

# **The History of Water Filters – Part II**

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## A Great Discovery in Water Filtration History

The Renaissance period, beginning in the late fourteenth century, ended the scientific and intellectual stagnation of the Dark Ages and sparked a new period of discovery. In this period, often called the Age of Discovery, several inventions came about that greatly affected the world. Included among these inventions was the microscope, a scientific innovation that greatly affected the history of water filters.

Long before the actual use of a microscope as we know it today, people had recognized the power of concave glass to make items appear larger and to focus heat from the sun. This discovery was little used until the advent of spectacles in the mid-thirteenth century. It wasn't until the late sixteenth century that such concave pieces of glass, or "lenses" as they were called, became relevant to the history of microscopy, and, consequently, to the history of water filters. In 1590, two Dutch spectacle makers, Zaccharias Janssen and his son Hans, began experimenting with lenses in a tube and found that they could greatly magnify objects viewed through the tube (Wilson, 1995). This invention was the forerunner to modern-day telescopes and microscopes.

A century later, Anton van Leeuwenhoek, considered the father of microscopy, built upon the Janssen's simple invention. By grinding and polishing the tiny curved lenses, he was able to reach magnifications of up to 270 times the original object (Wilson, 1995). This advanced microscope had a great effect upon the study of water purity and water filtration. Scientists were now able to view tiny material particles present in water that had been presumed to be clean.

## The Use of the Microscope in Water Filter History

Anton van Leeuwenhoek used his discovery of the microscope to see and describe the teeming life in a single drop of water. Robert Hooke, considered the English father of microscopy, confirmed Leeuwenhoek's descriptions of tiny, living

organisms in a drop of water and further refined the microscope. Soon scientists were examining tiny particles of life they had never before seen nor known existed prior to the invention of the microscope.

The microscope has an interesting place in water filter history. In mid-19th century London, where diseases ran rampant because of the tight quarters of the working class, city officials began to link the spread of cholera to poor drinking water quality (Baker & Taras, 1981). In areas where sand water filters had been installed, the outbreak of cholera had greatly decreased. To further corroborate this conclusion, John Snow, a British scientist, was able to link several cholera deaths to water from the Broad Street Pump, a nearby water pump that had become contaminated by a leaking sewer (Baker & Taras, 1981). Using a microscope, he was able to confirm the presence of tiny cholera bacteria in the water. Ironically, this water came from a pump that had been noted throughout the city for its overall good taste and quality. This instance proved once more that the taste and visual clarity of water does not necessarily indicate purity.

As British government officials noted the effect of water quality on cholera outbreaks, both through Snow's discovery and through the evidence of decreasing cases of cholera where sand water filters had been installed, they mandated the installation of sand water filters throughout the city. This mandate was one of the first instances of government regulation of public water and would set a precedent for municipal water systems.

## The Advent of Municipal Water Treatment

Long before Snow linked cholera deaths to poor water quality, people were beginning to suggest that pure water be provided to every household through some sort of citywide water filtration. The supposition that every person deserved clean water to drink and bathe in was related to the general philosophical themes of the Enlightenment period in Europe. During the Age of Enlightenment of the sixteenth through eighteenth centuries, philosophers ruminated over the natural rights of all humanity. The right to clean, pure water began to be associated with these innate rights of all humanity. Such philosophical discussions led the French scientist La Hire to propose that every French

household have a sand water filter installed that would provide clean water to that household. Sand filters had become the most popular method of water filtration throughout many European towns.

About 100 years after La Hire first suggested that all citizens should be given the right to pure water, government officials in the United Kingdom began to wonder, also, if every household in their domain should be provided with some kind of filtered water. In 1804, the first citywide, municipal water treatment plant was installed in Paisley, Scotland (Baker & Taras, 1981). This plant would provide filtered water to every household within the city limits. The Scottish water treatment plant depended upon slow sand filters designed by Robert Thom, an important scientist of the Scottish Enlightenment. In 1827, James Simpson, an English scientist, created a similar design to Thom's, and the Simpson water filter models were soon implemented in municipal water treatment plants throughout England.

The slow sand water filters designed by Thom and Simpson were very large and required frequent and extensive cleaning. Because of the growing need for filtered water, scientists in the United States designed a rapid sand filter in the late nineteenth century (Baker & Taras, 1981). The rapid sand filter was cleaned by powerful jet streams of water, greatly increasing the efficiency and capacity of the water filter.

### The Effect of the Scottish Enlightenment on Water Filter Technology

It is no coincidence that the first municipal water treatment plant was designed and installed in Scotland. Many of the greatest philosophers and scientists of the eighteenth century hailed from Scotland. Historians typically term the period between 1740 and 1800 the Scottish Enlightenment because of the outpouring of scientific thought from Scotland.

After the Act of Union of 1707, which joined Scotland, Ireland, Wales, and England under the inclusive union of Great Britain, Scotland, traditionally known as one of the most backward nations in Europe, joined in the general fervor and scientific discovery of the Enlightenment (Buchan, 2003). In this period, David Hume, the Scottish philosopher and historian, outlined the tenets of the

modern-day scientific method, and Adam Smith, the famous British economist, published his revolutionary economic theory that is the foundation of modern-day, free-trade economics.

A lesser known scientist and engineer, destined only to make the chronicles of water filtration history, also came from this era of Scottish Enlightenment. Robert Thom, advancing upon the technology of small-scale, slow sand filters, designed the first, citywide, water filtration plant. His plant was able to provide filtered, pathogen-free water to the entire city of Paisley, Scotland.

Thom's success in designing a municipal water treatment plant, added to the scientific evidence that had proven decreases in waterborne diseases as a result of filtered water, led to the passage of the Metropolis Water Act of 1852 (Binnie, Kimber, & Smethurst, 2002). This law, the first of its kind, required that all water supplied to London be treated by slow sand filtration.

Thom provided a revolutionary water filtration design that would change the face of water treatment history.

*To be continued in Summer 2005.*