iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 5 **Issue:** III **Month of publication:** March 2017

DOI:

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

Volume 5 Issue III, March 2017
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

An Experimental Study of Advanced Universal Impeller System with Limited RPM using Pedal Mechanism

S. P. Kamanwar[1] , K. N. Wagh[2]
[1]M-tech Student, [2]Asst. Professor, Mechanical Engineering Department, Guru Nanak Institute of Technology, Nagpur, India.

Abstract: ***In this paper discuss that the technical evolution and latest technological trends with considerations need effectively creation an optimistic system like to design and construct advanced universal impeller system with limited r.p.m. Using pedal mechanism. The aim of this paper is followed by using human power and available resources taken into consideration so that this will be helpful for common man in their daily life. This works carried out on the human effort power so that; there is no utilization of any electricity. Also this work can be useful in the highly inflammable refineries, factories and sensitive plant area to provide oil, petrol and diesel supply to plants where system cannot use electricity because of chances of fast burning and heavy blasting with availability of small fire. Further there is requirement to lift petroleum product towards overhead tank for any relevant application. In this project there is manufacturing of advanced impeller and related design to lift the oil with minimum r.p.m. Without using electricity. This works on the principle of centrifugal force and vacuum created by minimum rotation of impeller.as compression and sudden release of a tube by creating negative pressure in the tube and this vacuum created draws fluid from the sump. Initially with the use of basic things available with us that are driver i.e. Front sprocket pedal gear, driven element i.e. Sprocket gear and chain. In this project, pumping of oil, petrol and diesel done by centrifugal pump which is created according to oil, petrol and diesel movement should at the top and inlet at the bottom level so that oil, petrol and diesel can be able access from anywhere and able to lift at the top of the building while creation of this vacuum creation is an important role which is taken into consideration.***

Keywords : ***hybrid impeller, pedestal bearing, round flange, mounted bearing***

I. INTRODUCTION

This projects works on the bicycle pedal gear and related setup. Initially with the use of basic things available with us that are Driver i.e. front Sprocket pedal gear, driven element i.e. Sprocket gear and chain. In this project, pumping of oil, petrol and diesel done by centrifugal pump which is created according to oil, petrol and diesel movement should at the top and inlet at the bottom level so that oil, petrol and diesel can be able access from anywhere and able to lift at the top of the building while creation of this vacuum creation is very much important task which is taken into consideration. Centrifugal pumps are a sub-class of dynamic axis symmetric work-absorbing turbo-machinery. Centrifugal pumps are used to transport fluids by the conversion of rotational kinetic energy to the hydrodynamic energy of the fluid flow. The rotational energy typically comes from an engine or electric motor. The fluid enters the pump impeller along or near to the rotating axis and is accelerated by the impeller, flowing radially outward into a diffuser or volute chamber (casing), from where it exits. There are basic three types of impeller which is described below. The efficiency of centrifugal pump is determined by impeller. Vanes are designed to meet a given range of flow condition.

A. Open Impeller

Vanes are attached to the radial hub, without any form, sidewalls or shroud and are mounted directly onto a shaft. It is structurally weak and requires higher NPSHR value. It is used in small diameter, inexpensive pumps, and pumps handling suspended solids. It is more sensitive to wear than closed impeller.

B. Closed Impeller

The closed impeller has both a back and front wall for maximum strength. They are used in large pumps with high efficiency and low NPSAR. It has high wear rate. It is most widely used impeller in centrifugal pump handling clear liquid.

II. LITERATURE SURVEY

A. M. P. Mohurle et al. (2016)

Studied importance of human power as an alternative energy source is investigated, since beginning to present state and its future scope. Natural fuel use is increased due to industrial development and these sources oil, coal and natural gas reservoirs are limited. Energy crises need to search for alternate source of energy that is specifically renewable energy. Human power credit is more because of health benefit as a source of energy. More effective use of human power could be achieved through properly designed mechanisms. Human power as prime mover used to operate working unit is termed as human powered machine. Design considerations for bicycle mechanism are discussed in this paper. Owing to appropriate and most effective technology to use human power efficiently is bicycle technology. In bicycle technology operator uses mostly pedal to operate machine and transmits Power through crank, chain and freewheels to the working unit. This machine is widely used to generate electric power, to operate various home appliances, to drive water pump, harvesting activities in agriculture sector and simultaneously useful for physical fitness of operator.

