

# TerranearPMC Safety Share

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## Week of August 12, 2019 – A Brief History of Respirators

Lately, I have found myself conducting quite a number of respirator training classes. My typical opening question is, “when was the concept of wearing a respirator first conceived?” Most people automatically respond with “World War I.” True, respirators were used during this time, as this is when Chemical Warfare, via the use of chlorine gas, began. However, the fact is, the concept of respiratory protection came into light during the first century, A.D. by “Pliny the Elder.” Pliny was a brilliant military commander as well as a Roman procurator in Spain and credited with writing numerous treatises on various topics.

During ancient times, one of the most hazardous jobs was working in an underground mine, where the Greek physician, Hippocrates (who lived circa 460 BC), noted the severe health effects due to inhaling hazardous materials such as lead. A few hundred years later, Pliny also recognized the same respiratory ailments suffered by those subjected to working in mines. This led to Pliny with the idea to use the bladder of a calf or goat to wrap around the nose/mouth area. This material was porous enough to allow for a person to breath while filtering particles from the air – a useful protective measure for those working in underground mines for which the Romans secured needed metals.

In the 16<sup>th</sup> century, *Leonardo da Vinci* proposed using a woven cloth dipped in water over the face to protect against smoke agents used in warfare.

By the 18<sup>th</sup> Century, London was afflicted by thick smog, due to the full thrust of the industrial revolution and excessive use of coal. Thus, many Londoners walked around the town with woolen sacs over their heads to filter out the heavily polluted air.

As time moved forward, inventors worked on designs to more effectively protect people from inhalation exposures. Some of these designs were so effective that they have influenced respirator manufacturers to this day. For example, the Haslett Lung protector, which was the first respirator to be patented in the U.S. in 1848, employed the use of one-way exhalation valves and moistened wool to filter dust. A few years later, another respirator type (made by Hutson Hurd) improved on the design of the Haslett respirator by incorporating a cup-shaped mask. This air purifying device was in use until the 1970s.

By the late 1800’s, there was a growing interest in air purifying devices, sparking a race to develop respirators that could protect against a wider range of pollutants, such as toxic gases. John Stenhouse, a Scottish chemist, built the first respirator capable of capturing toxic gases from the air. His designs pioneered the use of charcoal in a wide variety of air purifying devices, including respirators used by firemen.

On April 22, 1915, German forces shocked Allied soldiers along the western front by firing more than 150 tons of chlorine gas against two French colonial divisions at Ypres, Belgium. This was the first major gas attack by the Germans, and it devastated the Allied line. Chlorine gas is known as an eye irritant and upper respiratory irritant and therefore, can quickly incapacitate a soldier’s ability to fight. Soon after, another chemical agent, phosgene – a chlorinated compound – was found to be more effective to disable the enemy as phosgene was able to reach the deepest reaches of the lung, causing



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such serious conditions as pulmonary edema (water in the lungs). This was followed by mustard gas; a material that caused temporary blindness. Thus, respirators now needed to be a protection devise for the entire face.

After the first world war, the military took a deep interest in the use of respirators as a defense mechanism against chemical warfare. This in turn led to the creation of efficient and inexpensive filters in the 1930s that were made with resin-infused dust. Further developments led to filters made of very fine glass fiber, that could eliminate particulate matter, while providing little resistance to breathing.

While respirators were generally being made to provide protection for warfare, by the mid-20<sup>th</sup> century many countries were facing another airborne crisis that was causing respiratory ailments. Countries such as the U.S and U.K were faced with some of the worst air pollution in their metropolitan areas. In December of 1952, the city of London was afflicted by a thick layer of smog, which lasted for five days and resulted in 12,000 fatalities and 100,000 reported cases of respiratory tract illness. Known as ‘the great smog’ or ‘big smoke’, it was caused by the overuse of coal, coupled with extremely cold weather and lack of wind; thus, trapping airborne pollutants and not allowing airborne contaminants to dissipate into the atmosphere. In 1943, Los Angeles suffered from its first smog incident. LA’s massive vehicle industry and factories were to blame for the smog. These cases would give impetus to environmental law reforms and a greater sensitivity to pollution issues. Labor reform laws also paved the way for development of more efficient respirators to be used in industry.

Although modern devices that were created following these and other pollution cases became more sophisticated, respirators still fall into in two main categories: 1) Air-purifying respirators: these purify air by removing pollutants before they are inhaled, and: 2) Air-supplied respirators: which deliver fresh air from an alternate supply.

As true with all personal protective equipment, respirators are a last resort to protect humans. Without the consideration of engineering controls, the problem of poor air quality shall persist. Major population centers such as New Delhi in India, Tehran in Iran, Mexico City in Mexico and many cities in China continue to suffer from heavy smog. As such, the demand for respirators continue. At the same time, developing nations that have strict anti-pollution regulations have been able to reverse the need for respiratory protection.

Although respirator technology has made tremendous advances, it is not uncommon to see people in cities and airports wearing simple dust masks – which are not designed to protect humans from toxic materials. In addition, without a proper fit test, the actual ability of a mask to offer a specific type of protection cannot be guaranteed. This is due to a lack of understanding of most people regarding the composition of pollutants and how respirators work, including the limitations of various types of respiratory protective devices.

**An object in possession seldom retains the same charm that it had in pursuit**

Pliny the Elder

