DESIGN OF A PARABOLIC TROUGH AND SELECTION OF A SUITABLE WORKING FLUID FOR A TURBINE SYSTEM

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Abstract

The need for mini-power generation, led to this research on design of a parabolic trough and selection of a working fluid. The metal drum was divided to three, in order to form a parabolic shape, and the boiler pipe was fitted centrally at the focal point of the parabolic trough. The working fluid used for the turbine system, was methanol because of its low boiling point and it is user friendly during operation; it is not hazardous to the human skin while testing. The performance evaluation, showed that the miniature turbine system developed a thousand kilowatts.

Keywords: - Parabolic Trough, Turbine System, Working fluid

Introduction

Turbine is a machine used in converting mechanical energy to production of power with aid of moving stream of water, air, or other fluids for continuous generating of electricity. This can be achieved either through electromagnetic induction of mechanical means. The energy of the fluid on the blades spins rotates the rotor shaft of a generator. Turbines are generally used in electrical generation, engines and propulsions. The machine that made use of rotor, usually with vanes or blades, driven by pressure, momentum or reactive thrust of a moving fluid. The flow of stream derives the turbine, which is connected to an electrical generator to produce electricity .Turbine is a machine that convert the kinetic energy in a stream of stream of fluid into mechanical energy by passing the stream. A Turbine is a device that turns fluid movement into energy. A wind energy conversion system, the purpose of which is to produce electricity, consisting of rotor blades, associated control or conversion electronics, and other accessory structures. It is an equipment that is driven by steam acting on a turbine or rotor to cause a rotary motion. Turbine is a machine used to produce continuous power in which a wheel or rotor, is made to revolved by a fast-moving flow of gas, water, steam, air, or other fluid. A turbine *is a method of using a moving stream of water, steam, air or hot gas to turn a wheel to produce* mechanical power. Turbine is a *device that convert the energy in a stream of fluid into mechanical energy*. Turbine is *an engine use to actuate the reaction or impulse or both of a current of* fluid. Turbine is device that *machine having a rotor, usually with vanes or blades, driven by the pressure*, momentum, or reactive thrust of a moving .Turbine is a mechanism that transforms rotational energy from a fluid that is picked up by a rotor into usable energy or work. Turbines achieve this either through mechanical gearing or electromagnetic induction to produce electricity. A turbine is a rotary mechanical device that extracts energy. The generating electrical power can be used when combined with a generator. The moving fluid acts on the blades so that they move and impart rotational energy to the rotor.

Turbines have a casing around the blades that contains and controls the working fluid. Modern steam turbines frequently use both reaction and impulse in the same unit, typically varying the degree of reaction. In a turbine, moving fluid acts on the blades so that they move and impart rotational energy to the rotor. A turbine is a machine that works by the action of a fluid on a series of surfaces, usually a circular set of blades. It is a device which converts mechanical energy into electrical energy or hydraulic energy into electrical energy.

The most well-known strategy for working liquid determination is here alluded as the "screening" technique: it comprises in building a consistent state recreation model of the ORC cycle and run it with various working liquids. The proposed model can be pretty much itemized, and the chose cycle execution pointers can differ starting with one distribution then onto the next. A survey of the logical writing in the field of working liquid choice looks at the changed papers with regards to three qualities: the objective application, the considered consolidating temperature and the considered vanishing temperature range. (N. Galanis, 2009) It was shown that, regardless of the variety of the functioning liquid investigations, no single liquid has been recognized as ideal for the ORC. This is because of the various speculations expected to play out the liquid examination (Aljundi, 2011):

A few creators think about the natural effect, the combustibility, the harmfulness of the functioning liquid, while some others don't. Different working circumstances (for example the considered temperature ranges) have been expected, prompting different ideal working liquids. Since no functioning liquid can be hailed as ideal, the investigation of the functioning liquid competitors ought to be coordinated into the plan interaction of any ORC framework. In many examinations apparently the suggested liquid is the one with the most elevated basic temperature, for example the plant proficiency could be additionally improved by choosing significantly higher basic point working liquid. Nonetheless, a high basic temperature likewise includes working at explicit fume densities much lower than the basic thickness. (Ajetunmobi, 2020)This decreased thickness shows a high effect on the plan of the cycle, since the parts should be larger than usual for two down to earth reasons:

i. Low densities include high liquids speeds and thusly higher tension drops. The liquid speed should accordingly be decreased by expanding the water driven breadth of the lines and intensity exchangers. (Vélez, 2012)
ii. The size of the development machine should be expanded to retain a higher volume stream rate. (Ajetunmobi D. T., 2019) This prompts the end that extra rules should be added to the sole thermodynamic proficiency while contrasting working liquids.

Liquid determination considering the expected intensity trade region, turbine size, cost of the framework, risk, and so forth. These examinations demonstrate the way that considering the financial matters can prompt the choice of altogether different ideal working circumstances and working liquids (Aljundi, 2011).

Methodology

The followings are the materials utilized for the plan of the little sunlight based fueled turbine framework.

Boiler unit which comprise of: round and hollow box, safeguard, reflect strips, represent sun oriented box, manometer. The turbine is built from a 12mm breadth gentle steel bar, and a length of 90m. The condenser which comprise of: plastic compartment, collector, winding copper pipe, manometer. This examination is intended for a medium temperature source (100° C-150° C) [7], a thickness of methanol is taken to be 792 kg/m^3, and the edge of boiling over of methanol is taken to be 64.7° C.The metal drum is separated into three equivalent amounts of freedoms from the focal point of one of its shut finishes. Each framing an area of point of 120° each from the middle. (Lüpfert, 2004).

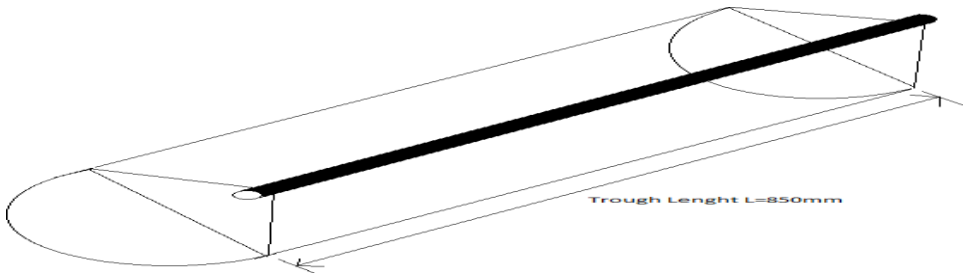

Figure 1: Parabolic Trough

Result and discussion

The metal drum is additionally partitioned upward descending on the bended surface from the closures of the lines that structure every area, through the whole length of the drum. At the far edges, from the middle, lines are attracted to meet the three lines on the bended surface of the drum. After this is finished, the barrel shaped metal drum is then removed along the division without disfiguring the math of the round and hollow drum. (R. Forristal, 2003).

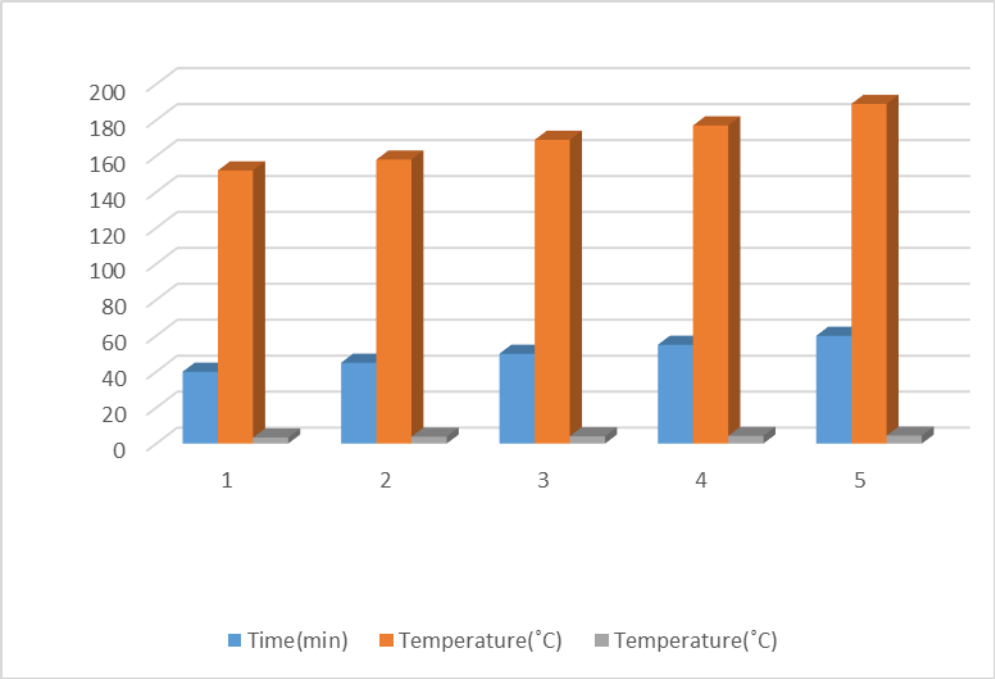

Figure 2: Temperaure-Time Difference

Conclusion

The investigation of the framework was completed and there was expansion in the tension of the working fluid with resulting expansion in the temperature. The functioning liquid presentation was high and the parabolic trough focused sunlight to the boiler system, to appropriately warm it. The design demonstrates the way that a sensible measure of energy can be produced from a miniature parabolic trough.

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