B. Amit Sartabe et al. (2015)

Studied the concept of Human Powered Multi-Purpose Machine mainly carried out for production based industries. Industry is basically meant for Production of useful goods and services at low production cost, machinery cost and low inventory cost. Productivity rate maintaining the quality and standard of the product at low average cost. They have to developed a conceptual model of a machine which would be capable of performing different operation simultaneously, and it should be economically efficient. it can be used in remote places where electricity is irregular or insufficient. It is designed as a portable one which should be used for cutting in various places. It should be used for operating on materials like thin metal, wood and p.v.c. Energy is the most vital aspect in development of modern technological civilization. In the present work, a human powered multipurpose machine is developed which can perform three types of operations drilling, sawing and grinding.

C. Daniel Davis et al. (2014)

The objective of this paper was to design fabricate and experimentally investigate the working of Pedal Driven Hacksaw (PDH). PDH was working on Slider Crank Mechanism. The experiment was done using PDH and plywood work pieces. The main parts of PDH is hack saw, reciprocating rod welded to the pedal of a bicycle, flywheel, sprocket and chain drive. The hack saw was connected with the reciprocating rod. By pedaling the bicycle the reciprocating rod moves, the hack saw moving with the rod. The plywood to be cut was placed under the hack saw. Thus the plywood can be cut without using external source . The performance characteristic of the PDH was compared with Hand Hacksaw at different rpm. The results indicate that the PDH had given better, accurate and faster cuts as compared with hand hacksaw at different rpm. PDH reduces the effort of cutting to a great extent.The result shows that cutting depth of about 17 mm can be obtained in one cycle of strokes for around100rpm.

D. Martin O.J. et al. (2014)

Studied design, fabricate and experimentally investigate the working of Pedal Powered Centrifugal Pump (PPCP) which used in small drinking water supply and garden irrigation. PPCP have a centrifugal pump operated by pedal mechanism. The centrifugal pump is located on its stand in such a way that driven shaft of the centrifugal pump is driven the bicycle wheel. By pedaling the bicycle, the bicycle wheel rotates, there for rotating the centrifugal pump which in turns discharges water from the reservoir. PPCP provides drinking water and irrigation in remote area. PPCP is designed as a portable one. The experimental investigation was perform of the PPCP was carried out at various rpm. The results show that PPCP had given a considerable amount of discharge and head. The PPWP uses only manual power thereby reducing the utility cost. Final result shows that discharge is about 0.0025m3/sec can be obtained for around 140rpm.

E. Sushil Dopekar (2015)

Science is basically "passive" observation of the universe, as it exists to generate knowledge. The project is work on the human powered base wood cutting machine which gives the less efforts of man and commonly used in rural areas where there is no power supply. The design gives a smooth operation during the cutting process. The cutting force is given by means of chain drive, gear assembly and other kinematic mechanism and all the parameter need to be optimized to get maximum cutting force. The machine is used for heavy duty wood cutting process for multiple operations like furniture; farm equipment's, workshop and construction areas

etc. machine is light in weight and portable machine.

F. Dinesh Kumar V T et al. (2016)

Studied Pedal operated circular saw machine which can be used for industrial applications and household needs is fabricated. It does not require any specific input energy or electric power. The objective of this model is using the conventional mechanical process which plays a vital role. This project made up of a larger sprocket which rotates with human powered pedal. The smaller sprocket is connected to the plane which is mutually perpendicular to the axis of the larger sprocket and rotated by using chain drive. The smaller sprocket is rigidly supported by means of shaft and bearing. The circular saw is mounted on the same shaft of the smaller sprocket. When the pedal is run, circular saw rotated which in turn cuts the wooden block material. The main aim of the project is to reduce the human effort for machining various materials. The power circular saw machine, which runs on human power, based on the principle of the conversion of rotational motion in a mutually perpendicular axis. Importance of this project lies in the very fact that saving of energy. cutter can be used and transferred to working place easily. if needed they can generate electricity with their project by connecting it to dynamo, diode and battery.

