Dual Side Water Pumping System using Scotch Yoke Mechanism

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ABSTRACT

The aim of the project is fabrication of duel side water pump. Duel side water pump using scotch yoke mechanism are reciprocating pump is which the plunger is provide for the pumping action. The plunger is reciprocated with the help of a cam place. By this action the water is pumped to very high pressure. This can be applied for various application. The cam plate gets the drive from the motor.The main function of the pump entirely depends upon the reciprocating motion of the plunger. The enter from the tank enter to the inlet port through PVC pipe. The water is passed to the cylinder. More the plunger compressed and delivers the water to a very high pressure. This cam plates get the drive from the motor.When the cam plate is made to rotate the plunger is move to the Bottom Dead Center (BDC). When the happens the suction of the water is in action. The suction is carried out by the plungers. The water sucked from the tank to the plunger cylinder through pipes and ports. The plunger forces toward the top dead center (TDC). Due to the force the developing of the water from the cylinder is carried out. The water is delivered through a one way valve. The delivery action takes place on plungers But the flow of water will be constant. The water delivered will be of very high pressure. The high pressure water is takes through pipes and utilized for the various purposes is agricultural applications..

Key words: *Pump, dual side, Scotch Yoke Mechanism*

1.INTRODUCTION

A pump is a Mechanical device which converts mechanical energy into hydraulic energy. This pump is classified into two types;

i. Positive Displacement and
ii. Non-Positive Displacement pump

In positive displacement pump is the one, in which the liquid is transferred positively from one stage to another stage by the to and fro motion of the plunger or piston of the pump. In non-positive displacement pump the liquid is transferred by the centrifugal force. This force is cause due to the rotary movement of an impeller. In this, our project, radial plunger pump is of positive displacement pump. The salient features of a Radial plunger pump have been retained in our project model and this has been achieved with great care. Due to high precision work involved in producing radial plunger pump besides higher cost these pumps are not widely manufactured by most of the industries. The very name itself indicates that it works with the help of a plunger. This plunger is reciprocated with the help of a cam shaft. This is rotated by the motor. The camshaft is the heart of this pump. The plunger reciprocated does the pumping action. The oil in the tank at normal pressure is delivered to a very high pressure after pumping. This high pressure oil is utilized for various purpose like lifting, load transferring etc.

2.LITEREATURE SURVEY

" DUAL SOLENOID RECIPROCATING PUMPS" "PAUL SULLIVAN" "1990"In the mid-1990s, an engineering firm was contracted to collect dense nonaqueous phase liquid (DNAPL) that was endangering

groundwater at a wood treating facility in Arkansas. According to the Environmental Protection Agency guidelines, a DNAPL is classified as one of several organic fluids that remains insoluble in water and, being denser than water, sinks to the bottom, becoming a risk to seep into underlying aquifers. The DNAPL found in the Arkansas facility was liquid creosote, which the firm had been hired to collect from the subsurface for the purpose of providing source control and containment. To overcome problems presented by the creosote's density, the firm proposed using a dual-well recirculation design. At first glance, the dual-well design appears simple. Both the recovery well and the recirculation well are contained within a single borehole. Inside the recovery well, groundwater and DNAPL collect. The collected groundwater recirculates into the other well as the DNAPL, being denser and heavier than water, settles into the recovery well's collection sump. The dual phase recovered stream contains both groundwater and the liquid creosote.

3.COMPONENTS USED

The main components of a project is

1. Reciprocating water pump
2. cam plate
3. A.C motor
4. Bearing

3.1 RECIPROCATING PUMP

The history of positive displacement reciprocating pumps goes back as far as 275 BC in Ancient Rome. In the sixteenth century, great lift and force pumps, driven by water wheels became the principle method for pumping water to be piped in Europe

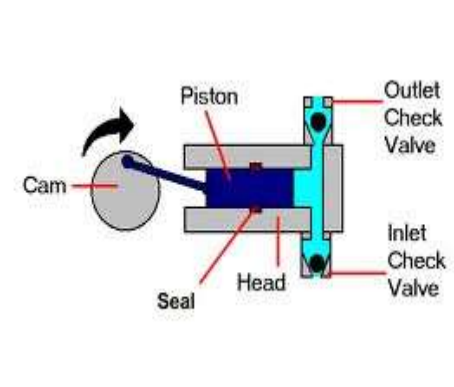


FIG : SINGLE ACTING RECIPROCATING PUMP

3.2 CAM PLATE

A cam is a projecting part of a rotating wheel or shaft that strikes a lever at one or more points on its circular path. The cam can be a simple tooth, as is used to deliver pulses of power to a steam hammer, for example, or an eccentric disc or other shape that produces a smooth reciprocating (back and forth) motion in the follower which is a lever making contact with the cam.

