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MONOGRAPH

“How Nikola Tesla’s ideas and inventions shaped the modern world”

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GRATITUDE

This monography was a personal learning and experimentation process, that helped me value the support that family, friends and my teachers gave me. For, I would like to thank my parents for always making pushing me forward towards my dreams; my friends, for supporting me when I was about to give up on this, and my teachers and tutor that managed to help me to build and structure this monograph. Thank you, and I hope that I don't take for granted your support.

SUMMARY

In this monographic work, I present the work and ideas of Nikola Tesla. In the first chapter I talk about the work and inventions that have been recognized in the name of him due to the reason of their high importance, and some of them are still being used until this day.

In the second chapter, I go deeper into how he had an impact on modern society with all his invention, since there were a lot of them, I present for the most part the ones that are known by a lot of people around the world or the ones that had a big impact but people didn't know existed or that were invented by Tesla.

And lastly, the third chapter is about his inventions and projects that didn't really work out for him for various reasons, such as a weapon or a photography machine, but his mind was also in the direction of revolutionizing transportation, it is also described in this chapter.

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INTRODUCTION

The following monographic work is an investigation on How the ideas and inventions of Nikola Tesla formed the modern world, the same one that has as purpose to analyze how Tesla's creations determined the way for the ample amount of technology that we have now, describing as its influence in the scene of the scientific world of his time and now, through an analysis of his inventions that caused a greater impact and have greater value for humanity.

The specific study of this topic helps us to understand how in his time he could revolutionize the scientific world because with hard work and effort he was able to make a lot of his inventions and ideas, because without it we would not have several things that exist today. since thanks to the ideas that he had the people over the years have been able to improve them and get to the things we have now.

The people who have dealt with this issue only refer to how people have taken their inventions and appropriated them, which is true, but there are more important issues to discuss, such as their inventions that have influenced today, without However, in the book "*The autobiography of Nikola Tesla*" Nikola Tesla himself specifies how at

the end of his career his work was dimmed by other scientists that took credit for his work.

Even though Tesla was born in Serbia, he lived all his life in the United States of America, this is because his mentor and rival, Tomas Edison lived here and let Tesla develop his whole career in this country, but what wasn't in his plans was that Tesla would surpass him in Canadas border while constructing the hydroelectric plant in the Niagara Falls.

Each one of the chapters depicted in the following dissertation present important parts in Tesla's life including his peak moments and his failures until the moment of his demise. I also present his most and least know inventions and plans that changed the worlds manner of thinking and that inspired and impulse many scientists and corporations of today society.

CHAPTER I

Tesla's less acknowledged discoveries

1.1 Discovery of the rotating magnetic field

In the year 1882, Nikola Tesla discovered the rotating magnetic field which consists in moving polarities that has poles that rotate in an axis. This discovery allowed the use of Alternating Current (AC) electric power system, that is still in use to this day. It is regularly used in electromechanical devices like induction motors, electric generators and induction regulators. As once said by Nikola Tesla (1878), "Next, I would visualize systems comprising motors and generators and operate them in various ways" (p.37). A couple of years later he managed to come up with this discovery.

1.1.1 Alternating Current electric power system.

The AC electric power system derives from the Direct current electrical supply (DC), AC being superior due to its ability to transport electric particles both forward and backwards simultaneously. While the DC current can only transport electric particles forward, and much more slowly. If you were to start two devices each one with a different current supply, you would be able to see that the one with AC current supply would start faster and would also move faster than the DC would.

1.1.2 Rotating magnetic fields in induction motors.

It is a device that uses an AC electric motor and the electricity that it needs to produce its motion in the axis is gotten through electromagnetic induction, thanks to the rotating magnetic field of the stator winding. This means that it can be built without any electrical connection to the rotor. There are two ways the rotor of this motor can be built, wound type and squirrel-cage type.

1.1.2.1 Wound type rotor.

A type of motor in which the windings of the rotor are connected to an external resistance with slip rings. When you adjust the resistances, you can control the motor's speed. If you insert high resistance in the circuit of the rotor, it can be started with low inrush. In comparison to the other type of rotor, this motor possesses more winding turns which makes causes it to have a higher voltage. Also, in this one the resistance is shortened out when the motor starts and causes the rotor to look like the squirrel cage rotor.

