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TRIPLE DISCHARGE PUMP WITH EPICYCLIC GEAR TRAIN

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ABSTRACT

This paper provides an Epicyclic external gear pump frame in which one solar gear is integrated with three planetary gears to achieve the flexible output rate as required. This paper describes the design techniques of the design, and the test of the Epicyclic external gear pump. In most systems it is necessary to drive the actuators, hydraulic cylinder or hydraulic motors at variable speeds. This is only possible with flexible output from variable displacement pump so itis impossible to use. Another method used is the use of a high-pressure pump. But higher capacity means higher costs and higher power consumption. There is therefore a need for a special pump system at low cost so that the need for flexible discharge can be easily met without much cost and setup.

Keywords: Pump, Epicyclic Gear, High Output, External Gear Pump.

I. INTRODUCTION

Introducing a novel gear pump using epicyclic gears. The geometric barriers of the system are defined, the kinematic requirements for its effective operation are discussed and determined in the form of fast centers. In terms of performance, the pump is characterized by a high flow rate, similar to that of a piston pump. However, the geometry and kinematics of these two systems are different. White in the case of a piston pump the action of the pump is due to the corresponding movement of the piston, in the case of an epicyclic gear pump is due to the relative movement of the planetary gears. Moreover, during the operation of the epicyclic gear pump nothing of it changes its direction of movement. External gear pumps are similar to pumping internal gear pumps in that two gears go in and out of the net to produce flow. However, the external gear pump uses two identical rotating gears - one gear driven by the engine and the other. Each gear is supported by a shaft with bearings on both sides of the gear.

1. As the gears exit the net, they create a growing volume on the inlet side of the pump. The liquid flows into the hole and is caught in the gear teeth as it rotates.

2. The fluid travels around the inside of the box in the pockets between the teeth and the box - it does not pass between the gears.

3. Finally, the junction of the gears forces the liquid into the outlet under pressure.

Because the gears are supported on both sides, the external gear pumps operate smoothly and are often used for high-pressure installation such as hydraulic applications. Since there are no heavy loads, the rotor shaft cannot rotate and cause premature aging.

II. LITERATURE REVIEW

1) E.A.P. Egbe (Mechanical Engineering Department, Federal University of Technology Minna, Nigeria) states in his Design Analysis and Gear Pump Test that Nigeria relies heavily on imports. Changes in this practice require the development of locally available technologies. An analysis of the gear pump design aimed at delivering 4.0913x10- 4m3 / s (24.55litres / min) fuel has been carried out in this project. Available technology has been used in the construction and production of an external gear pump. The design has considered appropriate ideas and principles that affect pump performance. Parts of the pump were locally produced with available materials. Pump performance was noted and test results showed a volume efficiency of 81.47 percent at a maximum delivery of 20litres / minute. The output decreased with an increase in the pressure of the head at a value of 0.344Litres / m.

2) Peng Dong1, Yanfang Liu2, Yang Liu2 and Xiangyang Xu2 offer in his paper how to use dual pumps for automatic transmission of energy savings To improve hydraulic efficiency, modern automatic transmission often uses an electric oil pump for their hydraulic system. An electric oil pump can support mechanical oil

pump to cool, lubricate, and maintain line pressure at low engine speeds. Additionally, first-stop operation can be performed using an electric oil pump; therefore, fuel consumption can be further reduced. This article suggests how to use a dual-pump system (single electric pump and single-fuel oil pump) for automated transmission based on driving simulation. A mathematical model for calculating transmission power losses is being developed. Energy losses are transmitted to heat that requires the flow of oil to cool and lubricate. The leak model is designed to calculate the leakage of a hydraulic system. To meet the flow requirement, a control system based on the flow of the electric oil pump is developed. The simulation results of different driving cycles show that there is an excellent combination of electric oil pump size and mechanical oil pump size with respect to energy saving. Alternatively, a dual pump system can also satisfy the requirement of start-up operation. This study is particularly important for the pre-construction of a dual pump system in automatic transmission in relation to energy saving and initial suspension function.

