



Mechanical Engineering

Elixir Mech. Engg. 72 (2014) 25276-25279

Elixir
ISSN: 2229-712X

Electricity produce by using sugarcane crushing machine an experimental study of energy transformation by using turbine setup

S.Manikandan*, P. Manikandan and S.Hariprasath

Department of Mechanical Engineering, Jayalakshmi Institute of Technology, Thoppur-636352, Dharmapuri, Tamilnadu.

ARTICLE INFO

Article history:

Received: 6 March 2014;

Received in revised form:

19 June 2014;

Accepted: 29 June 2014;

Keywords

Pelton wheel turbine

Kinetic energy, Mechanical energy,

Electricity, Work, Water tank,

Pent stock.

ABSTRACT

This is innovative idea to produce electricity. Now a day's world mostly depends up on the electricity, why means all industry machinery are run by source of electricity. In summer time don't get the wind and water energy properly. So this time electricity demand are occur .so this kind of problem 50% satisfied the project. This system produces two outputs give one input. The system consists two circuits are primary and secondary circuits. To give input energy to the primary circuits and produced mechanical energy. This Mechanical Energy applied to the secondary circuit. The secondary circuits produce the two output energy. The two output energy is work and electrical energy. Finally DC generator produce 2kw and also work are done. This project using small scale industry means get many profits.

© 2014 Elixir All rights reserved

Introduction

What is importance of electricity in daily life? , Electricity is an integral utility in modern society, with links to everything from a human's subconscious fear of the dark to the practical need for working illumination in an industrialized world. The entire world essentially runs on electricity, in one form or another ,and while combustibles are essential at the present time as well, their time is nearing an end. Electricity is not only ingrained in modern life, it is also critical for its continued existence, as electricity will soon be the main source of power produced world-wide. All of the modern energy alternatives are focused on creating electricity by renewable means, such as wind turbines, solar arrays and geometric heating .ultimately using steam to turn the large turbines, creating electricity. Electricity is the future but it is also the past and present, as without a continuous power supply, many living with assistance would not be able to cope. Most of the modern medical treatment that are commonplace today, would be extremely risky if not impossible, without modern power and lighting.

Lighting alone is the backbone of civilization, paving the way for extended work capabilities, development and comfortable living without proper lighting, travel would be a life-threatening process at every step, risking collisions, getting lost frequently and impact with stationary object, even with the modern, high-power headlights on vehicle today. Electric power run the world, with governments, corporations, and financial institution replying on it daily for communication, commerce and even direct trading. The grip of electric power also extend to the smallest and seemingly insignificant aspects of the average citizen, from mobile communication to the ability to cook indoors. Electric power is and will continue to be. One of the most important energy forms available to the human race as a hole and as fossil fuels steadily run out, more and more dependence upon the it will become the standard but now a day electricity demand are occur in Tamil Nadu, so this kind of problem solved by this project.

Objectives

A Characteristic of turbine energy by using that, we produce mechanical energy and electricity. The main objective of the project "to give single input and produce two outputs".

This is innovative idea to produce electricity. This project may use small scale industry means get many profits.

Literature Reviews

Sugar Cane Trash Processing for Heat and Power Production

Kurt Woytiuk (2006),This paper summarizes a preliminary investigation into new sugar cane trash processing methods at the Puunene Sugar Mill on the island of Maui, Hawaii. The mill is owned and operated by *Hawaiian Commercial and Sugar*, a subsidiary of *Alexander and Baldwin*. The objective of the investigation was to eliminate the practice of open field cane burning used in current cane harvesting methods in order to dispose of the non-sugar bearing component of sugar cane called "sugar cane trash." As opposed to open field burning, sugar cane trash could be used to offset the need for supplemental fuel in the existing power side of the milling process. However, due to the herbaceous nature of sugar cane trash, without treatment, high levels of slagging and fouling are certain in conventional biomass fired spreader stoker boilers.

Laboratory and pilot scale tests were carried out to investigate the removal of elements known to cause boiler slagging and fouling by water leaching. Temperature, leaching duration and particle size were varied in the laboratory. Particle size was found to effectively reduce slagging and fouling probability of the potential fuel. This was determined by observing an increase in ash fusion temperatures, a reduction in chemical components known to cause boiler fouling and a decrease in total alkali concentration per energy unit below the level empirically found to be the threshold for slagging and fouling.

