WHAT IS A TESLA COIL AND WHY WOULD ANYONE BUILD ONE?

Synopsis by Jim Zimmerschied 9/25/22

Who was Nikola Tesla? An electrical engineer and inventor born in Croatia in 1856 (reportedly during a lightning storm).

He was interested in how things work, and at an early age invented a crude water wheel. He studied engineering in Graz (Austria) and Prague, worked in electric wiring systems in France, and migrated to New York City in 1884. He had a letter of recommendation regarding his genius capabilities from a friend of Thomas Edison and started working for the inventor on DC generating equipment.

Edison was convinced that DC was the best way to transmit electric power for lighting and motors; Tesla soon parted ways with Edison and began pursuing an AC motor design he conceived of in his spare time in Prague.

Tesla imagined a rotating electric field that would turn motors using multiphase AC power. Tesla soon built prototypes and patented AC multiphase components to be used by the new motor. Multiphase power could be easily transformed to high voltages for power distribution. Tesla eventually sold his patents to George Westinghouse, an inventor and entrepreneur.

Westinghouse used Tesla's alternating current system to light the World's Columbian Exposition at Chicago in 1893. This success was a factor in their winning the contract to install the first power machinery at Niagara Falls, which bore Tesla's name and patent numbers. The project carried power to Buffalo by 1896.

Tesla maintained his own laboratory and produced many inventions related to electric power and lighting. He developed means of producing electric power at higher and higher frequencies. He eventually built what is now called the Tesla Coil, a high frequency resonant air core step-up transformer. Tesla envisioned the ability to transmit electric power without wires.

In 1899, Tesla set up a large laboratory in Colorado Springs. Here he built an enormous Tesla coil that could produce long sparks and could transmit measurable power to receiving coils outside the lab.

With what he claimed was proof of concept, Tesla headed back to New York City to find investors.

He was able to convince JP Morgan to lend him money for what was touted as a wireless telegraphy system able to transmit stock information instantly across the ocean to Europe and back. He began building a giant coil and a building to house generators and other required equipment.

However, before the project was finished, Morgan found out that the real purpose was to transmit wireless power to any point on earth. Since there was no obvious way to bill the power sent into free space, Morgan stopped the flow of money and Tesla's dream vanished in the abandoned plant, called Wardenclyffe.

After that, Tesla's inventive power was drastically impaired but he continued working on such items as bladeless turbines and an automobile speedometer, as well as speculating about beam weapons.

Why would anyone build a Tesla coil? One side use of the Tesla coil (TC) was in radio. Tesla demonstrated use of his radio frequency devices to control a model boat. He also transmitted code across town. However, he mainly pushed the power transmission aspect and lost the invention of radio to others, such as Marconi, who used Tesla's inventions.

So for the commercial world TCs were part of early radios and later were used to power TV screens.

For the at home inventors and wackos, the TC is interesting in its ability to produce do-it-yourself lightning. The three coils I will demonstrate for ASME are in three sizes: a small electronic coil that can play music, a small spark gap coil that produces 12 in. arcs and can light fluorescent tubes wirelessly, and a medium size coil that can produce 6–8 ft arcs. (The photo below shows a bigger coil I built). A search of YouTube will return a large number of Tesla coil related items, including how to build them. One site, LOD.org, shows a tricycle that is powered by a nearby Tesla coil, proving to a small extent that Tesla could have transmitted power to some moderate distance.