International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 4 Volume No.6 July – 2022
DOI:10.46647/ijetms.2022.v06i04.004 ISSN: 2581-4621

Experimental Setup Of Pedal Operated Water Purifier

Nakul Jakkannavar[1], Rakesh Athanimath[2], Rohan Khot[3], Manish Nesarekar[4],
Prof. Siddesh.G.M[5],Dr. Rajendra Galagali[6]
[1,2,3,4]*Students, Dept of Mechanical Engg. SGBIT Belagavi, Karnataka, India*
[5]*Assistant Professor, Dept of Mechanical Engg . SGBIT Belagavi, Karnataka, India*
[6]*HOD, Dept of Mechanical Engg. SGBIT Belagavi, Karnataka, India*
[1]nakuljakkannavar2000@gmail.com, [2]rakeshra213@gmail.com,
[3]rohankhot06@gmail.com, [4]manish143nesarekar@gmail.com,
[5]siddeshgm@sgbit.edu.in, [6]hod-mech@sgbit.edu.in

***Abstract*--- The analytic design of a pedal operated water purifier for the villagers is discussed in this study. It operates on the idea of compressing and quickly releasing the tube by creating negative pressure in the tube, which sucks water from the sump in the pump while the motors push the water through filter, purifying the water. The design includes a pedal-powered centrifugal pump, a filter, and hose. When a person sits down and begins to pedal, the pedal cranks converts movement to a rotor, which presses the tube against rollers designed to pass the fluid. By delivering and improving drinkable water for usage, this technology will reduces labour cost and stresses**.

***Keywords*—Decontamination system, pedal crank, Centrifugal pump, Container, Local resident, pure water.**

I. INTRODUCTION

Uncontaminated water and proper sanitation and keeping things clean and disease-free and aid to all who lawfully live in a country, state, etc. is possibly the largest challenge in the twenty first century may be uncontaminated water, decent sanitation, and adequate assistance to all inhabitants. The most striking example of this neglect is the high risk of death among little infants due to water related disorders. Water is essential for survival, and everyone should have access to an adequate supply.

Increasing the availability of clean water can have a positive impact on health. Over one billion people don't have access to sufficient drinking water and clean water, and over five thousand children die every day as a result of contaminated water insects, particularly mosquitoes that spawn in water, cause diseases such as dengue fever, malaria, yellow fever, etc. Drinking water is fetched in India from a distance from the habitat. House wives and their children trek for miles together to get drinking water and pure water, spending hours together to meet their daily needs for their families. Some wealthy residents travel vast distances in their vehicles, such as motorcycles, trucks, and automobiles it burn a lot of fuel.

A single household of five, on the other hand need at least fifteen gallons of water every day. To remove the contaminants, the water can be boiled, but this requires a lot of energy. In villages, water is heated by burning wood, resulting in deforestation and the accumulation of charcoal. Almost all low-income countries have now stated that they are suppling sufficient amounts of drinking water. As the population grows, the number of instances continues to rise. Many youngsters are still dying as a result of water-borne illness. The major goal of this project is to design a water purifier that uses human pedal power to give clean and pure water to the communities and near by villages.

II. MATERIALS AND METHODS

In the arrangement shown in Fig. 1, a standard bicycle is used. This job necessitates the use of a peristatic pump. This positive displacement peristatic pump is used to a variety of fluids. Water is pumped through a flexible pipe that is housed inside a circular pump casing. An exterior circumference is attached to a plate form rotor with numbers of "roller", "shoes", and "wipers," which is then linked to the notch. When the pump starts, the rollers wrapping the tube and move it absent from the entrance a vacuum that draws the liquid out. The water is caught between the narrower portions of the tube by a set of rollers, and it flows towards the discharge.

The forward-facing roller exits the hose and widens the capture area, while the back roller impels the liquid out the release. Peristalsis is a variety of biological systems, including the stomach tract.