1.1.2.2 Squirrel-cage rotor.

This refers to the rotating section of the induction motor, it is composed by a cylinder made up with steel laminations, and copper or aluminum conductors embedded into its surface. While it is operating, the part of the rotator that doesn't move, is connected to an AC power source, and it generates a rotating magnetic field, and that movement produces power induced in it by the stator field, making its own magnetic field.

1.1.3 Rotating magnetic fields in electric generators.

A generator is an alternator that produces electricity using electromagnetism, that's where the rotating magnetic fields take part in the device, when the rotation is happening it is being influenced by another magnets magnetic field which is creates an even more powerful magnetic field and a rotor that's cuts the lines of flux of the stator. These generators provide almost all the energy that electric power grids use. To reverse the conversion of electrical energy into mechanical you need an electric motor, which can be driven by a mechanical force to provide electricity and make manual generators frequently.

1.1.4 Rotating magnetic fields in induction regulators.

It is an electrical machine that provides a continuous variable output voltage, it is uses its primary rotating magnetic field for excitation winding and its connected to the supply voltage, the secondary winding which is connected in series to the circuit to be regulated, while this is happening, it rotates through 180 degrees and the voltage that is introduced changes from adding voltage to stopping it from doing so. Since the rotor can't turn more than 180 degrees its leads are able to relate to flexible cables to a circuit in the exterior.

1.2 Co-invention of the three-phase electric power

This is a usual method used to alternate current electric power generation, the way it is transmitted and how it is distributed, it uses electrical grids to transport the power and can be used to power up heavy load machinery. Since it uses less conductor

material it is used more often instead of the two-wire single phase circuit at the same line to make voltage touch ground. Due to the difference in the phases, the power on any conductor gets to its maximum point in a third of a cycle after another one of this third of cycle repeat before the remaining conductor starts. In comparison to the AC power supply, this one supplies energy without neutral connections and can move the same amount of power using only almost twice the amount of wire that the AC needs. It would be possible for it to transfer power constantly and negating phase currents while maintaining the capacity-to-conductor amount in material. Also, its possible that they may have a fourth wire, more commonly used in low power transmission being this one the neutral wire and allowing the other ones transport the energy, making it a feasible for domestic use like houses with high electrical usage.

1.2.1 Two-wire single phase circuit.

It's how AC current is distributed using a method where all the voltages in the supply vary at the same time, it is usually used when the energy loads are heating and lighting with some big electric motors. It can be powered by a three-phase source in two manners, through the connection of a one phase and a ground point or by matching two phases.

1.2.1.1 Applications of the single-phase circuit

In some countries in America, usually used in commercial places such as strip malls or individual stores or in residential areas, regardless of this, rural areas also benefit from this device due to the reason that three phase energy supply is not available,

if the inhabitants of this areas wish to have this type of connection they must use a phase converter. It can also be applied in electric railways to speed up the train depending on the amount of voltage transmitted to it. Usually it uses a ground conductor that protects the area against electric shock and only carries a minimal amount of circuit in case of a malfunction.

1.2.2 Applications of the three-phase electric power

This is rarely used for domestic needs, its more commonly used in machinery and mostly in energy transmission due to its higher power resistance and efficiency while transporting it. While being in some sense cheap, they provide a more stable energy output and needs little to none maintenance in the short-term usage in comparison to its single-phase counterpart.

CHAPTER II

Tesla's impact on the modern society

2.1 The first hydroelectric power plant

One of the best examples in which you can demonstrate the importance of Tesla's inventions is when inventor He thought of the Niagara Falls, he saw an opportunity to create energy for the electrical needs of the people. Thanks to George Westinghouse, Tesla was able to go on with his project on building a hydroelectric plant due to that Westinghouse had the resources to make it happen, thus leaving Edison behind in the race of building this revolutionary way of producing energy.

While he was immersed in what at the time was called the current wars. Both Tesla and Edison were fighting between each other to decide which way of transmitting power was the best one. The dispute consisted in public appearances and show off the technology, trying to calm concerns over commercial applications and safety. The AC system used a changer that was able to control the power output in different situations and proved to be more efficient and less expensive.