3) Syed Ibrahim states that in his construction of integrated gears trains is one of the most important components of a mechanical transmission system where failure of a single gear will affect the entire transmission system, so it is very necessary to determine the causes of failure to try to reduce m. The various mechanisms of gear failure and their possible solutions to failure are mentioned in J.R. Davis (2005), Khurmi & Gupta (2006)], P. Kannaiah (2006) as bending failure (load failure), Pitting (contact pressure), wear points and abrasions, or whatever related to gear loads and this study is related And the development of gear design that leads to a reduction in gear load failure. Further, table.1 describes different areas of research conducted by different authors on Epicyclic gear trains. The study conducted in this study demonstrates an analysis of the preparation of an epicyclic gear train in India to reduce load failure. The analysis is limited to the development of the gear train by loading the analysis of gears, PINs and annulus including solar and plant equipment, as well as finding suitable loading conditions for the train to operate effectively without leading to loading failure. Epicyclic Gear trains have been used in the industry for their many benefits including high torque capacity, relatively small size, low weight, improved efficiency and a highly compact package, yet there has never been a comprehensive study of its load-bearing performance relative to different parameters. modules, material, and power trains of epicyclic gears. This research paper provides an attempt to fill that gap in the goal of making epicyclic gear trains load performance at different parameters. This process helps to achieve the optimized design of epicyclic gear trains where it has the best performance without any failures and small loads working on gears. The main objective of this research study is to improve the epicyclic gear train through load analysis, to prevent future load failures in the epicyclic gear dynamics of the train that combines mechanical efficiency.

III. COMPONENT USED

1. OIL SUPPLY
2. GEAR PUMP
3. POLYURTHANE EYES
4. HOSE COLLER & LINK
5. CARRYING
6. GO
7. IMOTO
8. BELT
9. OUT

1) OIL SUPPLY :

The Hydraulic system works in supplying compressed oil. What needs to be done is to find the right amount and pressure to match the volume of the system. When the Hydraulic system was first adopted, however it would really be necessary to address the question of suppressed oil supply. An important part of any supplied oil supply is the use of an equivalent Hydraulic gear pump. Hydraulic pump is a machine that takes oil at a certain pressure and delivers air at high pressure. The pump capacity is the actual amount of oil pumped and delivered as well as the output volume of the oil in the inlet conditions i.e. at atmospheric pressure and normal ambient temperature. The purity of the suction oil is one of the factors, which determines the health of the pump. Warm and moist absorbent oils will lead to an increase in condense rainfall from pressed oil. the pump

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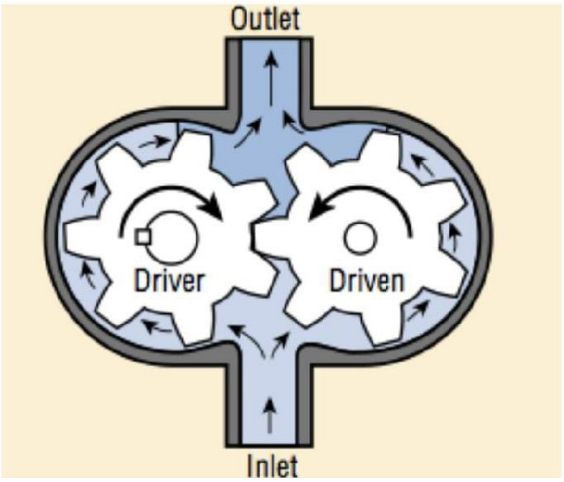
may be divided into standard types.

- Good removal pump.
- Inefficient pump
- Repeat type pump
- Circulating type pump
- Gear pump.

2) GEAR PUMP (POSITIVE DISPLACEMENT PUMP) :

Gear pumps rotating moving pumps carry fluid using rotating gears. They operate using two or more internal gears that create vacuum pressure, which furthers the fluid. Integrated, high-pressure gear pumps provide stable and fluid-free flow compared to dual diaphragm pumps and peristaltic pumps. They are best suited for applications for pumping high viscosity such as oil, plastics, paint, adhesives, or soap. Gear pumps are the most common type of exhaust pump used. Normally, the rotating junction of the two gears (driving gear and idler) moves to create absorption in the pump area and to draw fluid. The liquid is then directed between the gear teeth and the casing walls in the discharge area. The volume decreases as the fluid travels from one place to another, causing an increase in pressure. Pressure relief valves are usually built inside the pump to protect the pumping system from a closed valve on the exhaust pipes. The flow of gear pumps is determined by the size of the space (volume) between the gear teeth, the rotation speed (rpm) of the gears, and the amount of slip (reverse flow). The slipperiness increases as the pump wears.



3) POLYURETHANE TUBES:

Pneumatic polyurethane tube is used more flexibly than normal nylon tube, PPU is widely used in Hydraulic control system where installation is quickly achieved due to its flexibility to provide you with well-suited applications where high flexibility is required to avoid kinking and does not work overtime. Use of P.U.Tube: Polyurethane has good resistance to oils, gases, other fuels, hydrocarbons and other solvents. Temperature range: -50 degree centigrade to +80 degree centigrade Pipes and connections usually used for ventilation are made of materials that should be proof of leakage and be in good condition and even support high pressure oil and pressure fluctuations. The purpose of the oil pipeline system is to bring pressed oil to the point of use. Compressed oil needs to be delivered with sufficient volume, proper quality, and pressure to enable the components that use the compressed oil. Pressed oil is expensive to make. A fully engineered oil press system can increase energy costs, promote resource efficiency, reduce productivity efficiency, and increase maintenance needs. It is generally considered that any additional costs incurred in developing a piped oil pipeline system will pay off for many times in the life of the system. Design specification: • Width: 1cm • Length 5cm • Material: Polyurethane construction: In our project we use polyurethane pipelines approximately 1cm wide which is connected to the piston cylinder actuator port with the help of a socket connector and other connector. solenoidal valve outlet hole. We also use another pipe to connect the solenoidal valve and connect it to the compressor with an inch inch reducer. Operation: The main function of the pipe and connector is to supply the compressed oil from the cylinder to the solenoid valve and solenoidal valve to the piston cylinder

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actuator. It has the ability to withstand high pressure as it passes through the pump to the solenoidal valve.

4) HOSE COLLAR & CONNECTOR:

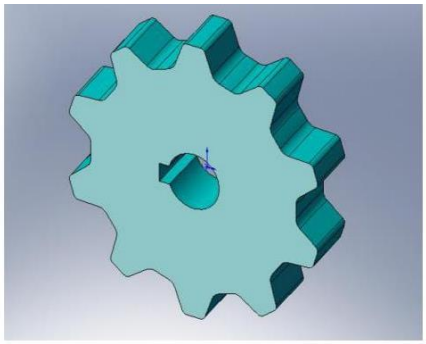
In our system there are two types of connectors used; one is a pipe connector and the other is a reducer. Hose connectors usually include the nipple of the adapter pipe and cap nut. These connectors are made of copper or Aluminium or solid metal. Cutters are used to provide connections between two pipes or houses of different sizes. They may be fitted with a straight, tee, "V" or other configuration. These slabs are made of plastic material These houses can stand at a high pressure of 10kg / cm2

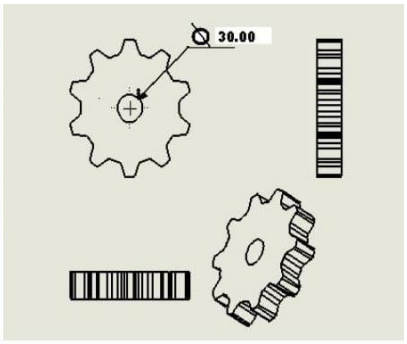
5) BEARING:

A ball bearing is a type of rolling-element bearing that uses balls to maintain the separation between the bearing races. The purpose of a ball bearing is to reduce rotational friction and support radial and axial loads. It achieves this by using at least two races to contain the balls and transmit the loads through the balls.in most applications, one race is stationary and the other is attached to the rotating assembly. As one of the bearing races rotates it causes the balls to rotate as well. Because the balls are rolling they have a much lower coefficient of friction than if two flat surfaces were rotating on each other. Ball bearing tend to have lower load capacity for their size than other kinds of rolling-element bearings due to the smaller contact area between the balls and races. However, they can tolerate some misalignment of the inner and outer races. The bearings are pressed smoothly to fit into the shafts because if hammered the bearing may develop cracks. Bearing is made up of steel material and bearing cap is mild steel.

6) GEARS :

There are two spur gears to transfer power from the lower hand shaft to the upper shaft. Next is the specification of gear Number Tooth - 30 Gear width - 30 mm Tooth width - 5 mm Dia. Machine length - 80 mm





PINION :

Pinion is a circular gear used in many applications:

• is usually the smallest gear on the gear train, although in John Blenkinsop's case The Salamanca, the pinafore was much larger.

[1] In many cases, like toys controlled by the remote, the pinion is also a driving gear.

• A small 90-degree driving gear facing the crown gear with a different drive.

• A small front sprocket on a chain-driven motorcycle

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. • A circular gear that grips and drives the rack on the rack and pin and on the rail rack stand.

• In engine-powered radios (i.e. nitro) this pin-gear can be called a grip gear when paired with a centrifugal clutch. [2] The pinion gear is a small cogwheel wheel. The teeth that go into the larger gear of the gear wheel are designed to be the best gears and are therefore well known in the various operating industries. Additionally the number of teeth in a pinion gear is rotating speed. The small toothed pinion produces extra torque. In the combo spanner there are four wings. The four feathers are attached to four holes each with a socket socket on the end. All of these pins rotate when the center gear is rotated with a handle. The different diameters associated with the pin are less than the Pitch circle radius = 18.5 mm Major diameter = 40 mm Gear size = 18 mm Tooth thickness = 5 mm Number of teeth = 19 mm

1) MOTOR SELECTION:

So choose an engine for the following features One phase AC motor Commutator motor TEFC construction Power = 1 / 15hp = 50 watt = 0.05kw Speed = 0-6000 rpm

2) BELT :

A band is a flexible material used to connect two or more mechanical rotating shelves, usually in parallel. Belts can be used as a source of movement, to effectively transfer power or to track related movements. Belts are fastened over the pulleys and may have twists between the pulleys, and the shafts do not need to be aligned. In a dual pulley system, the belt can run pulleys normally on one side (same as on parallel shafts), or the belt may fall, so that the direction of the driven shaft is reversed (opposite the driver. If parallel shafts). As a source of movement, the conveyor belt is a single application in which the belt is adjusted to carry continuous load between two points.

3) PULLEY :

The pulley wheel on an axle or shaft designed to support movement and change the direction of the taut or belt, or the transfer of power between the shaft and the cable or belt. In the case of a pulley based on a frame or shell that does not transmit power to the shaft, but is used to direct cable or power consumption, the supporting shell is called a block, and the pulley may be called a sheave. The pulley may have a trench or trench between the flanges around its perimeter to secure the cable or belt. The driving element of the pulley system can be a cord, cable, belt, or chain. The Hero of Alexandria has identified the pulley as one of the six simple machines used to lift weights.

[1] The pulleys are assembled to form a block and a tackle to provide the advantage of high power consumption equipment. Pulleys are also attached as part of a belt and drive chains to transfer power from one rotating shaft to another.

