

MANUALLY OPERATED SPIRAL TUBE WATER WHEEL PUMP

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Abstract - At present world's most prime need is to save conventional sources of energy. Among them the one thing which is attracting concentration is the concern of degradation of fuel sources, the diesel and gasoline oils. Fuel is required in daily life for many purposes like in vehicles, machine operations, etc. The pump also requires fuel for its operation. Hence it is necessary to study the design and working of pump for its further modification. During this study it is found that the 'spiral tube water wheel pump' is an effective method for pumping water or similar liquid without use of electric or fuel supply. Also it is totally eco-friendly method. The designed model is successfully giving the positive results. It is pumping water to give desired discharge and for various heads. So it can be used at different locations having geographical diversity.

Key Words: Spiral tube water wheel pump, conventional sources, head, discharge, geographical diversity.

INTRODUCTION

Around the world, pump is used for many purposes. For this study we are focusing on pump used for agricultural purposes. In rural areas farmers are facing problems of cut-off of electricity. The physical locations of some villages are such that it becomes very difficult to supply electricity to those areas or even if electricity is facilitated, the environmental or weather conditions of those areas are so complex that the electricity providers have to do so. **However we can't change the environmental conditions but can change the technology. We can design the new technology. So the idea of the 'pump without use of electricity' came from here which is named as 'spiral tube water wheel pump'. This pump can be design as per our requirement and with chipsets raw material. Hence the cost of this pump is very low. During the study it is found some drawbacks of this pump. The main drawback of this pump is, as it is totally depend on flowing water, its use will be restricted according to season that is it will be used in only monsoon season when flowing water is available. To overcome this drawback we decided further change in present technology. It is enhanced with the provision of**

manual operation. This designed pump can be used anywhere and in any season.

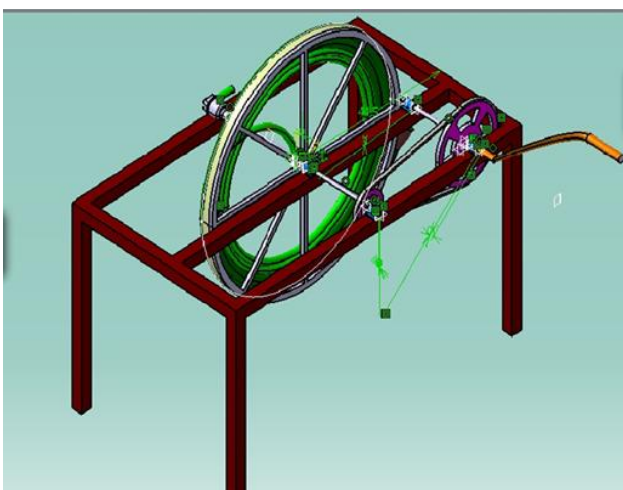
In proposed model, chain drive is mounted over wheel structure on which spiral tube pipe is already fixed. The wheel structure is kept partially submerged in the water, from where water is to be pumped, when force is applied manually to rotate the chain drive through handle, the wheel structure will rotate accordingly. The scoop will collect the water during each rotation and will pump that to desired place due to its spiral action. This method is totally independent of electricity or fuel supply and almost maintenance free. By taking into account rural areas and their physical conditions, this will be the most effective substitute for current pump.

LITERATURE REVIEW

Rahul Urunkar & Prof. P. P. Deshpande [1], have done work on improving chain drive efficiency by changing diameter of drive sprocket, work or invention related to a novel automatic chain tensioning unit, work or invention related to drive shaft driven bicycle, experimental study on the efficiency of bicycle chain drives under a variety of operating conditions and to explore the factors that govern chain drive efficiency. B. N. Dhameliya & D. K. Dave [2], have studied the causes and failure patterns in bearings used in railway bogies and their remedies. It comprises the basic construction of bearing with its detailed design and analysis and types of failure. Manager of asset mangt [3], have published the data to give the allowable pipe sizes, class and materials for water mains. This is consisting of technical guidelines given by South Australian Water Corporation. The objective of these papers are to ensure that all water supply pipes installed in SA Water's infrastructure achieve the required economic life span, of 100 years, it is critical that the materials and characteristics of the pipe types be appropriate to that aim. Samantha Marshall [4], have provided an overview of kenya's water crisis, along with a brief review of the literature and some empirical background. It reviews the main causes of the water crisis and how it affects the health of millions of local peoples. Furthermore, the article summarizes some of the main solutions proposed to overcome the crisis. Nicole Glass [5], have described water crisis was

