Portable Agricultural Irrigation Centrifugal Pump Using Two Stroke Engine

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ABSTRACT

The pump, which is an important machine used in the irrigation system used to transport the water per the agricultural requirement. In this project the real pump prototype operated with economical fuel alternate to electricity is designed for agricultural irrigation system. The objective of the project is to design portable centrifugal pump powered by two stroke multi fuel engine. In this system the electricity is not required to run the pump, the engine will provide the necessary power to the pump to transport the water by means of rotational energy. Portability is one of the main advantages of this project. Flow control valve at the outlet of the centrifugal pump controls the water flow rate as per the requirement. This can be used for the short term requirement.

1.1 INTRODUCTION

There are many types of irrigation system has been used. In our project of portable agricultural irrigation system in centrifugal pump using pesticide engine plays an important role, the main aim of the project is to run the pump with the help of the pesticide engine. Through this project we can learn how this engine work and how it produce power and how the pump work using this. The main aim of the project is to run the pump using the two stroke engine and transport the water from the water storage tank. The material and power transfer system used to systemize the machinery and they are classified into pipes, belt and storage tank.

1.2 EXPERIMENTAL SETUP

The machinery as follows

i) Fuel storage tank
ii) Carburetor
iii) Two stroke engine
iv) Crank
v) Pulley
vi) V-Belt
vii) Centrifugal Pump

1.3 BLOCK DIAGRAM

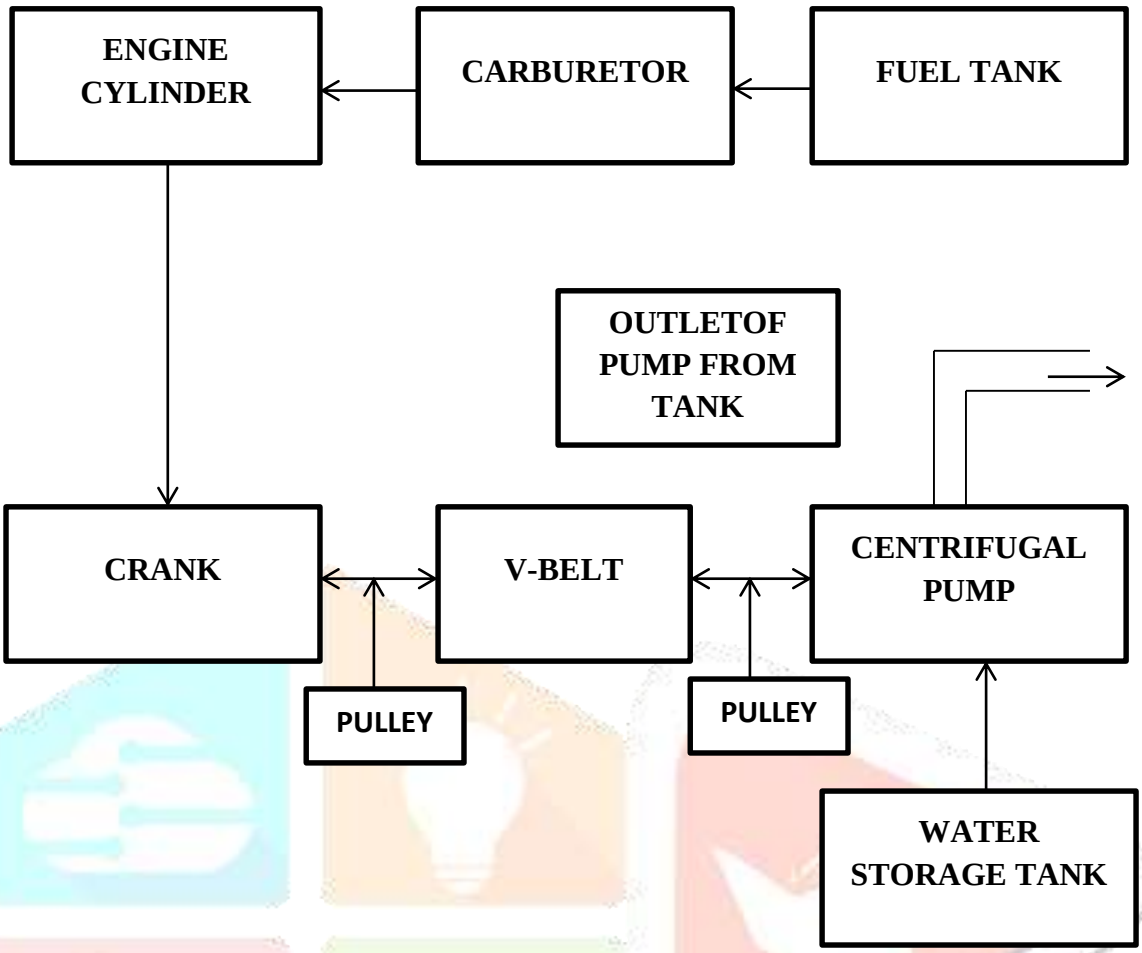


FIG 2.1

(BLOCK DIAGRAM)

