Biography: Augustin Bernard Mouchot (1825-1912)

Important things that we know today about solar energy are connected with one of the inventors of a 19th century Augustin Mouchot, his life and occupational career. He was French engineer, mathematician and physicist. He was a man of enormous imagination. Mouchot was drawn to the idea of finding alternative energy sources, believing that the coal fuel would eventually run out. Thus, he undertook research on solar energy. He was an inventor of the earliest solar powered engine, converting solar energy into mechanical stem power. Solar cooking was his another field of investigations. Exploring solar cooking he used works of Horace-Benedict de Saussure and Claude Pouillet. Mouchot also demonstrated principle of ice blocks production using a solar-driven adsorption chiller. Then he developed the first parabolic solar collector and made a few interesting public demonstrations of his inventions in Paris. Even Emperor Napolen III was impressed by Mouchot ' s device presentation. His scientific achievements were amused. We can call him the pioneer in the field of solar energy.

"*One must not believe, despite the silence of modern writings, that the idea of using solar heat for mechanical operations is recent. On the contrary, one must recognize that this idea is very ancient and its slow development across the centuries it has given birth to various curious devices.*"

- Augustin Bernard Mouchot, at the Universal Ex

position, Paris, France (1878).

Augustin Mouchot predicted a need for solar energy. *"Eventually industry will no longer find in Europe the resources to satisfy its prodigious expansion... Coal will undoubtedly be used up. What will industry do then?"*

- Augustin Bernard Mouchot, after demonstrating an

early industrial application of solar thermal energy

(1880).

Augustin Bernard Mouchot was born in France on 7 April 1825. Town where he was born Semur-en-Auxois is located within Burgund's region. At first he was a teacher at the primary schools of Morvan (1845–1849) and then taught at Dijon. In 1852 he attained a degree in Mathematics and a Bachelor of Physical Sciences in 1853. Later Mouchot was a mathematics teacher in secondary schools of Alençon in years (1853–1862), Rennes and Lycée de Tours in years (1864–1871).

In this period of time the French teacher – Augustin Mouchot started to undertake research on solar energy. The idea of finding new alternative energy sources overwhelmed him. In 1860 he began exploring solar cooking, based on the work of Horace-Bénédict de Saussure and Claude Pouillet. Horace de Saussure was a French - Swiss scientist and started his work of solar cooking in 1767 building a miniature greenhouse ,in which he placed a pieces of fruits. This new technology called solar cooking. Horace continued his experiments with other materials as insulators an tried cooking at different altitudes. Claude Servais Mathias Pouille was a French physicist.. Between 1837 and 1838, independently of John Frederick William Herschel (1792-1871), he made the first quantitative measurements of the heat emitted by the Sun.

In 1866 Augustine Mouchot had developed the first parabolic solar collector. He designed a new collector, which concentrated the rays of sunlight from all sides of absorber. He experimented with a water-filed container enclosed in glass, which was exposed to the heat of sun until the water boiled. The steam that was produced provided power for a small steam engine. That was a great achievement. This device was presented in Paris in August 1866 to the Emperor Napoleon III, and the inventor was founded for a more ambitious phase of building.

It is worth to mention, that in this time a very high speed progress of industrialization in France and other countries was noticed. Many factories used steam engines. It was necessary to have sources of fuel for steam engines. In France a big problem with coal appeared. The source of this fuel was almost exhausted. Moreover, France had to import a coal from England. Coal was expensive. French government promised to support financially all researches, which could create possibility to be independent on coal imported from England. That was a good moment to find alternative energy to develop and use the solar energy. Thus, the consecutive years gave Mouchot possibility to improve his inventions of solar systems.

Over the next few years, Mouchot built lager and lager machines One of his most successful inventions was presented at the Great Exhibition of the most modern technologies from around the world in 1867. Many attendees were amazed at this invention. A huge crowd gathered at Mouchot's "solar engine" device. It had a huge light – capturing apparatus that could generate enough steam to power a small engine. In his book "The Power of Light: *The Epic story of Man's Quest to Harness the Sun* Frank Kryza said on the device: "*When Mouchot put it on the display, the reaction was one of stupefied amazement – a motor that ran without fuel, on nothing more than sunbeams! It struck observers as bizarre – even magical."*

Mouhout won a first place medal at this exhibition and could continue his work on the developments.

In 1869 he poured himself into writing the first book ever devoted to solar energy: *La Chaleur solaire et ses Applications industrielles* and at the same time he displayed in Paris the largest solar steam engine he had yet built. But Paris was at that time under siege during the Franco-Prussian War in 1871, however, the monster engine was not found after the siege ended.

In September 1871, Mouchot received financial assistance from the General Council of Indre -et-Loire to install an experimental solar generator at the Tours library. In December 1875 he presented to the Academy of Sciences a device, which he claimed would provide a steam flow of 140 liters per minute in optimal sunshine. He got the permission from the ministry to leave his teaching position in order to develop work on an engine for the Universal Exhibition of 1878. He had important mission to execute solar engines in French Algeria. He got a grant for the purchase of materials and execution of solar engines and was recommended to the Governor of Algeria.

Augustin Mouchot from 1860 to 1878 built different mirrors and use them to cooking food, boiling water, pumping water and even producing brandy. At first Mouchot solar device was able to bring three liters of water to boil in one and a half hours. Muochot invented the conical mirror and implemented in cooker in 1870's. Parabolic mirror concentrate the reflected rays of sun light to a point and cone concentrate light to a line. Mouchot found out that cone mirror can be quite enough good to boil water for tea or produce steam for engines. Construction of cooker with the conical mirrors was much more easy. First solar pump was build in 1861 and in 1874 Muochot used a solar energy for pumping water in Algeria. Mouchot's solar devices were used by the French soldiers in North Africa. In this way they were preparing meals without a smoke.

A few solar system were build and used to power stem engines. On September 1878 at the World Exhibition in Paris Mouchot presented the biggest one. The mirror concentrating solar energy had diameter of five meters. All device could produced an ice blocks, using solar energy and machine of Edmund Carre*. This big mirror has one disadvantage. It was made of silver and oxidized and had to be often clean. Muochot was awarded a gold medal for presentation of this experiment.

Furthermore, in 1880, Mouchot's assistant Abel Pifre –a French engineer presented a solar-powered printing press. Sunlight from parabolic mirror heated up water in small boiler and produced steam for steam engine, which drove printing machine. Abel Pifre was able to print 500 copies per hour of his newspaper "Soleil-Journal".

However, The political and economical situations in France have changed. The economy in France was improving. The Cobden-Chevalier Treaty** between France and the United Kingdom

caused that coal became cheaper. It was a very important commitment for France in time when sources of coal were exhausted. Later French miners have found new coal deposits in Eastern France.

Due to this fact the government was not more interested in supporting financially researches on alternative energy. Additionally, French government assessed that solar energy was not enough economical. Mouchot studies become less important as before. He hasn't got more financial support. His activity concerned with the investigations and implementations of solar energy in practice stopped. Mouchot went back to the teaching profession.

Imagination and inventions of Mouchot were appreciated by the Institute of France. He received twice prizes in 1891 and in 1892 and he was named *Lauréat de l'Institut by the Institut de France.*

Augustin Bernard Mouchot died in Paris.1912.

* The first absorption machine was developed by Edmond Carre in 1850, using water and sulfuric acid.

** The Cobden–Chevalier Treaty was a Free Trade treaty signed between the United Kingdom and France, on January 23,1860. It was named after the main British and French originators of the treaty, Richard Cobden Member of Parliament and Michel Chevalier.

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