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Abstract

In this paper, I explained the mechanical process of water turbines, how they produce electricity, and their significance in regard to the United States moving to cleaner energy. Based on feedback provided, the most noticeable changes are the fluidity of sentence structure, as well as the condensing of run-on sentences in order to have my paper flow. Additionally, I included some grammatical changes in order to broaden my range of audience so it was more understood.

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ENG21003-S: Technical Paper, Water Turbines

Hydropower. In a time when there has been gaining traction to move towards renewable energy sources to save our planet, there has also been growing attention towards how we can move our electrical needs to renewable sources and cut our dependency on fossil fuels and oils. One of these such resources is hydropower. Since the beginning of time, water has enabled humans to cultivate and create populations and societies. In an age of global crisis, we now have been turning to water as the future of energy and electricity.

However, for there to be hydropower, we must discuss one of the most vital parts of turning the kinetic energy of moving water into mechanical work and electrical energy for us to use as electricity: water turbines. Water turbines are part of the larger, structural hydroelectric power plants. Usually located on or near large water sources, these plants require constant flowing water and possible changes in elevation to produce electricity (EIA).

The benefits of relying on hydropower are nearly unparalleled in comparison to the benefits that solar and wind power may produce. As the main power source is water, it eliminates the possibility of pollution. Certain types of hydropower, such as “impoundment hydropower”, create “reservoirs that offer a variety of recreational opportunities” (EERE), and provide more value through creating public opportunities and activities. Additionally, as hydropower can instantly create power and electricity, it is always running at maximum capacity. Therefore, this causes hydropower to be a prime source for electrical back-up to towns and cities in the event of a blackout or power outage (EERE).

As mentioned before, in order for there to be hydropower, there must first be a water turbine. Water turbines are categorized into two different types: impulse and reaction turbines. Impulse turbines require the velocity of water in order to move the turbine, and therefore produce electricity (EERE). As water travels down due to gravity, or propelling water jets, and falls into buckets which move the turbine, the runner begins increasing in speed, causing the turbine to move fast enough to produce enough electricity (Fig.1). Then we have reaction turbines, which requires the action of both “pressure and moving water” (EERE). As water travels down from a high-rise source, this causes runner blades to move, also helping the water to turn faster. Due to the speed of the water, the blades begin to turn the kinetic energy into mechanical work, which in turn causes electricity (Fig. 2).

While the technology is still somewhat currently new with respects to large-scale projects such as towns, cities, and companies, the specs that were visible on the internet were somewhat limited. Based on what was found, it can be concluded that there is some correlation towards the area of the intake channel with respect to the maximum power output. For example, in order to have a max output of 5 kilowatts, the intake channel requires an area of 1 square mile. However,

with a max power output of 100 kilowatts, the intake channel must be an area of 12 square miles. Lastly, with a max power output of 250 kilowatts, the intake channel, must be at least 30 sqaure miles (Systems).

Even though the power specs are reasonably high and release a sufficient amount of energy in the power grid, there are still some disadvantages to the water turbine. The first, and most important, being that the turbine relies on water from lakes and rivers in order to power homes and other structures. If that water disappears, most likely due to climate change, then it will become difficult to maintain and create power for both yourself, and the surrounding community. Additionally, parts and assembly for a hydropower plant, much less a water turbine quickly add to the cost of maintenance, swaying off more consumers from switching to an environmentally friendly alternative source of energy.

It is important to note, thought, the contributors of the water turbine, for without them we would not be able to start weening off fossil fuels and other non-renewable resources. The history of water turbines actually dates as far back as the Chinese Han Dynasty, from 202 BC to 9 BCE. Some of its most early uses was in the development of papermaking, pounding and hull grain harvested, and breaking ore and other minerals found. Richard Arkwright's development of Crawford Mill in 1771 in England was the start of both the Industrial Revolution, as well the birth of modern hydropower and water turbines (Brief). In furthering the development to today's more modern structures, we must also credit the works of French engineer Benoit Fourneyron and British-American Engineer James Francis, who developed todays' most widely used turbine, the Francis turbine.