G. G.P.Patil at al. (2015)

Studied an experimental analysis of a hydraulic gate is a control equipment used for controlling the flow of water through any component of the irrigation system. it holds the water on the upstream side though some gates deal with a reversible water flow in special cases.Various component of hoist mechanism have been made so proportional as to take the worst load coming on individual component. The various stresses induced along with manual calculation check during design procedure for safe value have also been verified by use of CATIA software so that we have checked our design successfully for all the stress induced in each & every component and the software increases accuracy andreduce chance of mistake.

H. Rocky Katoch at al. (2012)

Studied an experimental setup of Pedal power generation. Humans are capable to generate approximately 150W of power while riding bicycle. This power goes waste without any use. By making use of this energy, we can run many electronic devices. A dynamo or an alternator can be used for harvesting the energy generated by a cycle rider. Charging of the battery can be done by a layman by just connecting the circuit to the output of the dynamo and it is connected to the bicycle. It would be charge the NiMH batteries. The rotational energy of the tires in the bicycle, generated by pedaling can be used to operate smallpowered devices. Both dynamo and alternator are used and various options are situations where a dynamo or alternator can be used are provided.

I. Ishan P. Lade at al. (2015)

Studied Bi-cycle operated centrifugal pump for water lifting. Mechanism consists of single centrifugal pump which is fixed on the rear wheel bi-cycle. by Paddling to pump 30-40 liters of water lifted to a height of 30 feet. By-cycle operated centrifugal water pump which isrun by rotating the pedal of a cycle. The system consist of a bicycle, rim, impeller, pulley and inlet and delivery pipes. pump is mounted on Rear wheel of cycle which is operated due to the rotation of wheel which creates the vacuumed in pump. By using a paddling we drive a bicycle, the rear wheel of the bicycle rotates at particular rpm using paddle mechanism. And this wheel rotates the impellers by sliding action between wheel and pulley but the rpm of the wheel is very low so they can't get require head and power effort on the paddling is low so for generating high speed in less power they can use the pulley which is mounted on the shaft of the pump.when they drive a bicycle the wheel of bicycle are rotate so they can provide a pulley over the wheel for high rpm , the pulley is mounted on the shaft impeller of impeller of the pump the impeller is rotate due to rotating of wheel with rotation of pulley. So they operate the pumpand lift the water at a particular head.

J. V. Girish at al. (2016)

The project consist of design and fabrication of a water lifting device without electricity and fuel. Here they use impulse pump which uses the energy of falling water to lift water to desired height. if properly installed, they will give many trouble free years of service with no pumping costs. Due to this reasons, the hydraulic ram is an attractive solution where a large gravity flow exists. Flow rate and delivery head will be increased by using contraction in drive pipe. Supply head is important factor which decides delivery head as well as flow rate. Flow rate can be increased by using parallel pumps. To have more delivery head at certain supply it is only possible to have series of pumps, but they need to have reservoir prior to the second pump in order to have continuous flow

as well supply head.

K. Dhruv Duggal at al. (2014)

Studied bicycle operated pump filter. The mechanism comprises of single centrifugal pump which is fixed with the rear wheel bicycle and runs by rotating the pedal of a cycle at a particular rpm. Paddling for just aminute or two is enough to pump 5-10 litersof water to a height of 10-15 feet. Thecomplete system includes a bicycle rim, impeller, an inlet and delivery pipes. The finalsupporting shaft is connected with animpeller. The wheel rotates the impellers by sliding action between wheel and friction roller of the pump. Using this process of paddling water can be lifted from the pipe into the form for cultivation. It is useful for pumping water from river, ponds, wells and similar water sources enabling poor farmers for pumping water for irrigation and cultivation. To overcome flow problems and to move liquids from place to place pump is used. The achievable pumping head and flow rate are directly related to the input power. Bicycle has both the functions of transporting equipment and driving membrane filtration system. UF membrane (0.5 micron) removes suspended particulates, colloidal material and certain bacteria. Cleaning of membrane is easily done by switching positions of flexible tubing direction and pedaling so that clean water flows in reverse direction, flushing out the particulates stuck on membrane surface.

