The Challenge of Toxics in the Chemical Processing Industry

Isn’t it time to take a closer look at the chemicals that society both praises and vilifies in order to discover the real truth and consequences?

‘It was claimed that as little as one part per billion in soil would pose a health risk.’ By Michael D. Shaw While acknowledging its failings and striving for improvements, the chemical processing industry should be proud of its record &#151 virtually from the beginning &#151 of sound stewardship in the management of toxics. It should aggressively publicize the positive while being mindful of overzealous media and activists, some of whom use the environment as a battering ram to destroy productive and responsible enterprises. To prove this point, let’s take a brief look at four examples of how the response to a toxic chemical had sweeping consequences.

#1: Early Pollution Control

Since the dawn of the Industrial Age, commercial enterprises have faced daunting challenges from economic and labor issues to ferocious competition and even government harassment. But, the processing industries, especially the chemical processing industry, have also been forced to deal with toxic and hazardous substances. Contrary to popular opinion, the chemical processing industry has been concerned about these materials long before the advent of regulatory agencies. Indeed, it’s surprising how far back this concern can be traced. The Leblanc process for converting sodium chloride into sodium carbonate came about because of a need publicized by the French Academy of Sciences in 1775. A plant was set up to run the Leblanc process in 1791, but it did not go full-scale until it was introduced in England in 1823. During the process, salt is reacted with sulfuric acid, yielding sodium sulfate and hydrogen chloride. The sulfate is then reacted with limestone and coal, producing a black ash that contains the desired carbonate and certain other products that are easily removed. In fact, the name “soda ash” for sodium carbonate is derived from this process. One of the first things noted when this process was scaled up was that the escaping hydrogen chloride could do damage to the factory and local environment. Methods were quickly developed to capture the hydrogen chloride, convert it to chlorine and absorb it in lime for bleaching powder, which had its own market. Because calcium sulfide, which is contained in the ash, has an offensive odor, methods were developed to remove it and recover sulfur, which in turn was used to synthesize the sulfuric acid for the original process.

#2: Chlorine's Story

Chlorine's story serves as a model for today's chemical processing industry. One of the greatest contributions of science has been the chlorination of water. While the processes of sedimentation and filtration were used in many industrialized countries by the mid-1800s to purify water, it was the introduction of wide-scale chlorination in the early 20th century that virtually guaranteed safe drinking water. Thus, it's all the more tragic that the UN's World Health Organization estimates that 25,000 people per day die of diseases associated with contaminated drinking water. But if non-use of chlorine can have disastrous effects, so can its misuse. The world was introduced to the toxic properties of chlorine when it was deployed in World War I as a chemical weapon. No doubt due to chlorine's fierce reputation, industry was quick to initiate protective measures. As a result, the Chlorine Institute was founded in 1924 and has been instrumental in creating safety best practices and fostering the manufacture of emergency kits and recovery vessels. Another consequence of chlorine's use as a chemical weapon was the development of gas masks, which eventually morphed into the respirators used by industry today.

#3: Ubiquitous Benzene

It had been known for some time, at least since the late 1920s, that rubber workers had worse cancer morbidity and mortality than the general population. It was not until the 1970s, however, that a link was established with the ubiquitous solvent benzene. As a result, allowable occupational levels of the compounds were drastically reduced, and sampling methods and field-appropriate analytical instruments were promulgated. Lawsuits also were filed. Considering everything, this first highly publicized chemical carcinogen in the age of OSHA was reasonably well managed by government and industry. Although it may be cold comfort for those whose lives were damaged by overexposure, the result was more aggressive policies toward possible carcinogens.

#4: Dioxin Today

Although dioxin can refer to any member of the group of compounds that are byproducts of certain syntheses, most people think of dioxin as being 2-, 3-, 7- and 8-tetrachlorodibenzo-p-dioxin. Because this chemical occurs in the synthesis of Agent Orange, its reputation is not a good one. In addition, the discovery of improperly disposed chemical waste in the early 1980s near Times Beach, Missouri, created a panic concerning its potential toxic effects. Poorly designed studies in which extremely high doses of the substance were given to guinea pigs and other animals far more sensitive than humans caused researchers to conclude that dioxin was one of the most toxic of all synthetic substances. It was claimed that as little as one part per billion in soil would pose a health risk. However, the only proven effect of dioxin is the skin rash chloracne. This point came to light during the highly publicized case of Viktor Yushchenko, the president of the Ukraine who was disfigured but not killed after he was given massive doses of the chemical in an assassination attempt. *Michael D. Shaw is executive vice president for Interscan Corp., a Los Angeles-based manufacturer of toxic gas detection instrumentation and*

related software. His academic credentials include undergraduate biochemical research at UCLA under Roberts A. Smith and Nobel Laureate Willard Libby, pioneering endocrinology studies under Dr. Jessie Marmoston (County USC Medical Center) and a graduate stint at MIT under Gene Brown. Question and comments can be addressed to Shaw at mds1@gasdetection.com. Additional information is available at www.gasdetection.com.