The development of the water turbine has created a vital source with respect to producing energy. Currently, we are facing drastic climate that is questioning our ability to survive on this

planet. Where or not we will continue to survive on this planet, is dependent on how other sources of energy such as solar, wind and water can efficiently produce electricity. As we become more dependent on the power and significance of hydropower, there is also the history and contributors which we must also remember. Without the invention of the water turbines and hydro power as a result of them, we may be looking at a darker fate than running out of fossil fuels and oils.

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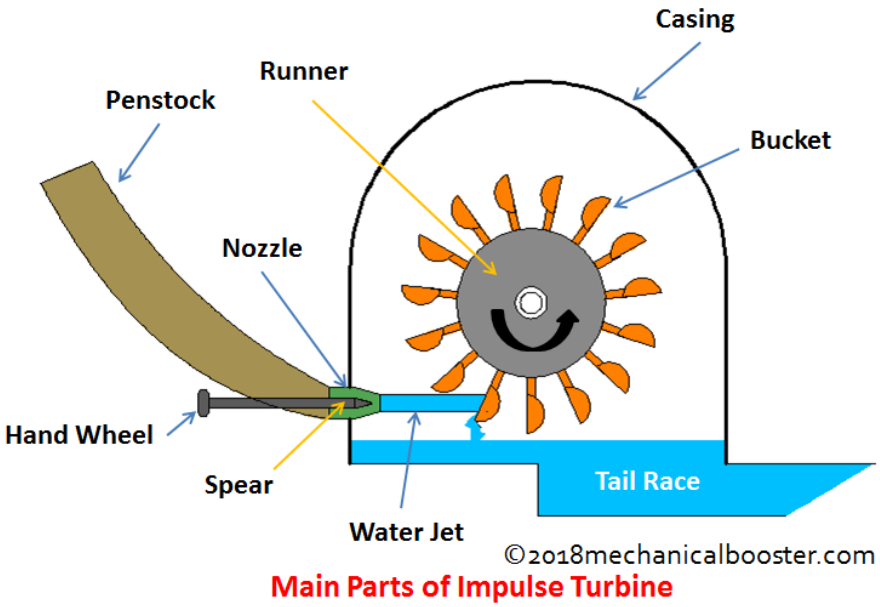

Figure 1

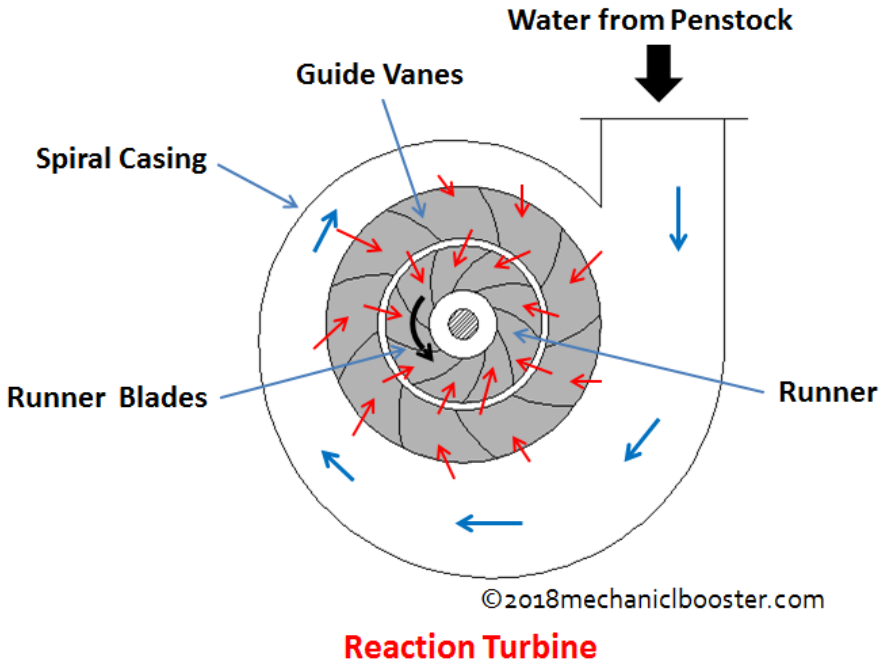

Figure 2