A Review On Development Of Hydraulic Control Valve Testing Machine

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Abstract- *In this article, the focus is on review on cost analysis, time analysis and machine efficiency of hydraulic control valve testing machine. Hydraulic control valve mainly used in farming equipment. High-level load lifting with a minimum application of force is required in the hydraulic control valve. The proposed work employed less number of checking parameters for control valve testing machine. Conventionally for testing control valve there are several methods and parameters to check it's accuracy. In proposed work number of testing parameters are reduced from eight to one. In order to reduce production time, increase productivity, decrease labour cost and optimization of the process, the number of parameters is reduced. Traditionally control valve is tested in the rig section and vary touch unit section. In suggested work, only one parameter is checked in the rig section and others are checked in vary touch unit section. Only relief valve pressure is checked in the rig section and other parameters are checked in vary touch unit section. Article shows the cost analysis and time reduction method study with analysis of machine on CAD software.*

Keywords- hydraulic control valve, spool valve, testing machine, vary touch unit, rig section.

I. INTRODUCTION

Tractor water driven framework unit is answerable for lifting, bringing down or holding of mounted or semi-mounted types of gear by pressure driven methods. Pressure driven framework have a two controls for example Position control and Draft Control. In Position Control, steady profundity of furrowing is kept up by modification of position control switch and the switch position is straightforwardly identified with the stature of the three-point hitch. Draft control detects additional strain on the hitch and permit the furrow to raise enough to get past the hard spot and quickly coming back to the ideal profundity. Present work is the dependent on work completed at tractor plant in Mahindra and Mahindra restricted. The control valve comprises of the two fundamental parts, help valve and principle spool (heading control valve). At the point when control valve is working, it is attractive that, the normal or pinnacle oil pressure remain moderately steady and variable pressure technique is utilized for better economy of the fuel or oil. Weight alleviation valve is utilized to arrival of weight at whatever point the weight surpasses preset incentive to shield a framework from brusting.In the weight help valve, non-direct powers, for example, back weight power, contact power, spring power, liquid power, and damping power assumes a significant job by following up on the moving piece of the valve.

II. PROBLEM IDENTIFICATION

The current testing machine for the most part joins a ton of inefficient aspects.There are seven control valve testing machines which set the help valve pressure at 30 LPM oil stream on the shop floor in Mahindra Company. This machines expends more space just as requirements more labor. Time required for testing one control valve is in like manner more since administrator needs to test all the eight parameters in Control Valve Test Rig (CVTR) and again comparable parameters in Varry Touch Unit (VTU) which builds the creation and work cost twice. At 30 LPM stream, blazing of the oil is more. Subsequently it is important to give option in contrast to existing issue. This should be possible by structuring changed control valve testing machine which will lessen the creation cost and increment the profitability which will work at 5 liter for each moment oil stream. Testing was completed to locate the best weight territory for successful usage of this new machine.

III. LITERATURE REVIEW

1) Energy saving and Fuzzy-PID position control of electro-hydraulic system by leakage compensation through proportional flow control valve

Gyan Wrat , Mohit Bhola , Prabhat Ranjan , Santosh Kr Mishra , J. Das

Utilized in substantial earth moving hardware. It is very apparent that direct actuators are one of the basic hardware segments utilized in the development and mining exercises like in blasts of unearthing hardware. The proposed

work utilized two diverse water driven circuits and a difference has been done as far as the vitality proficiency. In one water driven circuit, the customary corresponding directional control valve (PDCV) is utilized for the position control. In another, an imaginative arrangement of utilizing relative stream control valve (PFCV) by making counterfeit spillage between the two parts of the bargains the actuator is assessed by its vitality proficiency. The additional stream originating from the siphon during position control is by-passed by PFCV instead of the weight help valve in PDCV. This lessens the vitality misfortune as warmth and builds the productivity of the pressure driven circuit. The reproduction of the pressure driven circuit is performed utilizing MATLAB/Simulink and results are contrasted and the investigations and it is discovered that water powered circuit utilizing PFCV is 8.5% more vitality productive than the regular circuit utilizing PDCV. The position control of the actuator is finished utilizing PID controller tuned by the fluffy controller.

2) Numerical Study of Flow Field and Energy Loss in Hydraulic Proportional Control Valve

M. Osman Abdalla, T. Nagarajan

Vitality misfortune ordinarily happens inside valves in the influence pressure driven frameworks. The complexities of the valve geometry make it muddled to figure the vitality misfortune scientifically. The stream qualities inside a water driven spool valve and inside a relative valve were examined in this examination utilizing FLUENT code. Figuring of the vitality misfortune needs estimation of both the stream rates and the weight drop of the liquid through the valve. The connection between the weight drop and the geometry of the valve was examined in this investigation. Additionally the connection between spool position and vitality misfortune over the relative directional control valve was contemplated. Results demonstrated a quick increment in pressure drop as the stream rate increments. Reenactment results moreover indicated that the state of the outlet port of the valve chamber has the most huge impact on the weight drop over the spool valve. The examination reasoned that the change of the geometry at the outlet zone of the valve chamber is the best way to diminish the vitality misfortune. On other hand, a corresponding directional valve with various spool positions was reenacted. Results indicated that little openings or holes of the spool make high choppiness, high speed and high weight varieties at the exit and high weight drop over the valve. All these reason high vitality misfortune inside the valve.

