber on the opposite side. This difference in pressure between the two sides of the piston causes the cylinder to extend and retract. Piston seals vary in design and material according to the pressure and temperature requirements that the cylinder will see in service. Generally speaking, elastomeric seals made from nitrile rubber or other materials are best in lower temperature environments,

while seals made of Viton are better for higher temperatures. The best seals for high temperature are cast iron piston rings.

Piston rod:

The piston rod is typically a hard chrome-plated piece of cold-rolled steel which attaches to the piston and extends from the cylinder through the rod-end head. In double rod-end cylinders, the actuator has a rod extending from both sides of the piston and out both ends of the barrel. The piston rod connects the hydraulic actuator to the machine component doing the work. This connection can be in the form of a machine thread or a mounting attachment, such as a rod-clevis or rod-eye. These mounting attachments can be threaded or welded to the piston rod or, in some cases, they are a machined part of the rod-end.

5. CONCLUSIONS:

Exposure to industry and getting acquainted to industrial practice is very essential for young engineer waiting for future that consist of an unknown environment. The critical knowledge integrated with practical hand skill is what makes complete engineer. This training has enhanced my confidence and simulated my interest in the field of engineering. After seeing the actual industrial practice, I learnt that a lot about work carried out at the top shop floor. This training provided with unlimited knowledge about the industrial knowledge about industrial environments and gave me chance to get acquainted with it. We have concluded that by using pneumatic connecting rod instead of manual connecting rod, we got less variations in specifications of complete product. We also concluded by including "DYE" in our quality department, which resulted in less rejection, helped us to gain more profit as compared before and saved a huge amount of time for quality assurance. By using foam at packaging stage we concluded that the scratches which were harming our product and resulted in rejection were no more found. By implementation of above things, we finally concluded that rejection rate was found very less as compared before and it resulted in very huge profit for the company.

7. REFERENCES:

1. Fluid Power Design Handbook, Third Edition, page 112, By Frank Yeaple, CRC Press, 1995, 854 pages

2. The Process of Cylinder Repair and Servicing - Berendsen Fluid Power". *berendsen.com.au*. 22 May 2015.
3. Mounting Style Can Dramatically Improve Hydraulic and Pneumatic Cylinder Performance", *Hydraulics & Pneumatics*, Retrieved June 6, 2016
4. Hydraulic cylinders: Types, mounting methods, and key specifications". www.mobilehydraulictips.com.
5. What are Telescopic Cylinders, and How Do They Work?", *Pneu-Hyd*, Retrieved June 6, 2016.