

Propellants & The Environment

The development of aerosols used for insecticides during WW II resulted in the first large-scale commercial use of a fluorocarbon as a propellant - the best known being Freon 12 or CFC 12 which is a chlorofluorocarbon (CFC). The most commonly used chlorofluorocarbon aerosol propellants are CFC 12, CFC 11, and CFC 113.

In 1974, the Ozone Depletion Theory was proposed by Professors Roland and Molina which led to CFCs being evaluated extensively from an ecological viewpoint. The end result was restrictions being placed on the use of CFC propellants.

Following the 1987 Montreal Protocol, the USA became the first country to prohibit the use of CFCs in aerosol packaging. Canada rapidly passed regulations that have been effect since January 1990 which also eliminate the use of CFCs in aerosols, except for some pharmaceutical applications.

As CFCs, seen to contribute to stratospheric ozone depletion and global warming, have now been banned worldwide, fluorocarbon manufacturers have undertaken programs to develop alternative fluorocarbons to be used as propellants in aerosol packaging. The most promising alternative to address environmental concerns posed by CFC's appears to be the hydrogen-containing fluorocarbons (HFCs).

Although the use of isobutane, a hydrocarbon propellant, was considered as an aerosol propellant as early as 1933, large-scale commercial use of hydrocarbons as propellants did not occur until 1954 when the first tank car shipment of hydrocarbon was made to Lenk Manufacturing Company to manufacture an aerosol shaving lather marketed by Colgate-Palmolive. Since then, hydrocarbons have been used to an increasing extent as aerosol propellants.

By the end of 1974, it was reported that more than 55% of all aerosol packages contained hydrocarbon propellants. By 1978 it has been estimated that this usage had increased to at least 75% and may be as high as 85% today.

Although compressed gases such as carbon dioxide, nitrous oxide, nitrogen and air have been considered for use as an aerosol propellant far longer than liquefied gases, they have only been used to a minor extent. This is because, unlike liquefied gases, compressed gases have inherent disadvantages that limit the range of products they can be used as propellants with.

Carbon dioxide was used for charging beverages as far back as 1869 but compressed gas aerosols did not appear on the market in any significant quantity until the 1950's. Nitrogen was one of the first gases used during this period. Greeted with enthusiasm initially, consumer complaints about "Nitrosols" soon reversed the attitude toward use of nitrogen.

Times have changed. Heightened concern for the environment has renewed interest in the use of compressed gases, particularly nitrogen, as they are considered to be "green" propellants and environmentally acceptable. They are also non-flammable and inexpensive.

As a result of several technological advancements, including the design of new low-spray-rate valves specifically for use with compressed gas systems and the development of commercial filling equipment with high production, there has been a significant increase in the number of compressed gas aerosol products in the recent years.