

*“Progressive development of the man is vitally dependent on invention. It is the most important product of his creative spirit. His ultimate purpose is a complete mastery of mind over the material world, and making the forces of nature serve the needs of mankind. This is the difficult task of any inventor who is often misunderstood and unrewarded. However, he finds ample reward in the belief that he belongs to a category of specially privileged persons without whom the human race would have long ago perished in the bitter struggle for survival against merciless elements.”*

*Nikola Tesla*

A prominent place among the greatest scientists at the turn of the 19th and 20th centuries who, with their miraculous intuition succeeded to recognize new scientific truths, pave new ways and accomplish new horizons in the technical world, belongs to Nikola Tesla.

Nikola Tesla, the scientist of Serbian nationality, visionary, the unexcelled inventor of “electromagnetic wheel”, poet of electrical engineering, has with his epochal works initiated a revolutionary era in the field of electrical engineering, the science that was being born at the time. Some of extraordinary inventions from the wide spectrum of his original inventions are: the poly-phase system of alternating currents which is today universally accepted for power system transmission, rotating electrical field, induction motor, high frequency currents and their phenomena, inventions in the area of radio-technology, wireless signal transmission, etc. Tesla “fertilized” the field of generation, transmission and application of electrical energy thanks to his bold fantasy and richness of his inventive mind, thus contributing that electrical power generation and its application in industry gain unheard-of proportions in the 20th century and become part of everyday life of all people.

Who really Nikola Tesla was and why credit goes to him for his merits to the mankind can be seen from the short account of his life and work.

### **Nikola Tesla – man, visionary engineer, inventor**

Nikola Tesla stepped on his life path on 10 July 1856 in the house of a progressive Serbian orthodox priest in the village of Smiljan in Lika (then Military Border in Austria-Hungary, today Croatia). During his studies in Graz he displayed great interest in electrical engineering. This was the very beginning of his long and imaginative searching for scientific truths. At the beginning of his work in Budapest, where he was employed after his philosophy studies in Prague, the truth linked with the idea of rotating magnetic field, searched for a very long time, was discovered in one instant. Looking for possibilities to materialize his ideas, Tesla left for Paris and Strasbourg, where he realized the first model of his induction motor. In Europe, he could not find adequate facilities and financial resources for his experiments that would precede his inventions in the field of electromagnetic technologies he had already worked on and, therefore, he decided in 1884 to leave for New York, the United States.

While working in Thomas Edison's company and then in his own “Tesla Electric Company” in New York, Tesla managed to design, theoretically work out and practically materialize a new electric power transmission system founded on the application of poly-phase alternating currents, which he had been perfecting in his mind for years. Once the experiments proved his

preliminary ideas, Tesla registered in late 1887 his first 7 patents (out of 41 in this field) with the US Patent Administration. They constitute a unique scientific and technical work called "poly-phase system", and are of fundamental importance for generation, transmission and use of electricity. In the said patents, Tesla presented in greater detail his poly-phase system and all the relevant components, different in terms of concept and construction, which make the nucleus of the power transmission system. One year later, Tesla presented this system to the most reputed experts in the USA during his famous lecture held at the American Society of Electrical Engineers in New York, causing admiration of the auditorium.

The discovery of the rotating magnetic field, produced by the poly-phase AC currents was one of Tesla's most important inventions, which laid a foundation of modern electrical energy. For most scientists this invention was one of the greatest successes of human imagination in the world history.

On the occasion of Tesla's 100-year birth anniversary, English Professor Reginald Kapp qualified this invention as follows:

"Many years ago in pre-history, an anonymous genius invented the wheel. That was one of the biggest benefits ever given by a man to his fellows. This invention was perhaps rather obvious, but the invention of an invisible wheel made of nothing but a magnetic field was far from the obvious and that is what we owe to Tesla. It could only spring from a brilliant and unique intellect".

Encouraged by the triumph, Tesla engaged in practical realization of his poly-phase system which was for the first time applied to the power plant built on the Niagara Falls (put into operation in 1896). Over a short time, Tesla's polyphase system for generation, transmission and application of electricity was accepted all over the world. In Serbia, only 4 years after the Niagara Falls, a power plant at the river Djedinja was built and the first electric light appeared in the town of Uzice.

After the strong opposition coming from contemporary scientists who propagated the use of DC (e.g. Lord Kelvin, T. Edison etc.), Tesla gained a great victory. Feeling that no fundamental invention in the field of industrial application of electrical machines can be additionally found, Tesla shifted all the energy of his creative spirit to completely new, by then unknown, fields of electricity application. He turned to the field of high frequency technics, and his original works changed fundamentally the human life making big steps into the future of the mankind. Tesla went beyond his time.

Tesla's inventive spirit felt that high frequency currents have performances that do not exist at low frequencies and that their better studying and understanding would clarify the natural laws to the benefit of the mankind. Tesla's fruitful and broad-range activity in the field of alternative currents and high voltages was long lasting and entailed important results and a world-wide great glory to him. One of the most important Tesla's inventions in the field of high frequency currents was the practical realization of wireless signal transmission by the radio. On the other hand, the invention of the high frequency current generator, known as "Tesla transformer", gave to the science of that period significant means for experiments and scientific work, contributing to an accelerated development of electrical engineering.

The results of Tesla's work in this field were very fruitful and far-reaching. New electrical engineering branches have developed from Tesla's work: radio-technology, tele-control, luminescent lighting technology, electrotherapy, electro-heat technology, etc. For his pioneer work in this field, Tesla was awarded the first golden medal of The Franklin Institute.

In the field of high frequency currents and high voltages, Tesla registered many patents and held lectures in 1891 and 1892 in the American Institute of Electrical Engineers in New York, the London Royal Institute and in the French Physicists Society in Paris.

In order to continue his researches and realize his ideas concerning wireless power transmission, Tesla built his laboratory in Colorado Springs at an altitude of 2000 m, with large generators for high frequency currents and high voltages. While making experiments, he had to solve many highly complex technical-technological problems. Nevertheless, Tesla's idea about a global electric power wireless transmission was neither proved during his lifetime nor has been until the present day.

In early 20th century, after important inventions in the field of poly-phase currents, high frequency currents and radio-technology, Tesla was at the peak of his glory.

After his return to New York, he started the building of a new laboratory on the Long Island, near New York, wishing to realize the system of "global telegraphy". Due to financial problems, he gave up the idea and began researches in the field of fluid mechanics registering his last patent in this field in 1916.

Tesla's life, constantly oscillating between the agony of failure and the blessing of success, ended in a "New Yorker" hotel room on Christmas, 7 January 1943. His numerous works, lectures, hundreds of patents, thousands of pages of both published and unpublished material remained after him and are being kept together with his urn in the Nikola Tesla Museum in Belgrade, Serbia.

In view of the immense number of different inventions in the world of electricity, Nikola Tesla is deemed to be one of the greatest technicians and inventors ever born. Numerous books have been published about Tesla's work and their number is permanently increasing. They are also expanded by new contents which assess Tesla's contribution from the point of view of the present-day level of science and technology.

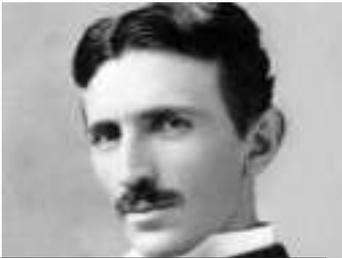
With his innovativeness, Tesla had far exceeded his contemporaries who admired and at the same time were surprised at him. Just few of them understood his far-reaching inventions. Still, the scientific community paid him a deserved tribute – honorary doctorates were awarded to him by numerous universities in Europe and America, and membership granted in scientific institutions. He was also awarded Edison's and Franklin's medals, and 56 diplomas.

In January 1976, Nikola Tesla was elected to the Hall of Fame of Great Inventors. The greatest honor to Tesla was, however, granted by International Electrotechnical Commission which named the unit for magnetic induction after him TESLA (T). Thus, Tesla's name as the

only scientist of all Slavic nations joined the famous names like Coulomb, Ampere, Faraday, Herz, Maxwell, and entered into the electrical engineering practice. He secured the honorary place in the Pantheon of general Slav Glory.

*The Program celebrating the 155th anniversary of Nikola Tesla's birth is not intended to raise his unachievable fame. The only wish is to express the pride that such a genius is an offspring of our nation whose name will be forever inscribed with brilliant letters in the history of science and technology.*

(Taken from CIGRE Serbia. Authors: R. Naumov, E. Turkovic, G. Spaic)



# 155 years since Nikola Tesla's birth

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