2.1.1 The motion of the water transformed into energy

Nowadays the hydroelectric power plants are commonly used to produce energy, the way they work is that a dam is placed in a river, so it can store water, so it can be released and while it flows inside a turbine, it activates a generator that will produce electricity. There are two other types of hydroelectric power plants, one that can also store the power, it is called pumped storage plant, and a small one that generates power for a house or any building located in rural areas.

2.2 Co-invention of wireless communication

Usually we are told that a person invented something, like Edison and the light bulb, however, this information is quite misleading, since there were many people or a group of people who contributed to the discovery of such device, in this case wireless communication. People believe that Guglielmo Marconi invented the radio, which is a wrong statement; it was a discovery in which many people participated, one of them being Tesla. He started his contribution to the investigation right where Rudolph Hertz left off, he said that such waves described in Hertz's research could be used to communicate throughout the world. He later found himself in a meeting in St. Louis where he would perform a demonstration of how wireless energy functioned. The device that was used for this demonstration had an appeal to it, there were not any cables connected from a source and to a receiver. After this success, he later demonstrated that his invention could also control other types of machinery while taking distance, in this

case a remote-controlled vessel. Apart from helping communication progress in history, this pushed some of the capabilities of robotics and other kinds of machinery. Later, after this demonstration being seen by Marconi, he managed to pull off the communication throughout the Atlantic. Due to his accomplishment in this demonstration, he managed to take away the patent from Tesla's name.

2.3 The Wardencllyffe project

Thanks to the inspiration that Tesla got from the radio wave communication, he had the idea to make a device that would deliver energy for the entire world, it was built in Shoreham, New York. Apart from providing energy, it would make it possible to transmit messages or any other type of communication from those times. The main financier was John Pierpont Morgan, but any additional investment was not possible, due to this the project was abandoned in 1906 and in an attempt to pay for his debts; Tesla was forced to take down the tower and sell it as scrap. If his endeavor would have been successful, he would have made an immense jump from the technology of that time getting closer to be like the one we had just a couple of years ago. In the beginning, the theory established that if he could make energy move through the earth at a specific frequency, he could control the earth's own energy and make it reappear at another place. Later, he thought of three ways that he could control the direction in which the electromagnetic waves went.

2.3.1 Using resonance to control the electromagnetic waves

He believed that waves followed the same concept as when waves bounce off matter, but due to the interference of other incoming waves, these could be redirected somewhere else. He thought that these waves could use the earth and the atmosphere to move the waves through them like if there were cavities in between them, if this would have been possible he thought of placing receiving stations at the ends of each resonance, to later move the signals from this place to another receiver where the waves would be translated to information for later being read as a message or to use the energy that was transmitted in machinery or anything else.

2.3.2 To flip radio on its head to move the waves

To make this happen He also thought that there were two types of waves in the atmosphere and limited them into wires but even if they were completely different both paired in Maxwell's equations. These waves were capable of transmitting the information through the air instead of through the ground; he planned to release balloons that would emit the waves which carried the desired information, but this option wasn't viable because sooner or later the balloons would have to come down on a regular basis and resupply just to keep the operation running, but since it wasn't viable he returned to the idea of the tower, however due to the lack of funding the previous time this idea was also discarded.

CHAPTER III

Tesla's failed secret designs

3.1 Tesla's failed projects

We already know that Nikola Tesla was one of a kind, he was brilliant, an excellent man with enormous capacities. Nevertheless, he always found resistance at the time of finding somebody in order to fund his current ideas since he wasn't a business person. We all know that when it comes to scientists or inventors that changed the world in some many ways, there are two big names, Thomas Edison and Nikola Tesla.

Mentioning Thomas Edison in this particular section is a really important deal, since Nikola Tesla actually worked for him while designing, what he thought, were going to be the best inventions the world could have ever imagine. These two inventors were head to head in what means technological inventions, but now we are going to analyze the different attempts Nikola Tesla had, that were unsuccessful.

