MODIFICATION & DEVELOPMENT OF DUAL SIDE WATER PUMPING SYSTEM USING SOLAR ENERGY WITH SCOTCH YOKE MECHANISM

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Abstract: The innovation identify with an instrument utilized for sucking the high viscous liquids by double side acting pump utilizing scotch yoke mechanism. In the majority of the industries, viscous liquids are sucked by utilizing radial pumps yet it gives less volumetric efficiency and prompts utilization of more power. Presently we plan a draw in responding sort by utilizing dual side acting pump, barrels appended at the two sides and it is associated with drive by scotch yoke mechanism. The scotch yoke mechanism gets the drive from the motor. The motor is connected to the shaft using bevel gear. And we are using solar energy when the electrical source is delayed. In this pump, the volumetric efficiency is high and the yield will be consistent.

Keypoints: scotch yoke mechanism, dual side acting pump, solar panel.
1. INTRODUCTION:

Each one of us will need or the like of water hotspot for drinking, showering, washing garments, getting ready nourishment and for water system. We may get the water from different sources like, lake, waterway, lakes, open well, bore well. So we need to direct the water from the source and utilize the water for the different purposes. Double Acting Dual Cylinder Pump is of positive displacement pump. Due to high exactness work including higher in cost, these pumps are not broadly made by the majority of the industries. This cylinder is responded with the assistance of a scotch yoke mechanism. This is pivoted by the engine. The cylinder responded does the pumping activity. The water in the tank at ordinary pressure is conveyed to a high pressure subsequent to pumping. This high pressure water is used for different purposes like planting, cooling water dissemination and so on. Scotch yoke mechanism system is utilized first in motors as it can deliver high torque. It is additionally utilized as a part of regular machining purposes. Here we utilize it for drawing water as we require high torque. The power supply is given to the engine and the engine begins to rotate. This rotate the crank and the cam in it. This produces the reciprocating motion in the slider and also moves the piston inside the cylinders. This opens the delta valve in suction side of the chamber and water comes inside and in opposite side of barrel conveyance valve opens and lets the water to the head. This is likewise done on another chamber at the same time. The valves utilized are non return valves which prevents the stream of water.

2. LAYOUT:

The main function of this pump is directly depends on the responding movement of the plunger. The water from the tank enters to the delta port through PVC funnels. The water is then passed to the chamber. Here the plunger compresses and conveys the water with high weight. This plunger is of one in number, which is ordinary stacked. These typical stacked plungers are responded by a cam plate.

The cam plate is bolstered by metal roller on the two sides to reset on the end plates, this cam plates gets the drive from the engine. In the plunger it has an adherent; it lays on the cam plate with engine shaft. At the point when the cam plate is made to pivot the plunger is moves to the Bottom Dead Center (BDC). At the point when this happens the suction of the water is in real life. This activity is done by the plungers. The water is sucked from the tank to the plunger chamber through funnels and ports and hence the suction happens. At the point when the cam plate pivots assist the plunger is likewise responded. The plunger powers towards the best Dead Center (TDC). Because of this power the conveying of the water from the chamber is completed. The water is conveyed through a restricted esteem. The conveyance move makes put on plungers on the other hand. Be that as it may, the stream of water will be consistent. The water conveyed will be of high weight. This high pres-sure water is taken through channels and used for different purposes in horticultural applications. The Line Diagram, Basic Scotch Yoke Mechanism, Photography of the proto-type has been appeared in Figure 1, 2, 3 individually.
3. LITERATURE REVIEW:

X Wang et al. [1] have learned about the Scotch Yoke wrench instrument whose application could be utilized as a part of a reciprocating inside ignition motor which will decrease the motor's size and weight thus creates sinusoidal piston movement that takes into consideration finish adjust of the motor. C. Gopal et al. [2] have assessed the examination advancements with Renewable Energy Source Water Pumping Systems (RESWPS). Alireza Rezae et al. [3] have learned about the specialized and money related parts of photovoltaic water drawing framework for water system reason in the GORGAN's ranch fields (one of Northern Province of Iran) with the RET Screen programming devices. Abdeen Mustafa Omer [4] has looked into the methods for utilizing wind vitality for water directing in country regions in Sudan. Ahmed Mohammedi et al. [5] has outlined a model which will express about the water stream yield (Q) that will be specifically an element of the electrical power input (P) to the engine pump, for different aggregate heads. Arif Hepbasli et al. [6] has given audit on HPWH frameworks as far as vigorous and exergetic perspectives in which the innovation alongside its chronicled advancement was advised and a thorough survey of studies were consequently directed over them and subsequently they were characterized and introduced as tables. P. Amrutesh et al. [7] has rolled out an investigation to improvement the current setup so an untalented administrator could work and keep up the grass fine and accomplish a uniform surface look with an application less demanding and furthermore at decreased cost where they at long last accomplished in contamination control as well. M. Sermaraj [8] have made an investigation about foot pedal pump which is fueled by our legs rather than arms to lift the water from a profundity scope of seven meters. In the past human vitality has for the most part been connected using the arms, hands, and back. Rizgar Baker Weli et al. [9] has made exploratory examination on an apparatus which is extraordinarily intended to play out the investigation at neighborhood in city of Erbil that is utilized to discover the measure of water which could be lifted starting from the earliest stage to a static head of 8 meters over the rooftop utilizing two modules of 50 W photovoltaic sunlight based based modules, the framework contains AC radiating pump, inverter, charging control and a 88 Ah battery for vitality sparing notwithstanding photovoltaic boards [10]. The power age has numerous challenges in our general vicinity and it is around 900 W.h/m2.day for PV module situated toward south at a tilt point of 360. Oghogho Ikponmwosa et al [10] has made a framework that could be utilized for disposal of the cost and wastefulness of human impedance that could be related with observing and controlling the pump by expanding the execution and life expectancy of the electric water pump.
4. INDIVIDUAL COMPONENT DESCRIPTION

4.1. SCOTCHYOKE MECHANISM:

![Scotch Yoke Mechanism](image1)

The Scotch burden is a responding movement system, changing over the straight movement of a slider into rotational movement, or the other way around. The cylinder or other responding part is specifically coupled to a sliding yoke with an opening that draws in a stick on the turning part. The area of the cylinder versus time is a sine wave of steady adequacy, and consistent recurrence given a steady rotational speed.

4.2. CYLINDER:

![Double Acting Cylinder](image2)

A double acting barrel is a chamber in which the working liquid acts then again on the two sides of the cylinder. So as to associate the cylinder in a twofold acting chamber to an outer system, for example, a wrench shaft, an opening must be given in one end of the barrel for the cylinder pole, and this is fitted with an organ or "stuffing box" to avert escape of the working liquid. Twofold acting barrels are normal in steam motors however surprising in other motor sorts. Numerous water powered and pneumatic chambers utilize them where it is expected to deliver a power in the two headings. A twofold acting pressure driven barrel has a port at each end, provided with water powered liquid for both the withdrawal and augmentation of the cylinder. A twofold acting chamber is utilized where an outer power isn’t accessible to withdraw the cylinder or where high power is required in the two bearings of travel.
4.3. **PISTON**

A cylinder is a segment of responding motors, responding pumps, gas compressors and pneumatic barrels, among other comparable instruments. It is the moving segment that is contained by a barrel and is made gas-tight by cylinder rings. In a motor, its motivation is to exchange drive from growing gas in the chamber to the crankshaft by means of a cylinder pole as well as interfacing pole. In a pump, the capacity is turned around and compel is exchanged from the crankshaft to the cylinder to compress or launching the liquid in the chamber. In a few motors, the cylinder additionally goes about as a valve by covering and revealing ports in the barrel.