International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 4 Volume No.6 July – 2022
DOI:10.46647/ijetms.2022.v06i04.004 ISSN: 2581-4621

Fig. 1

III. WORKING PRINCIPLE

When a person pedals, the water passes from the contaminated reservoir (sump 1) and is pumped by the centrifugal pump, where it converts rotary motion to the rotary chain drive mechanism, then the water passes to the purifier (RO purifier) which actuates and starts to purify contaminated water. Where the unwanted particles are cleared from the water is being purified with help of purifier. And the purified water passes to the tank (sump 2) As shown in Fig. 2.

After purifying the water, we check pH value of purified water. And this experimental setup is also used to generate the electricity by using Dynamo, which is fixed to the wheel.

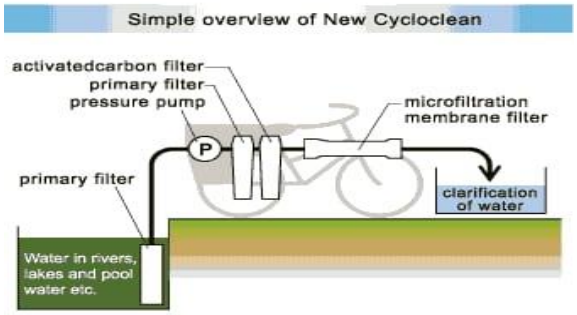

Fig. 2

IV. OBJECTIVES

1. The goal of this paper was to design, create and experimentally, the working of which used in small drinking water supply and garden crop-watering.
2. By pedaling the bicycle wheel rotates there by pointing away from the pump which in turns discharges water from the tank.
3. Pump provide drinking water and crop watering with water in remote areas where electricity is not available. Bicycle is not only free from pollution but also cause healthy exercise.
4. The purpose of this set up is to design a small scale water cleaning kit which needs maintenance and is cost.
5. The system is movable and ecofriendly.

V. LITERTURE SURVEY

Original material and skill can be used to build the pedal operated pump. This bicycle powered pump extracts water at a rate of 2 to 3 gallons per nano second from wells and boreholes up to a depth of 23ft. where electricity isn't available, it provides crop watering/irrigation as well as drinking water. They can be built with locally accessible materials and easily altered to meet the needs of the original in habitant. They save the stoner money on energy bills, can be used anywhere, don't pollute the environment, and provide good activity.

The modest water pump will be straight forward to operate and repair using basic tools, and will provide enough water inflow to wash small area of agriculture. The report explains how the design process works.

VI. SPECIFICATIONS OF BICYCLE CHAIN DRIVE

1. Diameter of the driver D_1=182.07mm
2. Diameter of the driven D_2 =74.4mm
3. Maximum speed of the driver N_1=120 rpm
4. Maximum speed of the driven N_2=293rpm
5. Teeth of the driver T_1=44 numbers
6. Teeth of the driven T_2=18 numbers

International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 4 Volume No.6 July – 2022
DOI:10.46647/ijetms.2022.v06i04.004 ISSN: 2581-4621

7. The center length between driver and driven x=500 mm
8. Length of chain L= $\pi (r_1+r_2) +2x+ (r_1-r_2)^2/x$ =1408.64mm

VII. **PUMP SPECIFICATION**:

1. Diameter of the motor shaft d =13mm
2. Length of the motor shaft l =220mm
3. Type of pump: centrifugal type
4. Power of the pump: 0.5HP
5. Suction diameter of the pump =25.4mm
6. Discharge diameter of the pump =19.05mm

VIII. CALCULATIONS

1. POWER TRANSMISSION

Considering a motor having a power of 0.5 HP at 2200 rpm.