3.1.1 Tesla's Death Ray.

Nikola Tesla while working with Thomas Edison had a great fear of humans dying in war, but he didn't make this design in order to fight in human wars; contrary to the kind of images it might create in your head, this "death ray" was originally created to prevent human deaths during the war. This was because Tesla dreamed about war that was fought not against humans, but against the machines; and in 1934, he caught the eye of the New York Times, that announced the possible creation of the first "death beam".

Obviously, he denied the creation a "death beam". He personally called it a "Peace Beam", but the problem was Tesla didn't fully convince anybody to fund his creation since almost anyone thought of his creation as "useless". The beam was designed to have a distance of about 250 miles, and (as he advertised) was able to take planes out of the sky. This caught the special attention of the Amtorg Trading Company, who were allegedly working with the Soviets. In fact, the idea was tested one time with the Soviet Union; but needless to say, nobody actually knows if Tesla's Death Ray actually worked or if its secretly used until now.

3.2. Tesla's Thought Photography Machine

It was the year 1933, In Kansas City an interview was taking place between Kansas City Journal-Post and Nikola Tesla. Few hours later, an article was published about the "greatest invention of all time" produced, obviously, by Nikola Tesla.

Tesla talked about discussing his ideas for a camera that could picture your own thoughts. Having thought about this idea for decades, the invention was based on the idea that your thoughts produced pictures inside your brain, which meant that they must have a corresponding image at some part on the retina of the eye.

Being convinced that he could come up with a machine capable of reading those specific images that would pop up in your brain, he decided to create that machine to be an addition of what they already had in the past, so they could project the image onto a screen and everybody could see them.

This invention would function obviously on real time, and as the person thought, this device would be able to capture those pictures and replayed them onto the screen. Nevertheless, finding subjects that would volunteer for this type of project was the most difficult part of the process, and the lack of help made it impossible to achieve.

3.3. Tesla's Flying machines

3.3.1 Tesla's First Aircraft

Nikola Tesla's last patents were made official in 1928. He said these inventions were going to change the way people travel from one place to another, since he was going to be able to "transport bodies through the air".

His first design was something that looked very different of what people of that time used to be familiar with, since it was a completely opened box connected with a series of propellers in the top, in the bottom and in front, and at the time the aircraft would turn on all of the propellers would allow the box to lift vertically in the air.

Nevertheless, every other scientist thought this was impossible to realize; since in that time, it was impossible for a human to think they were going to be able to travel in the sky from one place to another. This resistance was the key why the machine was never made, and that is why Tesla failed in all his attempts of getting funding to create this new machine.

Moreover, later, newer scientists discovered some errors in the design that Tesla made (something that was really unusual for him) that made the aircraft unworkable. The craft that was originally created to “hover”, as he suggested, would have been able to only travel in circles, since stability and control panels were not specified and were not included in the design, maybe because he didn’t want anyone else to steal his idea (which was really usual for him).

3.3.2. Flying round machine.

In 1911, The New York Herald received an important message from the one and only Nikola Tesla. He told them that he was creating an anti-gravity flying machine, also called “The Flying Saucer”.

He explained that his creation “will have neither wings nor propellers. You might see it on the ground and you would never guess that it was a flying machine...” (Tesla, 1911, p.68). He said his machine could move in any direction, safely, faster than anything seen before, and regardless any type of weather. Also, he said this was the first step to the creation of not only planetary travel, but interplanetary trips.

Nobody believed in this, but nowadays, conspiracy theories relate this specific type of work with extraterrestrial journeys, since the famous-called UFOs have this exact description, and since it was long suspected that the governments stole all of Nikola Tesla’s work, research and inventions, people now think that the government took advantage of all the knowledge Nikola left behind in order to create a big gap in humanity creations, but all of this made in secret.

CONCLUSIONS

At the end of this monographic work it is concluded that:

- If it wasn't because of him, many of today's world inventions would have been delayed or wouldn't have happened at all.
- Thanks to his brilliant ideas and creations, we are now many years ahead of what we would have been without him, because of his competition his ideas flourished.
- He taught with his example that you don't need to have the best education in order to be a successful scientist or professional in life.

RECOMMENDATIONS

At the end of this work it is recommended that:

- Deadlines shouldn't be that stricter when there are exams or projects.
- It might be a good idea to start this work at II of baccalaureate.

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