"Design and fabrication of hydraulic pneumatic reciprocating pump"

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ABSTRACT

In the industry we use three methods for transmitting power from one point to another. Mechanical transmission is through shafts, gears, chains, belts, etc. Electrical transmission is through wires, transformers, etc. Fluid power is through liquids or gas in a confined space. In this chapter, we shall discuss a structure of hydraulic systems and pneumatic systems. We will also discuss the advantages and disadvantages and compare hydraulic, pneumatic, electrical and mechanical systems. Fluid power is the technology that deals with the generation, control and transmission of forces and movement of mechanical element or system with the use of pressurized fluids in a confined system. Both liquids and gases are considered fluids.

keywords: hydraulic, pneumatic

1.INTRODUCTION

Fluid power system includes a hydraulic system (hydra meaning water in Greek) and a pneumatic system (pneuma meaning air in Greek). Oil hydraulic employs pressurized liquid petroleum oils and synthetic oils, and pneumatic employs compressed air that is released to the atmosphere after performing the work. Perhaps it would be in order that we clarify our thinking on one point. By the term "fluid" we refer to air or oil, for it has been shown that water has certain drawbacks in the transmission of hydraulic power in machine operation and control. Commercially, pure water contains various chemicals (some deliberately included) and also foreign matter, and unless special precautions are taken when it is used, it is nearly impossible to maintain valves and working surfaces in satisfactory condition. In the cases where the hydraulic system is closed (i.e., the one with a self-contained unit that serves one machine or one small group of machines), oil is commonly used, thus providing, in addition to power transmission, benefits of lubrication not afforded by water as well as increased life and efficiency of packings and valves. It should be mentioned that in some special cases, soluble oil diluted with water is used for safety reasons. The application of fluid power is limited only by the ingenuity of the designer, production engineer or plant engineer. If the application pertains to lifting, pushing, pulling, clamping, tilting, forcing, pressing or any other straight line (and many rotary) motions, it is possible that fluid power will meet the requirement. Fluid power applications can be classified into two major segments:

- Stationary hydraulics: Stationary hydraulic systems remain firmly fixed in one position. The characteristic feature of stationary hydraulics is that valves are mainly solenoid operated. The applications of stationary hydraulics are as follows: Production and assembly of vehicles of all types. Machine tools and transfer lines. Lifting and conveying devices. Metal-forming presses. Plastic machinery such as injection-molding machines. Rolling machines. Lifts. Food processing machinery. Automatic handling equipment and robots.
- Mobile hydraulics: Mobile hydraulic systems move on wheels or tracks such as a tower crane or excavator truck.

2.AIMS AND OBJECTIVES:

- To eliminate the need for complicated systems using gears, cams, and levers.
- Motion can be transmitted without the slack inherent in the use of solid machine parts.
- The system should not be subject to breakage as are mechanical parts .
- system mechanisms should not subjected to great wear

3. CONCEPTUAL LINE DIAGRAM.

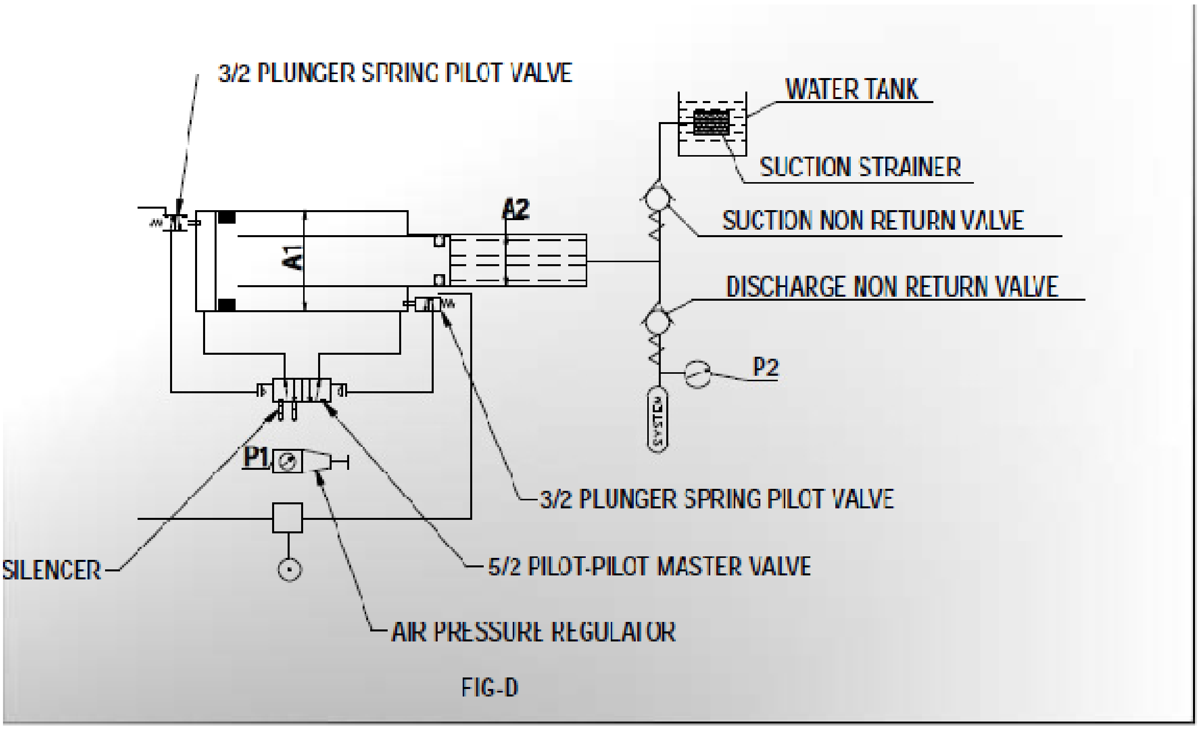

Fig. HYDRAULIC PNEUMATIC RECIPROCATING PUMP

4.LITERATURE SURVEY

- *Paper named”* Process simulation of energy behaviour of pneumatic drives" says that In this article the energy analysis of the pneumatic system is implemented in the simulation model. Previous research has shown the comparison of methods for the investigation on the energetic behaviour of pneumatic drives and its practical application .Concerning the analysis of the methods for determination the energy efficiency, the presented model is based on exergy analysis.

  Exergy analysis is able to consider all energy losses as well as the influence of the temperature behaviour on the available useful pneumatic energy.

- paper named" Design of High Speed Rotary Valves for Pneumatic Applications "says that Valves based on rotating geometry have long been sought by designers for their simplicity, compactness, and desirable dynamic properties. Unfortunately, they generally involve tight sealing surfaces with significant relative motion, making them particularly prone to problems of wear, leakage, and seizure. These inherent weaknesses are easily overcome in applications involving low pressures or low actuation speeds but become more significant in applications with high pressures and/or high speeds.

- Paper named "Controller Design for Simulation Control of Intelligent Pneumatic Actuators (IPA) System says that Intelligent Pneumatic Actuators (IPA) is a system for application that requires better control and accuracy. The purpose of this paper is to present a controller design for simulation control of an IPA system using Proportional-Integrative (PI) controller and pole-placement feedback controller. Before the controller is designed, a model identification is used to obtain the plant using transfer function. The flow for the controller design starts with the theory, mathematical calculation, procedures and the implementation of the simulation control by using MATLAB software. Furthermore, simulation results are compared and analyzed to illustrate the performance of the proposed controllers.

5.HEAD IN FLUID DYNAMICS

In fluid dynamics, *head* is a concept that relates the energy in an incompressible fluid to the height of an equivalent static column of that fluid. From Bernoulli's Principle, the total energy at a given point in a fluid is the energy associated with the movement of the fluid, plus energy from pressure in the fluid, plus energy from the height of the fluid relative to an arbitrary datum. Head is expressed in units of height such as meters or feet.

The *static head* of a pump is the maximum height (pressure) it can deliver. The capability of the pump at a certain RPM can be read from its Q-H curve (flow vs. height).

Head is equal to the fluid's energy per unit weight. Head is useful in specifying centrifugal pumps because their pumping characteristics tend to be independent of the fluid's density.

There are four types of head used to calculate the total head in and out of a pump:

1. **Velocity head** is due to the bulk motion of a fluid (kinetic energy).
2. **Elevation head** is due to the fluid's weight, the gravitational force acting on a column of fluid.
3. **Pressure head** is due to the static pressure, the internal molecular motion of a fluid that exerts a force on its container.
4. **Resistance head** (or *friction head* or Head Loss) is due to the frictional forces acting against a fluid's motion by the container.

6. REFERENCES

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