triggered by a sharp population increase, misguided agricultural policies promoting the use of water, a lack of governmental regulation on using water, and a vulnerable climate to global warming. Due to inadequate water, local peoples are suffering from lack-of-water-induced food shortages, and dehydration-related health problems. M. A. Younes [6], have investigated the pumping stations. Performance of the pumping stations should satisfy water requirements, and management. There are many problems face these pumping stations affecting their reliability and stability. Hydraulic problems are the most important item in the field of pumping station operation and design. The objective of the research is to determine the source of hydraulic problems and to evaluate suction side and operating conditions of the pumping units. Discharge and suction pressures, flow rates, as well as vibration level were recorded simultaneously at different conditions. Henry P. Gavin [7], have studied design of wheel with its spokes. The spokes of three rear bicycle wheels of different spoke patterns were instrumented with strain gauges in order to investigate the effect of the spoke pattern on the spoke strain and fatigue resistance properties of the wheels. Analytical, numerical, laboratory, and field studies show that spoke strains due to radial loads and in service conditions are insensitive to the spoke pattern. M. Denny [8], have given physical study of waterwheel design and its performance. The waterwheel evolved over two millennia to become an efficient machine. They analyse the physics of waterwheels, and construct simple models that show why the two most important types had very different efficiencies. Their analysis reveals the important design parameters, and captures the essential features of our oldest mechanical power source. In particular, they have calculated the efficiencies of several types of waterwheel

PROJECT MODEL



It consists of one wheel structure. Then one poly-pipe is spirally wounded and it is fixed on the wheel structure, which is mounted on main shaft with the help of a bearing. For giving rotation to this wheel structure it is provided with a chain drive. A handle is provided over this chain drive for giving the pumping has to be done.

PARTS SPECIFICATIONS

Sr	Part	Mtrl	Design criteria	Dim. (cm)
1	Frame	M.S.	Bending, shear	100*51.5*46
2	Rim/ wheel structure	M.S.	Shear	φ58.5
3	Pipe	PVC	-	φ3/4" (300cm), φ1" (330cm)
4	Shaft	M.S. (EN8)	Bending, shear	φ20, 25.7cm long
5	Bearing	STD (P204)	-	
6	Sprocket	STD	-	φ ₁ 18.5, φ ₂ 8
7	Chain (1/2")	STD	-	n= 80
8	Handle	M.S.	Bending, shear	φ20

Table-1 Parts Specifications

ACTUAL MODEL



RESULTS

RPM	DISCHARGE (lit/min)				
	For				
	Ground level	head= 1ft	head= 2ft	head= 3ft	head= 4ft
15-25	7	4.5	3.2	2.3	1.8
25-35	8.5	5.1	3.6	2.8	2.1
35-45	5.7	4	3.1	2.1	1.5

Table-2 Results

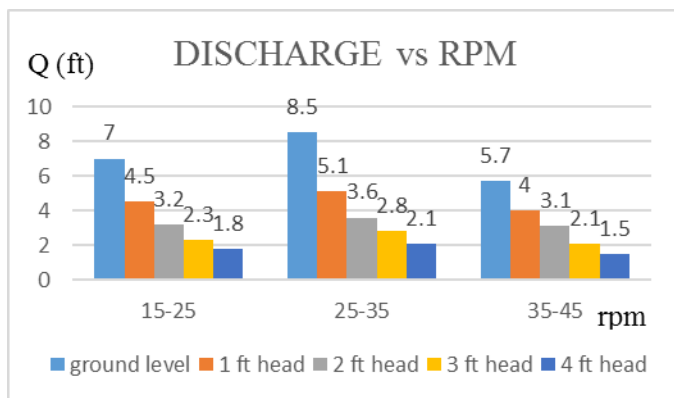


Chart -1 Discharge Vs RPM

CONCLUSION

Presently the pumps in use are operated by electric or fuel supply. The current pumps are temperamental and noisy. Therefore it requires maintenance very frequently. As it runs on electricity or fuel, it has high running cost. The proposed model is made up with chip raw materials and is purely independent of either electric or fuel supply. Hence the installation and running cost is greatly reduced. The maintenance problem is also eliminated. Due to this it will be the best option for current pump in rural areas. The different results we have calculated with the help of different parameters such as discharge, head, rpm of wheel structure, torque applied, size of pipe etc. The analytical study have proved the effect of wheel size on discharge, effect of wheel size on head, effect of torque applied on discharge, effect of torque applied on head etc. Hence spiral tube water wheel pump is the best substitution for current pump as it can be used in rural areas where frequently breakdown of electricity occurs.

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