

Chlorine Gas Disinfection Association Ph: 949-459-8735 Fax: 949-858-9607  
30575 Trabuco Canyon Rd # 104, Trabuco Canyon, CA 92678

## **CHLORINE GAS: Per gallon of water treated, the safest form of residual disinfection**

Commercial air travel in North America has evolved into the safest mode of transportation available, bar none. Per mile traveled, commercial air has fewer injuries and deaths than with any other mode of transportation including rail, sea, and of course the automobile. For example, the risk of death in driving from LA to New York is 10 times greater than flying. Yet, there are still many people who have a fear of flying. Why is this the case? Because with many, emotions and unfounded fears become the overwhelming motivation in their decision making process. Logic, historical facts and statistics are disregarded at the expense of their quality of life, financial well being and most importantly, *their safety*. The water industry, unfortunately, is suffering from a similar fate.

The shift away from chlorine gas disinfection to other forms of residual disinfection is based on the theory that the alternatives are safe and gas disinfection is not. This theory has been fueled by regulations, worst case scenarios and a phenomenon that we are referring to as “BHOPAL SYNDROME”. That is, “If we use chlorine gas in our plant, our community could suffer the same fate as the community of Bhopal India.” In addition, government data bases are extremely inaccurate, media use the word “Chlorine” to describe all types of residual disinfection, and risk analyzers and regulators have not even considered the safety and health risks associated with the alternatives. Per gallon of water treated, our research is indicating that Chlorine Gas (like commercial air travel in the transportation industry) is the safest form of residual disinfection available, bar none.

There is no question that chlorine gas is a hazardous substance. Many of us

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in the gas disinfection industry have had a snoot full on occasion and have a lot of respect for it. However, comparing a water treatment application to what happened in Bhopal is like apples and oranges. Because chlorine is a hazardous substance, the gas disinfection industry has spent more than 90 years evolving and perfecting the technology to make it the safest form of residual disinfection available. By combining a venturi with a moving water source, it was discovered early in the century that chlorine gas could be fed under vacuum from the feeding device. The Chlorine Institute was founded to “Self regulate the industry” in the 1920's and to set standards in packaging, transportation and use. These and other advances led to the invention of the modern valve mounted vacuum regulator in 1960 that feeds under vacuum “From source to point of application”. There is no other major hazardous chemical industry that takes advantage of this invention. From the data that we have gathered, there has not been a single off site consequence resulting in a fatality since the invention of this modern vacuum feed device. Over 100,000 sites in operation, 40 years of service, and not a single documented off site fatality! Logic, historical facts and statistics show that the probability of a Bhopal in *our industry* is next to nil.

It is only natural to assume that when the government comes up with a regulation, that there must be a problem. The fire codes, OSHA, the EPA and a number of other regulators must know what is going on, right? Wrong! Not a single one of these regulations was made based on facts and historical data from OUR INDUSTRY, the chlorine gas disinfection industry.

The government & regulator databases on chlorine incidents are highly inaccurate due to two major factors: 1) the government data bases don't differentiate between industries and 2) much of their database information is based on media reported *Hypo accidents* that incorrectly use the word “chlorine” in their headlines or articles to describe these accidents.

Because the government databases do not differentiate between industries, the gas disinfection industry (only 4% of chlorine use), gets lumped in with all other industries. Unfortunately, other industries cannot take advantage of

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the vacuum feed technology that we use in the gas disinfection industry. They must feed under pressure to their process, and this is where the possibility for a significant release exists.

Since early 1996, the Chlorine Institute has been using clipping services to collect information on media reported chlorine events. They very generously offered these clippings to us in December 1999 to "Jump Start" our work on an incident database for our industry. A preliminary analysis of approximately 400 reported "Chlorine" or "Chlorine Gas" incidents relating to disinfection indicates that about 55-65% of chlorination accidents were actually due to Calcium Hypochlorite, Sodium Hypochlorite, onsite hypo generation or a combination thereof. Over 50% of these Hypo accidents use the word chlorine or chlorine gas in the article headline. For example, a cal hypo accident in Arizona is described as "Chlorine tank explosion shuts down Grand port". A large sodium hypochlorite accident in New Jersey was reported as "Chlorine accident sickens 23", and an onsite hypochlorite generator explosion in California was described as "Explosion rocks water treatment plant...when chlorine generation tanks were being installed". This reporting slants government databases and further tarnishes the reputation of the gas disinfection industry.

As you can see from the above, there are serious safety issues related to the handling all residual based disinfectants. Calcium Hypochlorite is responsible for serious gas releases, fires and explosions accounting for about 25-30% of chlorination incidents. Sodium Hypochlorite accounts for about 30-35% of the reported incidents, but these incidents are on the increase municipally and are to blame for some of the most severe gas release when other chemicals are accidentally delivered into a hypo tank. In fact the AWWA disinfection committee reports in the May 2000 Journal AWWA, *"Although the switch to non-gaseous chlorine was a definite trend in these survey responses, new safety problems have been reported with nongas chlorination systems since the 1998 survey. Reported incidents included gas releases from the nongas chlorine sources following the introduction of acidic chemicals such as alum into bulk liquid chlorine solutions. In such*

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*incidents, the gas chlorine releases may be less readily detected or contained if these liquid storage and feed facilities are not designed for gas detection or containment.*” Incidents with onsite generation is relatively low due to a very small number of users, however, serious injuries have been reported in California and Florida where improperly vented hydrogen has been detonated. The remaining 35-45% of reported chlorine incidents are in fact due to compressed chlorine gas.

In addition to the safety issues that need to be addressed when using the alternatives, many are disregarding the health consequences of changing from using chlorine gas. Chlorate and Bromate formation (known carcinogens) are of far greater concern when using one of the hypos than when using 100% chlorine gas. Have these risks been fully assessed? NSF and the EPA are now beginning to look at these issues as users are blindly switching to one of the alternatives.

Chlorine Gas Disinfection does not have a perfect record and it is not always the answer. We have a number of areas where we can continue to improve including facility design, training and maintenance. But when municipal water agencies with trained personnel and modern equipment are switching to hypo as the “Magic pill” to satisfy regulators, they in many cases are unknowingly increasing their risk rather than decreasing their risk. The water industry should not let emotions and unfounded fears become the overwhelming motivation in our decision making process. Logic, historical facts and statistics should. Don’t get trapped into “Driving from LA to New York to be safer.” If users of chlorine gas look at their own historical facts and statistics of use, they will not be surprised to find that gallon for gallon, chlorine gas is the safest form of residual disinfection available.