L. Ratnesh Mishra at al. (2016)

Project report contain information about pedal powered water pumping and purification. The PPWPWP works only on mechanical energy. PPWPWP was designed for irrigation in various places. PPWPWP consists of a centrifugal pump operated by pedal mechanism. The centrifugal pump is mounted on its stand in such a way that driven shaft of the centrifugal pump has butted to the bicycle wheel. By pedaling the bicycle, the wheel rotates, thereby rotating the centrifugal pump which in turns discharges water from the sump and transmitted to prefilter switch purify the water simultaneously. Pedal powered water pumping and purification meet these problems as this system only works on pedal powered there is no need of electricity neither to pump nor to purify the dirty water.The experimental investigation was executed and performance of the pedal powered water pumping and purification hadcarried out at different rpm.

III. CONCLUSION

Literature survey show the improvement in Human power based water lifting mechanism. However only little work is done with pedal and centrifugal mechanism structure for expected delivery head. This project used to lift the water from lower domain towards upper domain i.e. towards overhead tank using advanced minimum RPM impeller via human power assembly. The impeller having capability that the impeller can be able to lift water towards upper higher overhead tank as it is created according to vision i.e. huge suction with minimum RPM so it can be able to absorb water from ground also. This impeller basically hybrid type so it can able to lift water, oil, fuel, highly inflammable solution with any viscosity. This project uses sprocket chain drive mechanism so load transfer is easier with minimum loss is possible. As using human power system main sprocket is rotating and small sprocket is placed over shaft of impeller so power transfer is suitably maximum so with the help of this kind of mechanism i.e. sprocket chain roller system can able to lift water or any solution towards overheat with variable increasing rate dimension that is the advantage of this project that means as system want to lift water greater than previous once so we need to increase the rotation of impeller with few RPM so system can able to lift water with increasing rate.