1.4 WORKING

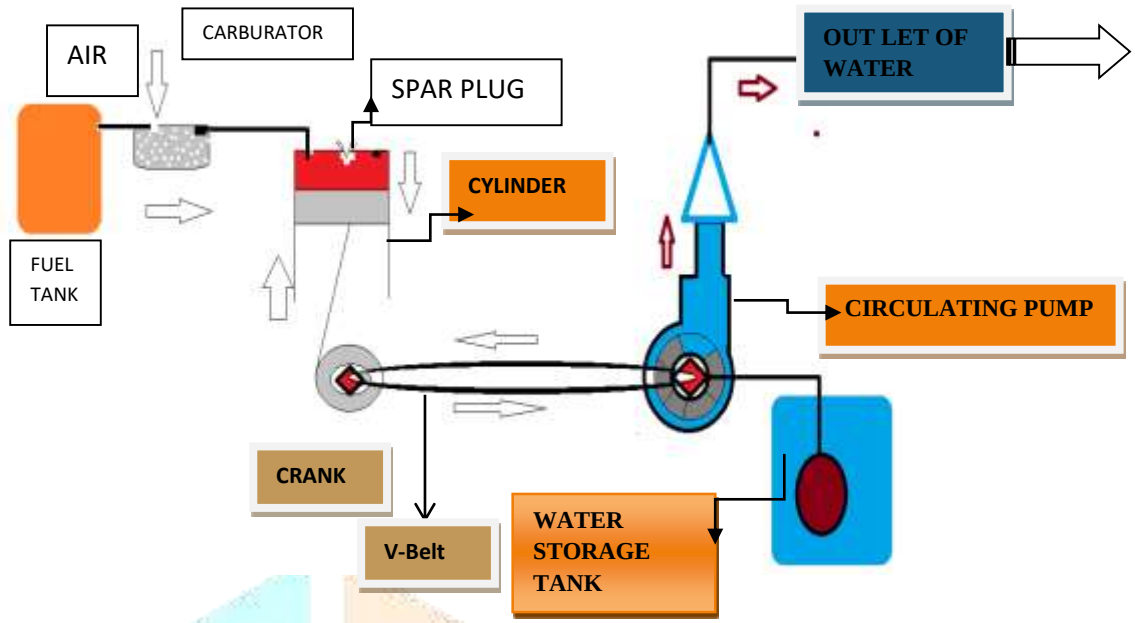
The fuel which is stored in the fuel tank the fuel tank is connected to the carburetor, the fuel is supplied to the carburetor; the fuel tank is connected with the valve, which controls the flow of fuel. The carburetor takes the air from the atmosphere and as the fuel enters in to the carburetor the air and fuel mix together. In this carburetor used is simple carburetor.

The engine is starts with the help of rope. Hence the engine used is pesticide engine and its starting method is rope start engine. Hence after this process takes place the carburetor supplies mixture of air and fuel into the engine then the combustion process takes place.

The crank rotates due to this the extension from the crank which is connected to the pulley due to this pulley rotates the pulley is connected to the V-belt. Another end of the V-Belt is connected to the centrifugal pump hence as the pulley rotates V-Belt also rotates hence the rotational power is transferred to the centrifugal pump due to this the impeller in the pump also rotates due to this centrifugal pumping action takes place. The motor used in this process is 0.5hp.

The pump suck the water from the reservoir or river or tank through the inlet and through the outlet the water is let out. This is the working of the project.

1.4.1 WORKING DIAGRAM



1.5 PHOTO OF THE WORK

1.6 CALCULATION

Internal diameter of the impeller D_1= 70mm= 0.07m

External diameter of the impeller D_2= 80mm= 0.08m

Speed of the Engine N= 4550 rpm

Speed of the Pump N_1= 3280 rpm

Amount of fuel consumed= 15ml

Capacity of Engine= 60cc

Mixing Ratio of petrol and Methanol= 1:3

Net reduction in speed: 4550-3380= 1270rpm

Duration of work= 30min

Head = 8m

Vane angle inlet Θ= 20°Vane angle outlet ϕ= 30°

Width at the outlet B_2= 35mm= 0.035m

i) To Find the tangential velocity

Velocity at inlet and outlet: u= $\pi DN \div 60$

For Inlet u_1 = $\frac{\pi * 0.07 * 3280}{60}$

Hence u_1= 12.02 m/s

For Inlet u_2 = $\frac{\pi * 0.08 * 3280}{60}$

Hence u_2= 13.73 m/s

ii) To find the Velocity of flow

Tan Θ = V_{f1} / u_1

Tan 20= V_{f1}/ 12.02

V_{f1}= 4.37 m/s (V_{f1}= V_{f2})

Tan ϕ = V_{f2} / (u2- V_{w2})

Tan 30 = V_{f2}/ (13.73- V_{w2})

V_{w2}= 6.16 m/s

iii) Work done by impeller per kg of water per second

Work done = (1/g)× V_{w2}×u_2

= (1/9.81) ×6.16×13.73

Work done = 8.62 kN-m/s

iv) To find the Discharge

Discharge Q= π×D2×B2×V_{f2}

Q= π×0.08×0.035×4.37

Discharge Q= 0.0384 m^3/s

v) Velocity of flow leaving the vane

V_2= $\sqrt{V_{f2}^2 + V_{w2}^2}$

V_2=$\sqrt{4.37^2 + 6.16^2}$

Velocity V_2=7.5 m/s

vi) To find the mano metric efficiency:

$\eta_{man} = (gH_m)/(V_{w2} \times u_2)$

$\eta_{man} = (9.81 \times 8)/(6.16 \times 13.73)$

$\eta_{man} = 92\%$

1.7 CONCLUSION

The project has been fabricated and the construction of the project is made into simple design and the weight of the machine is about 12Kg.

The system which helps to suck the water which is the normal working of the centrifugal pump but the advantage is that electricity is not required to run the centrifugal pump. Due to its less weight it is portable one.

With the help of this water can be sucked from the reservoir, tank and it can be used only for the short term use. As it is compared to electrical pump the speed achieved is high hence the rate of suction is increased.

There is also advantage and disadvantage in this project but it can be used. The construction is simple and cost is less.

1.8 REFERENCE

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