3.3 A.C. MOTOR

An electric motor is a machine, which converts electrical energy to mechanical energy. Its action is based on the principle that when a current-carrying conductor is placed in a magnetic field, it experiences a magnetic force

whose direction is given by Fleming's left hand rule.When a motor is in operation, it develops torque. This torque can produce mechanical rotation. A.C. motors are also like generators classified into shunt wound or series wound or compound wound motors.

3.4 BEARING HOUSING

We should fabricate our housing design mild steel plate dimensions are 100 *50 *12 mm and also the bearings are properly fit into the bearing housings.

4.DESIGN CALCULATION

Diameter of the cylinder D = 75 mm

Diameter of cam plate = 150 mm

Length of stroke L =2*r = 150 mm

Speed of motor N_1= 1440 rpm

Speed of crank N_2=200 rpm

Power of motor P= ¾ hp

Diameter of smaller pulley D_1=40 mm

Diameter of larger pulley(D_2):

$N_1/N_2 = D_2/D_1$

D2= (N1/N2) * D1

= (1440/200) * 40

= 290 mm

Speed of the crank N_2= $(D_2/D_1)*N_1$

= (40/290)*1440

N_2 = 200 rpm

Volume of water delivered in one revolution = area *length of stroke

= $(\pi/4)*(75^2)*150$

=4417*150

=662679.70 mm^3

=$0.66*10^{-3}$ m^3

No of revolution per second =N/60

= 200/ 60

=3.33 rev/s

Discharge $Q_1 = A*L*(N/60)$

$=0.66*10^{-3}*3.33$

$= 2.19$ litre/s

Discharge of one pump(Q_1)=2.19 litres/s

Total Discharge of two pumps(Q)=$2*Q_1$

$=2*2.19$

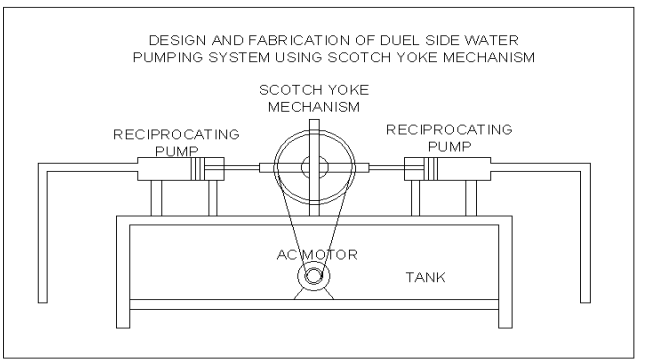
$Q= 4.38$ litre/s

TOTAL DISCHARGE(Q)= 4.38 litre/s

5.WORKING PRINCIPLE

The main function of this pump entirely depends upon the reciprocating motion of the plunger. The water from the tank enters to the inlet part through pvc pipes. The water is then passed to the cylinder. Here the plunger compresses and delivers the water to a very high pressure. This plunger is of one in number, which are normal loaded. These normal loaded plungers are reciprocated by a cam plate . The cam plate is supported by ball bearing on both sides to reset on the end plates. This cam plates gets the drive from the motor.

In the plunger it has a follower. It rests on the cam plate with motor shaft . When the cam plate is made to rotate the plunger is moves to the Bottom Dead Centre (BDC). When this happens the suction of the water is in action. This action is carried out by the plungers. The water is sucked from the tank to the plunger cylinder through pipes and ports. And thus the suction happens. When the cam plate rotates further the plunger is also reciprocated. The plunger forces towards the top Dead Centre (TDC). Due to this force the delivering of the water from the cylinder is carried out. The water is delivered through a one way value. The delivery action takes place on plungers alternatively. But the flow of water will be constant. The water delivered will be of very high pressure. This high pressure water is taken through pipes and utilised for various purposes in agricultural application



6.ADVANTAGES

Even if all the other pumps are similar in use the dual side water pump is more advantageous than the other pumps.

1. This is of compact in size
2. Less Maintenance is enough
3. The water pumped is of higher pressure
4. Quite running and smooth operation is achieved.
5. Higher efficiency
6. Full efficient positive displacement pump

7.APPLICATIONS

1. Since the dual side water pump is more efficient it is used for pumping the water mostly.
2. It is widely applicable in agricultural purposes .

8.CONCLUSION

The fabrication of dual side water pumping system was successfully completed as per the designed specification.The trial performance of this device provides to be successful, with case of operation and safety, hence

the results have given a clear indication of its commercial viability. The cost analysis has shown its economic feasibility and we are under the impression that it can be further reduced, when produced on a mass scale.

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