Similar pilot scale tests were also performed, but particle size reduction was made impossible due to equipment failure and pilot scale samples were not reduced below the threshold for slagging and fouling in the leaching treatments. Further laboratory scale tests are recommended to determine the precise particle size limits below which slagging and fouling will not occur.

Improvement of the fabrication and testing of a sugarcane juice extractor for the cottage industry

Makinde-ojo, Ayoola Macjay (2010), university of agriculture Abeokuta, Over the years, sugarcane production in Nigeria has been championed by small-scale farmer who end up terminating the juice extraction at the consumption level using the teeth to bite off the rind and chewing on the internal tissue to suck up the juice. To boost the production of sugarcane and its products, Dr. Ukatu A. C. (Late) and Mr. Soetan A. C., created a sugarcane juice extraction machine fabricated and constructed in the Agricultural Engineering department of the University of Agriculture, Abeokuta. This juice extraction machine, constructed over two year ago, has a juice extraction efficiency of 70 – 77% and a rate of juice extraction of 60 – 65%.

To this end, the required improvement and modification for the machine is to be carried out in the course of this project work. This includes the maintenance and cleaning of the machine parts, identification of the required improvements, casing of the machine operating chamber for the juice extraction, painting and aesthetic improvement, and testing the machine performance. To achieve this, the appropriate materials were purchased from a Gate market in the city of Ibadan, Oyo state.

While the sugarcane specimens of the *Saccharum officinarum* species, were purchased from Elewera market, Abeokuta, Ogun state. The purchased materials for the machine improvement work were fashioned into the required form and installed, while the purchased sugarcane was used in testing the improved machine.

Finally, aside the obvious upgrade in the aesthetics of the machine, the improved sugarcane juice extraction machine for the cottage industry was tested and the extraction efficiency was obtained as a range of 65% – 76%, while the rate of juice extraction is 56.19kg/hr.

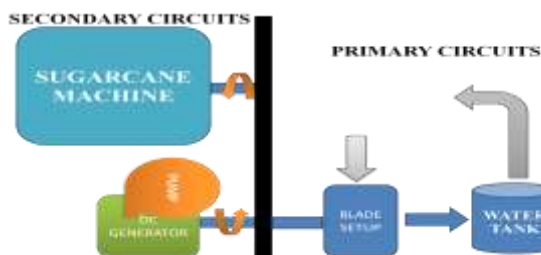
Experimental methods

Construction

The constructions have two circuits. The two circuits are primary and secondary circuits. The primary circuits consist of water tank, pump(2HP), pentastock, blade setup. The blade setup has a pelton wheel turbine.

Dimensional views

It is 2-dimensional view of total process has shown below.

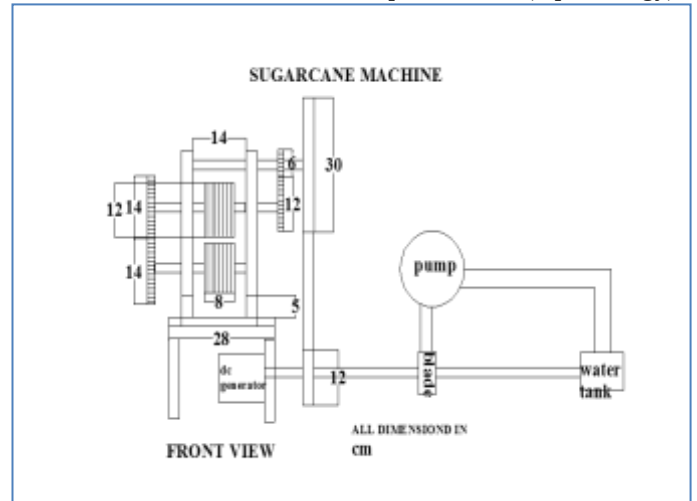


The pelton wheel turbine shaft connected to the secondary circuit. The secondary circuits have sugarcane machine, dc generator (5HP). The generator are coupled to the pelton wheel

turbine and also sugarcane machine pulley connected to the generator pulley using belt.

Working

Initially the electric motor (2HP) switch will be ON. The motor will be rotate and also rotate the pump. The Pump suck the fluid in water tank in way of pentastock and discharge the fluid in blade setup. The blade setup having the pelton wheel turbine. The water will strike to the pelton wheel(input energy).



The pelton wheel will be rotate(1750rpm). It has shaft coupled to the dc generator and rotate (1750rpm) and produce electricity (2KW) and also the rotation of dc generator is transmitted to the sugarcane machine pulley through the belt. The machine run means work are done. The process are continued. It is also called cyclic process.

calculation

specification of pump:

1. Diameter of the impeller D_1 : 200mm
2. External diameter of the impeller D_2 : 400mm
3. Speed N : 1200rpm

Assume data:

1. Angle made by relative velocity at inlet (θ) : 20(deg)
2. Angle made by relative velocity at outlet (ϕ) : 30
3. Angle made by absolute velocity at inlet (α) : 90
4. Whirl velocity of inlet (V_{w1}) = 0
5. Velocity of flow (v_{f1}) = (v_{f2})

Calculation For Outlet Velocity Of Water:

✓ Tangential velocity of impeller inlet(u_1):

$$U_1 = \frac{\pi D_1 N}{60}$$

$$= \frac{\pi \times 0.2 \times 1200}{60}$$

$$U_1 = 12.56 \text{ m/sec}$$

✓ Tangential velocity of impeller outlet(u_2):

$$U_2 = \frac{\pi D_2 N}{60}$$

$$= \frac{\pi \times 0.4 \times 1200}{60}$$

$$U_2 = 25.13 \text{ m/sec}$$

Velocity of flow at inlet (v_{f1}):

$$\tan \theta = \frac{v_{f1}}{u_1}$$

$$= \tan \theta \times u_1$$

$$V_{f1} = 4.57 \text{ m/sec.}$$

Whirl velocity at outelt (v_{w1}):

$$\tan \phi = \frac{v_{f2}}{u_2 - v_{w2}}$$

$$V_{w2} = 17.215 \text{ m/sec}$$

Outlet velocity of pump:

$$V_2 = \frac{v_{w2}}{\cos \beta}$$

$$V_2 = 20 \text{ m/sec}$$

Work done:

$$W = \frac{VW2 \cdot U2}{G}$$

$$= \frac{17.215 \cdot 25.13}{9.81}$$

$$W = 44.1 \text{ NM/N}$$

Nozzle

$$A_1 V_1 = A_2 V_2$$

$$\left(\frac{\pi}{4}\right) * (0.80)^2 * 20 = \left(\frac{\pi}{4}\right) * (0.30)^2 * V_2$$

$$V_2 = 142.22 \text{ m/sec}$$

Hence the outlet velocity of nozzle is 142.22m/sec to strike direct on the turbine blade.

Conclusion

Thus the experimental setup and that specification are identified. By using the water tank, pump, blade setup, generator, and sugarcane machine produce the electricity. Furthermore we will research the related work and execute the idea for the future work.

We use project at democracy area. Identify the fabrication setup like pump, water tank, turbine setup, dc generator & sugarcane machine. Thus the project of design & calculation are obtained.

Acknowledgement

The author gratefully acknowledge the technical support provided by the Research centre, Department of Mechanical Engineering, Jayalakshmi Institute of Technology, Thoppur,

Dharmapuri, Tamilnadu, India.

References

- Amosun, A., Gbabo, A. and Wada, A.C. (2000). Open Pan Sugar Processing Technology: An option for developing Countries. *Sugar Tech* (2). June 2000 India
- Anonymous (1999). *Nationally Co-ordinated Research Programme on Sugarcane*, National Cereals Research Institute Annual Research Review Meeting, Badeggi, Nigeria. 20-23 April 1999. pp. 50-51
- Busari L. D. (1999). *Project profile and viability appraisal for the NCRI 10 TCD Brown Sugar Processing Plant*. National Cereals Research Institute, Badeggi, Nigeria. Pp3.
- Fry, J (1997). Global perspective of the Sugar Industry. Pp.1-16. In: Intensive Sugarcane production: Meeting the challenge beyond 2000. *Proceedings of the Sugar 2000 Symposium*, Brisbane, Australia, 20-23 August 1996.
- KurtWoytiuk (2006), Sugar Cane Trash Processing for Heat and Power Production: Lulea university of technology.
- Dr.ScottTurn, Cane trash processing proposal, assistant researcher at the Hawaii natural energy institute.
- Makinde-ojo, Ayoola Macjay(2010),Improvement of the fabrication and testing of a sugarcane juice extractor for tshe cottage industry: university of agriculture abeokuta.
- Wikipedia (2010), Sugarcane. <http://en.wikipedia.org/wiki/Sugarcane>
- Dr.R.K.Bansal ,a textbook of *fluid mechanics and hydraulic machines*.