Hydraulic Flow Divider For Walking Beam Conveyer

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Abstract- *Walking beam conveyer is a hydraulically powered meant for transporting heavy weight. This machine consists of two vertical hydraulic actuators (40x160mm) fixed below the walking beam at equal spacing for upward and downward motion and one horizontal actuator (80x300 mm) for horizontal motion. When the beam is subjected to a point load acting at some distance from any one side of the beam, the weight distributed in the actuator is not uniform. This leads to inefficient functions like high pressure at one actuator only, it which leads to the falling of heavy load and hazardous working environment. This problem is overcome by the usage of the coupled hydraulic motor which is connected to the actuators and provides the equal pressure distribution i.e. equal weight to the beam system and there is no tilting of heavy load and the working environment is safe.*

Keywords- Walking Beam Conveyor, Flow Divider, Actuator, Sleeve Coupling and Hydraulic Oil.

I. INTRODUCTION

Walking beam conveyor is a device which is used to move an object in step by step manner. Generally it has four steps of operation to move the object from one place to other. It consists of a beam called walking beam, which can be moved both horizontally and vertically. It can be operated by electric power or hydraulic power. The objects are placed over a v-shaped bed called skid. The device consists of series of skids, above which the object is to be transmitted is placed. When the walking beam rises above the level of the skid the object is carried by the walking beam. When it is lowered below the level of the skid then object get placed on the skid.

The four operating step of walking beam conveyor is given below

1. Raise
2. Forward
3. Lower
4. Return

Then the operation is repeated again.

II. TYPES OF FLUID FLOW DIVIDERS

Broadly fluid flow dividers are classified into the two main categories as,

a) Priority Flow Divider
b) Spool-type Flow Divider for 50-50 split
c) Motor-type Flow Dividers
d) Synchronizing Circuit for 50-50 Flow Divider
e) Motor-type flow-divider circuit with 50-50 split

a) Priority Flow Divider:

This type flow divider is often used on vehicle power steering, where an engine-driven pump's output may vary as rpm changes or as its flow is used for other functions. A priority flow divider assures that the power steering always has ample fluid at any engine speed or when other functions are active.

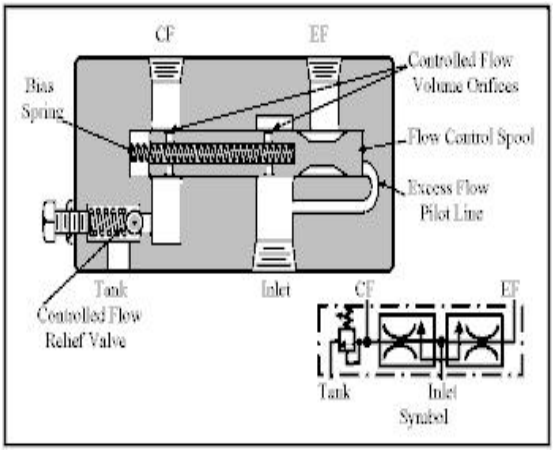

Figure 1: Priority Flow Divider

b) Spool-type Flow Divider for 50-50 split:

It is usually set up with identical orifice sizes for a 50-50 split. This particular design does not allow reverse flow, so bypass check valves are required when flow must return the same way it entered.

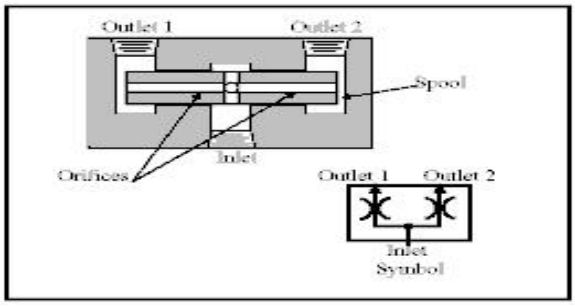

Figure 2: Spool-type Flow Divider for 50-50 split

c) Motor-type Flow Dividers:

A motor flow divider is constructed from two or more hydraulic motors in a common housing with a common shaft running through one set of gears on all motor sets. There is a common Inlet to all motors and separate outlets. The motors are usually gear-on-gear design.

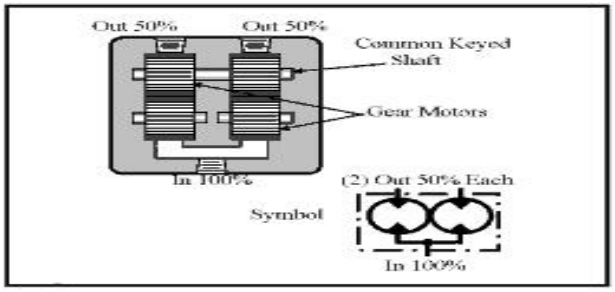

Figure 3: Motor-type Flow Dividers

d) Synchronizing Circuit for 50-50 Flow Divider:

The circuit shows a motor flow divider synchronizing two hydraulic motors. As the motors turn in right-hand rotation, they stay almost perfectly synchronized. Pressure to each motor may vary but flow from each flow-divider outlet remains near constant.

