Lifting of Water by Wind Energy

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Abstract:
Since time immemorial, the main source of energy has been coal, oil, natural gas, nuclearenergy, wood and coal. However, all these sources are limited and are the main cause ofpollution and this has led to development and more focus on sustainable energy supply withminimum pollution effects. Hence research and analysis has shown that wind energy, solarenergy and biomass are the most prominent solutions to the above problems because they areeco-friendly and readily available in nature.
Wind energy can be generated using windmills that provide mechanical energy that is useddirectly on machinery e.g. water pump and grinder; or wind turbines that provide electricalenergy. The main objective of our project was to design a windmill .
Windmills are classified into two main types based on the axis about which they rotate. Horizontalaxis has the main rotor shaft running horizontally and if the rotor must be oriented inthe direction of the wind, a wind vane is coupled with a servomotor. Vertical axis has the mainrotor shaft running vertically.

Keywords: Wind Mill, Wind Energy, WaterPump, Reciprocating pump, Blade, Natural resources, Renewable energy, Aerodynamic blade.

Introduction:
The utilization of renewable energy is popular, as the issue of global warming comes up and People are trying to anticipate the extinction of fossil energy. One of the energy sources which is nowgetting attention and popularized is wind energy. Other than electric generating and millingutilizations, wind energy could also be used as energy sources for desalinating process, waterpurification and water pumping. The social and economic health of the modern worlddepends on sustainable supply of both energy and water. On the other side, with the increasingpopulation, industrial and agricultural activities, available water resources has been excessivelyexploited and severely polluted.

Literature review:
Wind is a natural and renewable resource that is freely available all over the world. Harnessing this power for pumping water would save a lot on power costs that are continuously on the rise. Also, wind power is available in remote regions that have not yet been connected to the national power grid. A windmill provides the best way of harnessing this wind power and using it to pump water that is below the surface or delivering the water to a raised storage tank.

P.Jagadeesh, G.Sampath, S.P.Saran, M.Selva, K.Srithar [1]; In this project wind energy is used to rotate the wind blades. This blade is coupled to the shaft. At the end of shaft the flywheel is placed. The eccentric arrangement is provided in the flywheel. Wind blade provides the continuous motion which helps to supply the water continuously .Hence research and analysis has shown that wind energy, solar energy and biomass are the most prominent solutions to the above problems because they are eco -friendly and readily available in nature.

Vivek Prasad, Manoj Swami, VaibhavTambe, FirojKamate, Sunil Bagade[2]; The goal of project is accomplished from the requires analysis and fabrication of prototype that is utilization of wind power to pumping water and generate electricity. Most preferable and suitable material from the design consideration point of view satisfying all the optimum condition and requirement is found to be Polypropylene Plastic. From result we have seen the efficiency of aerodynamic shape blade.

Ronak D Gandhi, Pramodkothmire, Debarshi Sharma, Bhushankumbhare, ShubhamChoukade[3]; This research paper explain idea about the current designs of the small scale wind mills along with the market requirement followed by the design of an innovative wind mills system. In this research paper focussed areas such as current designs, power generation, blade design power saving and fail safe methods are taken into consideration. The paper also considers the development difficulty limiting the design enhancement such as noise, aesthetics, material cost, maintenance, and other issues. These are the problems which may affect the design, manufacturing and marketing of the product. This report also elaborates the design and development of such a wind turbine blade profile for domestic application by comparison with various profiles. This research is used for producing electricity at low wind speeds which can be used to power the lighting requirements of a house.

V. R. Gosavi, Dr. Anil K Deshmane[4]; This Paper proposes atomized system for efficient use of water in Agriculture. The idea behind this project is to develop an inexpensive and user friendly system which will provide an additional sense to the Agriculture field so that the expenses toward the Electricity, Manpower, and water requirement can be minimized and more efficient water delivery can be made possible. This project involves the evolution of watering manually to watering automatically.

E. P. Reznicek, E.I.1 and A.C. Elmore [5]; The objective of this paper is to characterize the performance of a Hamburg Germany Engineers without Borders designed wind pump. Speci

Jialin Zhang, Zhenggui Zhou, Yansheng Lei [6]; This paper establishes the initial blades based on the S822and S823 airfoils for low wind speed, which are put forward bythe National Renewable Energy Laboratory (NREL). The paperthen seeks to optimize the chord length and installation angle ofthe blade according to genetic algorithm and calculation based onBEM method. Finally, this paper made a further analysis and test of the design points by CFD method. Results of the numerical study proved that the optimized wind turbine blades possess high aerodynamic performance in low wind speeds. This paper uses the Hicks-Henne function for parametric modelling blades, and genetic algorithms that possess parallelism and global optimization ability as the optimal numerical method.

Objective

- Lifting the water without using electricity and fossil fuel
- Setup must be nonpolluting and less noisy in operation.
- Maintenance free, one time investment is preferable.
- Installation must be easy and cheap.
- Energy used must be cheap, clean and renewable.
- Solution must be eco-friendly.

Methodology

- Identification of the problem (site visit)
- Literature review
- Data Collection
- Finding solution to the problem
- Design of product
  - Design of blades
  - Material Selection
  - Selection of pump
  - Gearbox
- Market Survey for required component
- Purchase of required component system
- Manufacturing and assembly
- Testing of setup
- Evolution of result of the project

Analytical Work:-

COMPONENTS:-

- Blades
- Rotor
- Frame
- Gearbox
- Positive Displacement Reciprocating Pump
- Strainer
- Non Return valve
- Tail
- Bearing
- Pipes

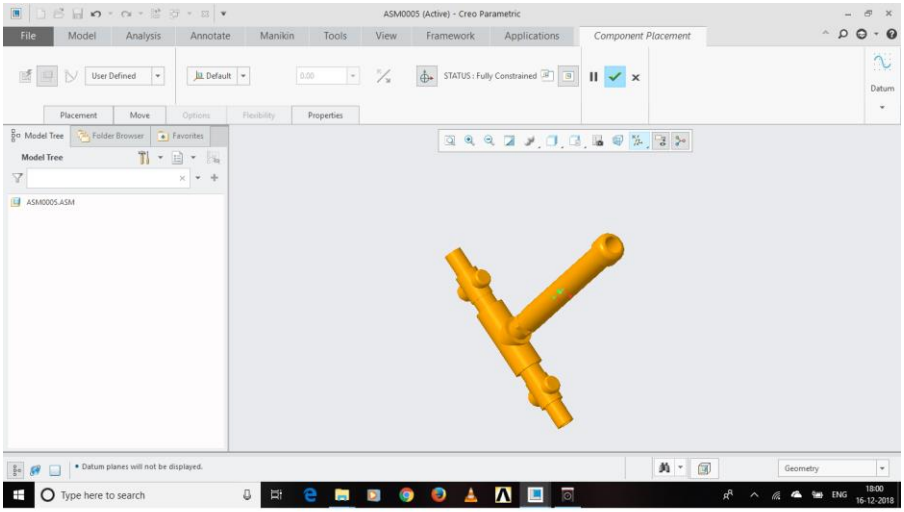

Fig. Assembly Stage 1

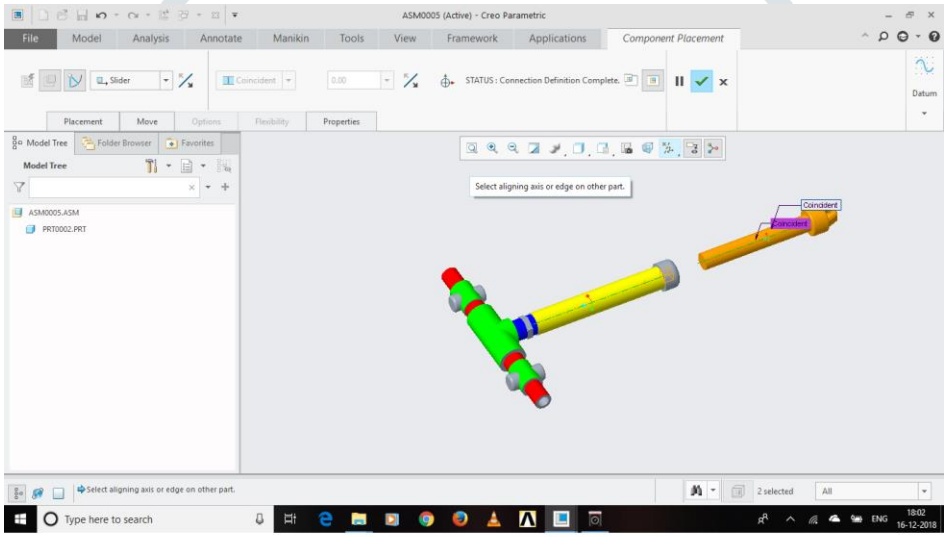

Fig. Assembly Stage 2

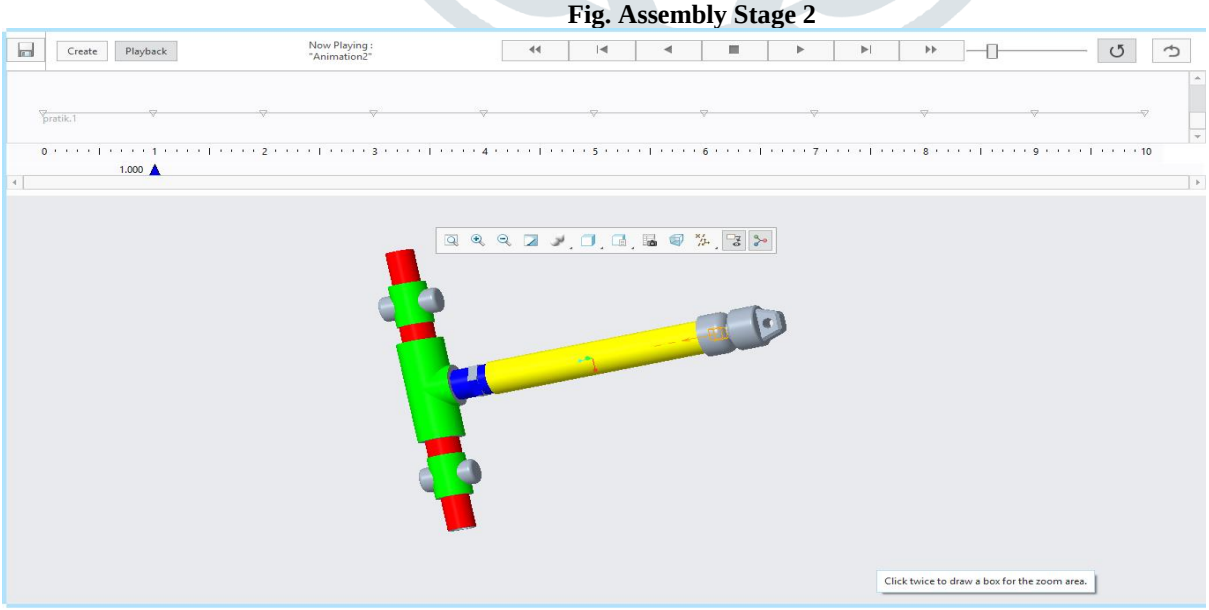

Fig. Final Assembly

Concluding Remark:-

- Hence we have partially concluded that wind energy can be used efficiently for lifting and pumping water to a particular head and distance at an cost effective price.
- Use wind energy for providing the proper torque to the reciprocating pump
- The goal of project is accomplished from the requires analysis and fabrication of prototype that is utilization of wind power to pumping water and generate electricity
- Most preferable and suitable material from the design consideration point of view satisfying all the optimum condition and requirement is found to be Polypropylene Plastic.

References:

[1] "Water pumping system using windmill", P.Jagadeesh, G.Sampath, S.P.Saran, M.Selva, K.Srithar, Volume 7 Issue No.3, International Journal of Engineering Science and Computing, March 2017.

[2] "Wind operated water pump", Vivek Prasad, Manoj Swami, VaibhavTambe, FirojKamate, Sunil Bagade, Volume: 03 Issue: 05 | May-2016, International Research Journal of Engineering and Technology (IRJET)

[3] "Design and development of windmill operated water pump", Ronak D Gandhi, Pramodkothmire, Debarshi Sharma, Bhushankumbhare, ShubhamChoukade, Volume-3, Issue-12, December 2015, International Journal of Engineering and Technical Research (IJETR)

[4] "Irrigation System and Water Lifting using Wind Mill Energy", V. R. Gosavi, Dr. Anil K Deshmane, Vol. 5 Issue 1 January 2015, International Journal of Latest Trends in Engineering and Technology (IJLTET).

[5]"Performance Characterization of a Wind-Powered Water Pump for Use in Rural Bolivia", E. P. Reznicek, E.I.1and A.C. Elmore, World Environmental and Water Resources Congress 2014: Water without Borders © ASCE 2014 1627