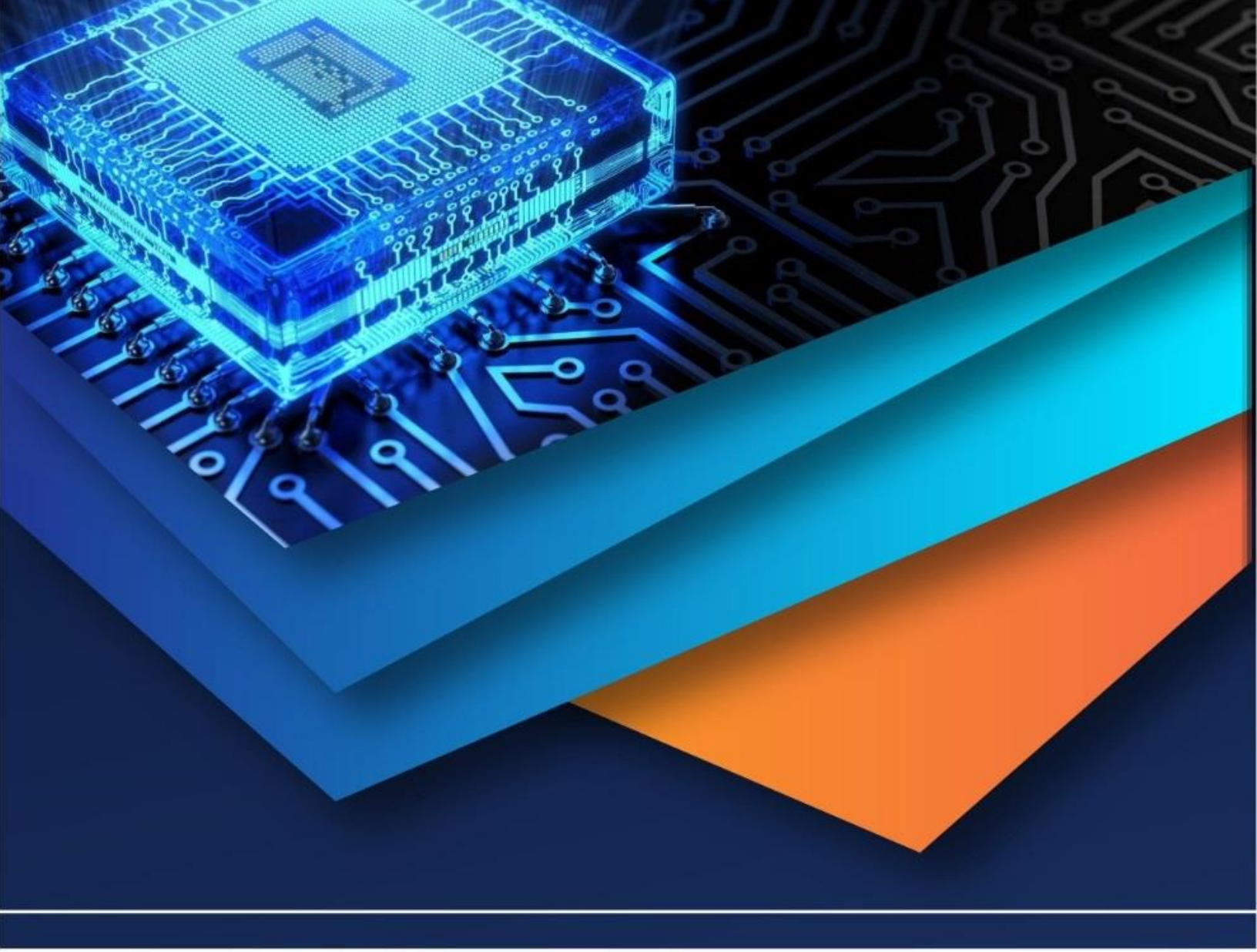
REFERENCES

[1] H. Krain, “A Study on Centrifugal Impeller and Diffuser Flow”, ASME Journal of Engineering for Power, Vol.103, No.3, 0ctober1981, Pp. 688-697.
[2] Guellich, J. F., Bolleter, U., “Pressure Pulsations in Centrifugal Pump”,Journal of Vibration and Acustics,Transaction of American Society of Mechanical Engineers, Vol.114, 1992, pp. 192.
[3] Cornelius Scheffer,“PumpCondition Monitoring through Vibration Analysis” Pumps:Maintenance, Design, and Reliability Conference, 2008.
[4] Omprakash, Gupta, K., Nakra, B. C. ,“Vibration and Noise Monitoring of Centrifugal Pumps”,first international symposium on Pump,Noise and Vibrations, Paris, France , July 7-9 , 1993, pp. 493.
[5] Seemin sheikh, Dr.CC Handa, AP Ninawe. Internal journal of engineering and research of a generalized design approach for Hydraulicrampumps, Oct 2013
[6] Cudina, M. S.,“Noise as an Indicator of Cavitation and Instability in Centrifugal Pumps”, Journal of Mechanical Engineering, Vol.45, 1999, pp134–146
[7] Khalifa, A. E., Al-Qutub, A. M., “The Effect of Impeller-Volute Gap on Pressure Fluctuations Inside a Double-Volute Centrifugal Pump Operating at Reduced Flow Rates”, 7thWorld Conference on Experimental Heat Transfer, Fluid Mechanics and Thermodynamics, Krakow, Poland, 28 June-03 July, 2009, pp. 905-912.
[8] Bernd Dürrer, Frank-Hendrik Wurm, “Noise sources in Centrifugal Pumps” Proceedings of the 2nd WSEAS Int. Conference on Applied and Theoretical Mechanics, Venice, Italy,November 20-22, 2006.
[9] Birajdar, R., Patil, R., Khanzode, K., “Vibration and Noise in Centrifugal Pumps- Sources and Diagnosis Methods “, 3rd International Conference on Integrity,

Volume 5 Issue III, March 2017
ISSN: 2321-9653

Reliability and Failure, Porto/Portugal , 20-24 July 2009.

[10] Guo, S., Maruta, Y., "Experimental Investigation on Pressure Fluctuations and Vibration of the Impeller in a Centrifugal Pump with Vaned Diffusers", JSME International Journal, series B,Vol. 48, No. 1, 2005.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY