Determining The Most Influential Engineering Innovator: Archimedes, James Watt And Karl Benz

Abstract & Summary

In this report I have explored the impact of the innovations and achievements of engineers of the past, to determine which engineer has produced the most influential engineering innovation. In order to do so, I have researched each engineer's innovations and resolved their impact on the past and the present. I have researched three engineers belonging to different time periods, Ancient, Industrial Revolution and Modern.

Ancient Engineer and Greek mathematician Archimedes of Syracuse had many innovations. Archimedes invented the compound pulley system, levers, Archimedes' principle of buoyancy, siege machines, Archimedes' water screw; the geometry of spheres, cylinders and circles. His contributions to engineering and mathematics, though not greatly as influential to the people of his time, have been used throughout history and are still used to a great extent today.

The Watt steam engine, created by industrial revolution engineer James Watt, was the driving force of the industrial revolution, removing many topographical restrictions, by enabling energy to be generated without a natural source.

Modern Engineer Karl Benz created the first automobile powered by an internal combustion engine. His design, which was later improved on by engineers such as Ford, enabled fast, cheap and efficient travel.

Based on each innovation's impact on the present, I have determined that James Watt has had the largest impact on society, through its influencing environmental, social, political and historical factors.

Introduction

Innovations and achievements of past engineers have facilitated the developments of today and have had a great influence on society in the present and the past. This report aims to determine which of the following engineers of different time periods, has produced the most influential engineering innovation based on their influence on society today, by considering their impact on social, environmental and historical factors. The engineers explored will be Archimedes of Syracuse, James Watt and Karl Benz.

Archimedes of Syracuse

Innovations and Achievements

- The (Compound) Pulley and The Lever
- Archimedes' Principle
- Archimedes' Screw

- Other Innovations, Mathematics and Siege Engines

Impact on the Time

Archimedes had an impact on society at the time, however, the extent and nature of this is hard to decipher due to a lack of accurate and reliable information. Though, by considering the nature of his innovations, we can better understand how he may have impacted the people of his time.

We can assume that the impact of his conceptual innovations (e.g. geometry of circle, buoyancy) was small, as there were little applications for them at the time.

The water screw was originally created to remove water from the hull of ships and flooded mines, though was also likely used in farming, where it transported water to irrigate crops. This may have made farming less laborious, and increased production and efficiency. The Archimedes screw had a measurable impact on parts of society.

Siege engines invented by Archimedes have the most varied impact, as their forms and utilization vary between sources, and is unreliable overall. Furthermore, it was used for war, which has had varying impacts on society, positive and negative. I generally consider the Siege Engines to have had a harmed society, due to the suffering that war brought with it, though war may be interpreted in several ways, and some may perceive it as having a positive impact and being progressive.

Archimedes may have had a measurable impact on society, through the efficiency of the Water Screw-in its specified uses, and siege machines, which likely positively and negatively influenced society.

Impact on the Present

Archimedes' laws are instrumental in the principles of mathematics and engineering and facilitate further developments made our past and present.

His mathematical discoveries are fundamental today, and many industries rely on them such as computer science to the arts. Innovations of today utilize these principles. Furthermore, he has had an impact on society since science and engineering, or its past variations became more common.

Archimedes' Pulleys and Levers also have had a major impact on society today, they form a basis through which engineers can build more complex and efficient products, with a range of uses from simple tools such as tongs, to industrial tools such as cranes.

Archimedes law of buoyancy is fundamental to maritime engineering and is essential to the design of ships, boats etc. The Archimedes' screw is also used today, in uses such as sewer plants and the generation of electricity.

Archimedes innovations and achievements have had a great indirect impact on society today, shaping our technology, and the technology of our past.

James Watt

Innovations and Achievements

- Watt Steam Engine

James Watt invented the first efficient steam engine with a separated condensation chamber. A steam engine functions by utilizing steam pressure to push a piston back and forth.

Impact on their Time

James Watt's innovation, the Watt Steam Engine, was the driving force of the industrial revolution. Before Watt's steam engine, factories were restricted by topography, as they relied on fast flowing-streams or wind to power machinery, with the utilization of Watt's steam engine, factories could be built away from natural sources of energy, which lead to a massive increase in production of goods.

Furthermore, I will be using the impacts of the industrial revolution to assess James Watt, due to his innovation being one of the major driving forces.

The industrial revolution brought was an era of great change and brought with it both positive and negative consequences. In the early days of the Industrial Revolution, before reforms and labour unions were made, working conditions were harsh. Early factories and mines used unsafe machinery, and workers were given insufficient training and protection. Moreover, the power that was held by owners meant, working hours were long and wages were low. The exploitation of women and children, also grew greatly, leading to a large amount of child labour, and mistreatment of women.

Over time, however, (in the 1800s) the working class formed labour unions, and reforms occurred, leading to prosperity for the common man. There was an increase in wealth, higher quality of housing, health care, education and an overall increase in the standard of living. Eventually, a new middle class was formed.

Impact on the Present

The industrial revolution (as a direct consequence of Watt's innovation), has defined our society today. It brought about fundamental changes to our society, greatly furthering our grasp on science, engineering and technology, whilst also contributing to several environmental, political and social problems we face today.

The population of our planet greatly increased due to health care is more robust than ever, child mortality dropping and issues such as famine being far less dangerous for society due to increased production of goods.

Urbanization, a phenomenon brought about by the revolution, has changed the way we live our lives and defined society today. It introduced the now dominating structures of employment, wages and purchasing. Moving from a much more intimate, closed society, to a larger, more interconnected one, where trade and production are on a much larger, international scale.

It also brought about social movements, such as the women's suffrage movement for equality, of which we can see the impacts of today. Society had a shift of ideals and values over the revolution.

However, there are also many negative impacts of the industrial revolution; climate change, pollution, rising sea levels etc. all impact our lives today and may have irreversible consequences to our environment and society. The wealth inequality also greatly increased, with the very small upper class possessing the majority of the wealth and influence.

Karl Benz

Innovations and Achievements

- Automobile

Karl Benz invented the first automobile (in this case a motorized tricycle) powered by a combustion engine. (1885)

Impact on their Time

Karl Benz did not have a large impact on the people of his time as most of society could not afford this new mode of travel (Refer to Appendix 3.1 (Gerd Hohorst, Jürgen Kocka, and Gerhard A. Ritter, 1978)). However, the upper class may have benefited from the innovation, as automobiles were faster and versatile than trains, ships, horses etc.

The release of the Ford Model T (an improvement upon Benz’s model [1908], the first affordable car, greatly improved travel for the middle, and more of the upper class, as it was far more accessible. It enabled far more individuals to have greater personal control and increased the interconnectedness of society.

Impact on the Present

Cars today are essential to travel and provide society with a reliable way to commute. The autonomy that more people gained caused social changes in individuals' lives, providing freedom, especially to those with less ideal locations and abilities. Accessibility greatly improved as more people could travel longer distances, causing people to be less restricted by their locations, opening more opportunities for work, leisure etc.

Though this invention also had some negative effects, CO_2 emissions by cars contribute to about 16% of total CO_2 emissions, which adds to global warming and climate change.

Conclusion

I believe the most influential engineer out of Archimedes, James Watt and Karl Benz, is James Watt, as he has had the largest, social, economic, environmental and historical impact on our world through his innovation, the steam engine, driving the industrial revolution, which caused a great shift in culture, had a large impact on the environment and brought progressive social changes to society. Neither Archimedes nor Karl Benz brought about such a great shift in

society and impacted upon such a broad range of fields in their time or the present.