$P = 2\pi NT / 60$

1HP = 0.746K = 746 W

$373 = 2\pi$ x 2200 x T / (60 x 1000)

T = 1619 N-mm

Velocity(V) = $\pi d_2 N_2 / 60$

= (π x 76.2 x 2200)/ (60 x 1000)

V = 9.312 m/s

2. FLOW RATE

$Q = AV = (\pi/4 x .01905^2) x 8.06$

$Q = 2.29x10^{\wedge -3} m^3/sec$

$P = \rho g Q H \Rightarrow H = P/(\rho g Q)$

$= 3743/(1000x9.81x(2.29x10^{\wedge -3}))$

= 16.60m

3. Head

Diameter o impeller = 70mm

Speed of pump = 2200rpm

$V = (\pi dn)/60$

= (3.142x70x2200)/60

= 8.06m/sec

4. **Shaft** : (Shaft type: Solid)

Dimension of shaft

M38

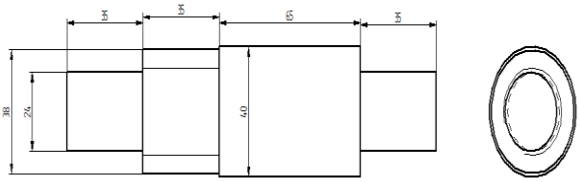

Fig: 3 Dimension of shaft

Material Used: EN8

Diameter of shaft: 40mm

Length of shaft: 170m

Formula Used:

$D_0^3 = 16T/\pi\tau (1/(1-K^4))$

τ=yield shear stress =55 N/mm^2

Torque transmitted T=F x r

F=Load acting=107.91 N

R = wheel radius=303.45mm

T=107.91x303.45=32745.28 N-mm

Substituting in equation we get

Website: ijetms.in Issue: 4 Volume No.6 July – 2022
DOI:10.46647/ijetms.2022.v06i04.004 ISSN: 2581-4621

$40^3 = [16 \times 32745.28/\pi\tau]$

$\tau = 2.60$ N/mm^2

As τ < allowable stress (hence the design is safe)

IX. RESULTS AND DISCUSSIONS

The design focused on all of the generality, invention, visualization, calculation, refinement and detail specification processes that establish the systems form. The design has undergone force analysis to ensure that its performance criterion is not compromised in any way. The design's primary physical parameter's are calculated using appropriate computation's and practical considerations based on reliable theory. As can be seen from the easily accessible accessories used, the design is basic, inexpensive, effective and affordable. The setup is shown in figure 1.

X. CONCLUSION

The positive outcomes associated with access to safe drinking water give a compelling justification for increasing useful goods divided sections aimed at improving the current drinkable water situation as a crucial entry point for attaining far broader work rewards with effort. By absorbing and managing the energy of pedal powder, the pedal operated water purifying system is a new system that is effective in transforming and improving countries like India to have everyday access to enough safe drinking water.

XI. REFERENCES

Curtis, V. And Cairncross (2003), S. Effect of Washing Hands with Soap on Diarrhoea Risk in the Community: A Systematic Review. Lancet Infectious Diseases 3, pp. 275– 281. Howard, G(2006).

Groundwater and Public Health, In: Schmoll O. et al. (eds). Protecting Groundwater for Health:Managing the Quality of Drinking-Water Sources, London, International Water Association Publishing, pp. 3−19.

Payment, P., Hunter, P. R. (2001), Endemic and Epidemic Infectious Intestinal Disease and Its Relationship to Drinking Water.

In: Fewtrell L., Bartram J. (eds), Water Quality Guidelines, Standards and Health, London, International Water Association (IWA) Publishing, 61−88pp.

Garneau, C. McNamara, K. and Chung J. (2008), Peristaltic Pump Project, Unpublished Final Project Report, Team D, ME 340.4, 41pp.

B. Gonzalez ,S. Alzate, J. Cromartie ,K. Hernandez, Advisor: Dr. Andres Tremante (April 7, 2014), Bicycle Powered Water Filtration System, A B.S. Thesis prepared in partial fulfillment of the requirement for the Degree Of Bachelor Of Science In Mechanical Engineering, Florida International University

A. S. Akinwonmi, S. K. Adzimah, F. Oppong, Department of Mechanical Engineering, University of Mines and Technology, Tarkwa, Ghana. 2012,Pedal Powered Centrifugal Pump Purified Water *Supply System, Innovative Systems Design and Engineering ISSN 2222-1727 (Paper) ISSN 2222-2871 (Online) ,Vol 3, No.11*