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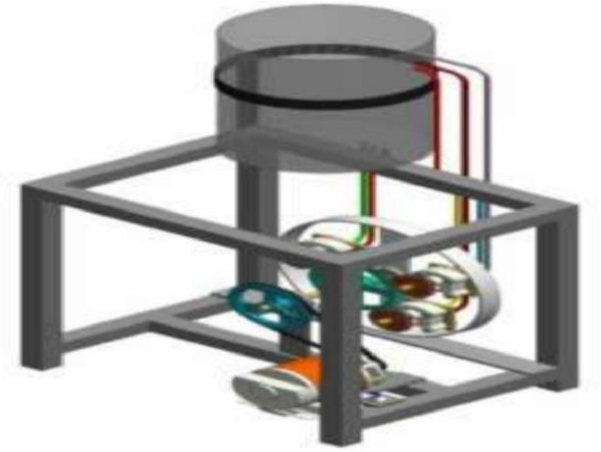
4. CADMODELOFTRIPLEDISCHARGEPUMPWITHEPICYCLICGEARTRAIN

As per the designed and analytical calculations made following the CAD model are developed using a separate command.



IV. CALCULATION

Extraction / s = Oil volume per turn x Number of revolutions per second

= 2aLn x N / 60 m3

There,

N = Rotational gear speed in r.p.m. = 25 rpm.

a = Area enclosed between two consecutive teeth and casing = 0.001 m2

n = Total number of teeth per gear = 7

L = Axial length of teeth = 0.005 m

Oil extraction capacity per transformation = 2 x a x L x n m3 = 2 x 0.001 x 0.005 x 7 = 0.00007m3 Extraction / s = Oil per transformation x per transaction number per second

= 2aLn x N / 60 m3 = 0.00007 x 25/60 = 0.000029166 m3 / s = 0.029 liter / s

Therefore total discharge by three pumps = 3 x 0.029 = 0.087 liter/ s

Process Sheet :

MATERIAL SPECIFITION:EN24 PART NO: RAWMATERIAL SIZE: 35 x 100 PART NAME: SHAFT								
SR. NO	Description Of Opration		Tool			Time in minute		
		Jig & Fixer	M/c Tool	Cutting Tool	Measuring Instrume	Setting Time	M/c Time	Total Time

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					nt			
1	Clamp stock	Three Jaw chuck	Lathe	–	–	15	–	15
2	Facing B/S to totol length 95mm &center drilling	Three Jaw chuck	Lathe	Facing tool & center drill	Vernier	5	14	19
3	Clamb stock between center	Center support &carrier	Lathe	Facing tool & center drill	Vernier	25		25
4	Turning OD dia. 28mm through out length	Center support &carrier	Lathe	Turning tool	Vernier		13	13
5	Step turning dia. 22to 77 length	Center support &carrier	Lathe	Turning tool	Vernier		9	9
6	Step turning dia.17 through 37 length	Center support &carrier	Lathe	Twist drill	Vernier		7	7
7	Step turning dia.16 through 27 length	Center support &carrier	Lathe	Twist drill	Vernier		7	7
8	Step turning dia. 22through 12mm length	Center support &carrier	Lathe	Twist drill	Vernier		8	8
9	Step turning OD dia. 17mm through 10mm	Center support &carrier	Lathe	Twist drill	Vernier		7	7
10	Milling key way 6x3x25mm 1no's	M/c Vice	Milling m/c	End Mill	Vernier	25	17	42

V. CONCLUSION

From the review of the above books, we know that it has low emissions and the time and energy required is high. The above problem can be solved by using a triple epicyclic gear train. By using a planetary gear train and solar gear we can increase emissions and save energy and time. Electricity can be reduced by using only one

electric motor to operate all three at a time or at each pump and obtain a flexible flow of fluid, which can be used for flexible fluid discharge. Due to the flexibility of the triple pump design, the pump cost can be reduced.

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