3) Adjustable Flow-Control Valve For The Self-Energising Electro-Hydraulic Brake

Michael Kuehnlein, Matthias Liermann, Julian Ewald and Hubertus Murrenhoff

This paper presents the design and performance of an electrically adjustable flow control valve. It is designed specifically for the self-energising electro-hydraulic brake which requires small volume flows, a fail-safe open characteristic, a leakage tight closed position, simple control by just one solenoid, good dynamics, and repeatability. The valve concept is based on a conventional pressure compensator design usually found in flow-control valves. The measuring orifice used to sense the flow through the valve is typically constant. In the presented design it is made adjustable using a hydro-mechanical pilot servo mechanism. The pilot is actuated by a proportional solenoid. The paper explains static flow equations used to parameterise the design. Dynamic simulation is used to validate the design before manufacturing. Measurements of the prototype show a good match with the simulation. Measurements of the main characteristics of the valve are shown, specifically the dynamic response to a step input as well as the flow-signal tracking and load pressure disturbance rejection behaviour. The valve is also tested in its target application, the self-energising electro-hydraulic brake, where it proves its effectiveness in normalising the response time of the non-linear and the inherently unstable brake. As opposed to a non-linear or gain-scheduling control, with the new valve the controller of the brake can be designed as a simple switching control. This is an advantage for the overall brake's safety evaluation and therefore helps to improve the prospects of using the self-energising brake in future applications such as rail vehicles.

4)Research On Low Cavitation In Water Hydraulic Two-Stage Throttle Poppet Valve

Songlin Nie, Guohe Huang, Yongping Li, Yousheng Yang, and Yuquan Zhu

Cavitation effectsly affects the exhibitions and life expectancy of water pressure driven control valve, for example, debasing productivity, extraordinary clamor, and extreme vibration. Two-phase choke valve is a practicable design to moderate cavitation, which is widely utilized in water powered weight alleviation valves and choke valves. The weight conveyance inside a medium chamber situated between two chokes of a two-phase choke valve is explored through numerical reenactments. The impacts of the entry zone proportion of the two chokes and the channel and outlet

pressures on the weight inside the medium chamber are inspected. The reenactment results demonstrate that (a) the weight inside the medium chamber isn't steady, (b) the areas of greatest and least weights inside the medium chamber are both fixed, which won't differ with the section territory proportion or the bay and outlet weights, and (c) the proportion of the weight drop over the front choke to the complete weight drop over the two-phase choke valve is almost consistent. The basic cavitation list of the two-phase choke valve is then settled. A semiempirical structure rule is gotten for the water pressure driven two-phase choke valve. The connection between's the basic cavitation file and the section zone proportion of the two chokes is explored. Applicable approval tests are directed at an exceptionally fabricated testing mechanical assembly. The trial results are reliable with the reenacted ones. Further examinations demonstrate that (a) the huge backpressure can improve not just the counter cavitation ability yet in addition the absolute burden inflexibility of the water pressure driven twostage choke valve, (b) a proper section zone proportion will be helpful for improving the against cavitation capacity of the water pressure driven two-phase choke valve, and (c) the water water driven two-phase choke valve with a section zone proportion of 0.6 would have the best anticavitation execution with the least danger of cavitation.

IV. CONCLUSION

The investigations directed in this proposition yield the accompanying ends for the new control valve machine under examination: It shows that, at 5 LPM stream, the new changed control valve arrangement gives the alleviation valve pressure in the scope of 2500PSI - 2600 PSI. This new arrangement decreased the contact misfortunes and funnel misfortunes which happen in past machine. At the point when help valve pressure is set for the 5 LPM, at that point there is no compelling reason to set the range at 30 LPM. At 5 LPM, blazing of oil is disposed of and furthermore diminished the utilization of oil. This new arrangement additionally tests the control valve inside 2 minutes as past time was 6 min. This serves to expands the creation rate and diminishes the creation cost. The alleviation valve pressure at 5 LPM isn't direct with 30 LPM stream for example on the off chance that pressure at 30 LPM have greatest worth, at that point it doesn't imply that pressure at 5 LPM have a most extreme worth, however the weight will be inside the range. The old CVTR machine required 6 minutes for testing all parameters however new machine required just brief that implies in a short time there are 3 control valve will be tried which builds the efficiency.

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