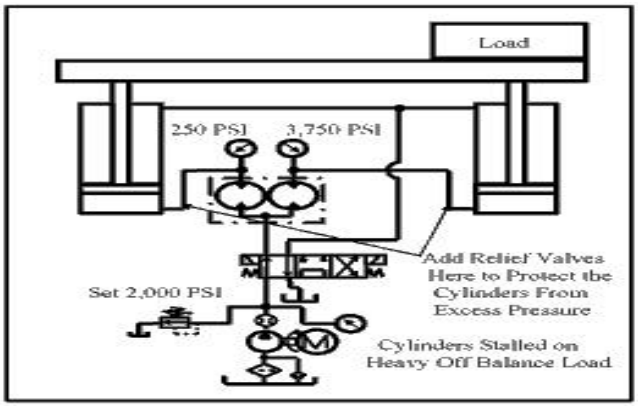

Figure 4: Synchronizing Circuit for 50-50 Flow Divider

e) Motor-type flow-divider circuit with 50-50 split:

This circuit in has two cylinders that are synchronized by a motor flow divider. Because this circuit operates at 2000 psi, it is possible that pressure at one cylinder could reach as much as 4000 psi due to intensification. Intensification occurs when one cylinder is lightly loaded.

III. HYDRAULIC FLOW DIVIDER

A hydraulic motor is a mechanical actuator that converts hydraulic pressure and flow into torque and angular displacement (rotation). The hydraulic motor is the rotary counterpart of the hydraulic cylinder.

A hydraulic motor converts hydraulic energy into mechanical energy: a rotating shaft. It uses hydraulic pressure and flow to generate torque and rotation. You can use hydraulic motors for many applications, such as winches, crane drives, self-driven cranes, excavators, mixer and agitator drives, roll mills, etc.

Figure 5: Hydraulic Flow Divider

IV. LITERATURE REVIEW

Daniel J Fonseca, Gopal Uppal & Timothy J Greene, in 2004 has reported that the major objective of this paper is to illustrate how Conveyor equipment selection is a complex, and sometimes, tedious task since there are literally hundreds of equipment types and manufacturers to choose from. The

expert system approach to conveyor selection provides advantages of unbiased decision making, greater availability, faster response, and reduced cost as compared to human experts. This paper discusses the development of a prototype expert system for industrial conveyor selection.

Tadeusz Opasiak, Damian Gąska, Grzegorz Perun & Bogusław Łazarz has presented the paper in 2014 in that a study of new design of rollers. The study focused on the measurement of static and dynamic resistance of rotating rollers and the impact of new construction on the power consumption of the belt conveyor. Rollers have been modified through the use of class C4 bearing seals and labyrinth seal U4Exp 62/65 with a cover 2LU4 of runner construction. Measurements of static and dynamic resistance of rotating rollers were made on a universal rollers stand and power measurements were carried out on a belt conveyor power supply system Gwarek 1200 No. TW in mine KWK Mysłowice–Wesoła.

V. PARTS DESCRIPTION

The various parts used in the flow divider which are used to specific applications to run it are listed below.

1. Vertical Cylinder
2. Horizontal Cylinder
3. Hydraulic Motor
4. Sliding Wheels
5. Coupling
6. Table
7. Lifting Plate
8. Work piece

VI. EXPERIMENTAL SETUP AND METHODS

As the hydraulic motor has a very high power rating we should use a frame material which withstands heavy torque, shocks along with weld ability. Hence after a brainstorming process we concluded that Mild Steel to be used for the fabrication of frame.

Figure 5: Frame Model

Motor type flow divider which provides synchronized movement of walking beam conveyor. The design of motor type divider is done in a manner such that two motors are coupled together to produce equal discharge.

The primary functions of a flexible coupling are to connect two shafts, transmit power from a driver shaft to a driven shaft and accommodate the misalignment between them. All flexible couplings accomplish these primary functions to varying degrees and no single type of coupling will be ideal for all applications, so it is important to understand and consider the attributes of each type of coupling. When a coupling connects two axially restrained shafts, the coupling may impart forces into the bearings. These forces should be reviewed to ensure the thrust capacity of the bearings is not exceeded. If the coupled shafts are not fully restrained, the coupling may move one or both shafts axially in an attempt to equalize forces. Applications involving axially sensitive equipment such as sleeve bearing motors or herringbone gear sets should be reviewed to ensure the coupling travel will not cause equipment damage.

VII. CONCLUSION

Motor type flow divider which provides synchronised movement of walking beam conveyor. The design of motor type divider is done in a manner such that two motors are coupled together to produce equal discharge. The frequent failure without flow divider is eliminated. The characteristics of both flow dividers are analysed and motor type low divider is recommended to implement in the hydraulic circuit for future use.

Though the cost of the hydraulic motor is high it has many advantages over the other type flow divider.

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