![Fig 4: Piston](image)

4.4. **CHECK VAKUE**

Check valves are two-port valves, which means they have two openings in the body, one for liquid to enter and the other for liquid to clear out. There are different sorts of check valves utilized as a part of a wide assortment of utilizations. Check valves are frequently part of normal family things. In spite of the fact that they are accessible in an extensive variety of sizes and costs, check valves for the most part are little, straightforward, or modest. Check valves work naturally and most are not controlled by a man or any outside control; in like manner, most don't have any valve handle or stem. The bodies (outer shells) of most check valves are made of plastic or metal.

4.5. **PLC MOTOR**

While the lighting control framework already talked about is helpful to clarify fundamental PLC task, a more commonsense, and just marginally more mind boggling, application is begin stop control of an AC engine. Before inspecting the PLC program, first consider a hard-wired approach. The accompanying line chart represents how a regularly open and a typically shut pushbutton may be associated with control a three-stage AC engine.

- Maximum speed: 1500rpm
- Maximum power: 1.5kw
- Voltage: 12volts DC

The electric motor supplies power to the centrifugal pump through series of gear trains.
Torque from Motor

\[ p = \frac{2\pi NT}{60} \]

Where \( p \) = power given by the motor manufacturer
N = speed of motor in rpm
T = Torque developed by motor

\[ T = \frac{60P}{60 \times 1500} \]

\[ T = \frac{2\pi N \times 1500}{2 \times 3.1428 \times 1500} \]

\[ T = 9.55 \text{Nm} \]

∴ Torque from the motor is given by 9.55Nm

4.6. GEARS:

Gear-Parallel and co-planer shafts associated by gears are called goad gears. The game plan is called goad gearing. Spur gears have straight teeth and are parallel to the hub of the wheel. Goad gears are the most widely recognized sort of apparatuses. The benefits of goad gears are their straightforwardness in plan, economy of produce and support, and nonappearance of end push. They force just spiral loads on the bearings. Spur gears are known as moderate speed gears. In the event that commotion isn't a genuine plan issue, goad riggings can be utilized at any speed.

![Gears Image](image.png)

4.7. SOLAR PANEL:

Solar panels absorb the sunlight as a source of energy to generate electricity. Sun oriented water pumping limits the reliance on diesel, gas or coal based power. The utilization of diesel or propane based water pumping frameworks require costly powers, as well as make commotion and air contamination. The general forthright cost, operation and upkeep cost, and substitution of a diesel pump are 2–4 times higher than a sun oriented photovoltaic (PV) pump. Sun oriented pumping frameworks are condition well disposed and require low upkeep with no fuel cost [1]. Keeping in see the lack of matrix power in provincial also, remote territories in many parts of world, PV pumping is one of the most encouraging uses of sun light.
5. FABRICATION:

- The ms plates are welded together to the expected measurements to shape the edge.
- Mild steel circle (wrench) is welded with the cam.
- Then the wrench is settled in the edge by methods for welding process.
- Then the burden is processed and settled in the way the cam responds inside the opening.
- Two barrels are welded in either sides of the scotch yoke and settled in the edge.
- The expansive pulley is settled by methods for a welding procedure to the one end of wrench shaft.
- The plc motor is settled in outline.
- The little pulley is settled in the motor shaft by methods for a bolt.
- The gear is settled between two pulleys.
- Non return valves strung in barrel ports and the yield and info funnels are connected.
- Solar panel is connected to the batteries to run the motor by solar energy.
6. RESULT AND DISCUSSION:

We are examine the different attributes of the pumping framework and we need to arrange the dissect information in the accompanying organization. From the examined information's we are comprehend the model figurings hypothetically. We have utilizing the general formulae's for figuring of the examined data's. The accompanying arrangement and the model estimations are made hypothetically. The investigation is made by methods for model.

Graph 1: DOUBLE ACTING PUMP
7. CONCLUSION:
Thus the detailed study of our paper is carried out. By the design provided above, the dual side water pumping system using scotch yoke mechanism is designed and analyzed for a prototype. This method of pumping water is very efficient compared to other pumping system. The cost of this pump is considerably low when compared to other positive displacement pumps since scotch yoke mechanism is used. It can be used for pumping high viscous fluids.

8. REFERENCES:


