Chemical Injection Technologies

Technical Bulletin

SUPERIOR™ Gas Ammoniators
Applications, Materials and Installation Notes

APPLICATION

Chloramines are the result of the reaction of ammonia and chlorine in water. They are widely used in potable water treatment as an inexpensive alternative to using activated carbon filtration for trihalomethane precursor removal, and to maintain chlorine residuals for an extended period.

The reaction of chlorine with ammonia produces monochloramine, dichloramine, and trichloramine. Monochloramine is the most commonly used form of chloramine since it contributes little or nothing to taste and odor in the finished product. To produce monochloramine, the chlorine-ammonia ratio must be maintained at 3 to 4 parts chlorine to one part ammonia. When chlorine is added in excess of this ratio, coupled with a lower pH, it can produce dichloramine and trichloramine. These two chloramine forms can cause taste and odor problems in the drinking water. Trihalomethanes which have been formed prior to the addition of chloramine will not be altered in this process. Any free chlorine present prior to the application of ammonia will form chloramines.

Chloramines are more widely known as "combined chlorine". They do not react with precursors to form trihalomethanes. Trihalomethanes are *suspected* carcinogens and are formed in the presence of free chlorine residual when the precursors are present and sufficient contact time is available. It should be noted that there is an ongoing debate about the relevance of the studies and methodology used in the research on trihalomethane toxicity.

Of the two types of chlorine residual, combined residual is a far less active disinfectant than free residual. Therefore, either the dosage of combined residual must be higher than that of free residual, or the contact time longer to produce equivalent results. This combination of dosage and time is referred to as Ct value. Ct values for chloramines are an order of magnitude larger than free chlorine.

DESIGN

SUPERIOR™ Gas Ammoniators are identical in design and function to SUPERIOR™ Gas Chlorinators. All features, advantages, dimensions and specifications contained in SUPERIOR™ Gas Chlorinator literature, with the exception of ejector nozzle requirements and part numbers, may be interchanged for use with SUPERIOR™ Gas Sulfonators.

MATERIALS

Ammonia (NH_3) in a dry (anhydrous), gaseous state is relatively compatible with a number of common engineering plastics. Unlike Chlorine gas, Ammonia exhibits no corrosive effects on stainless steel, although in a pressurized state its highly alkaline nature can cause some plastics to swell and discolor. Therefore, the PVDF inlet adaptor used in gas chlorinators is replaced with a stainless steel adapter designed to fit the slightly different dimensions of the ammonia cylinder valve. Also, the silver inlet valve plug is replaced with an identical valve plug made of stainless steel.

The special Viton O-Rings used in SUPERIOR™ Gas Chlorinators and Sulfonators are designed to withstand highly acidic environments and are not suitable for use in Ammonia gas. All O-Rings in SUPERIOR™ Gas Ammoniators are made of neoprene. All other materials, not specifically mentioned above, are the same as those used in SUPERIOR™ Gas Chlorinators.

INSTALLATION CONSIDERATIONS

Ammonia must be added to the system **before** the chlorine. Since the ammonia must come into contact with the chlorine to form the chloramines, static mixers should be installed in the piping before the application of chlorine in order to disperse the ammonia. Another static mixer should be installed after the addition of the chlorine to thoroughly mix the chlorine/ammonia solution.

Pub.No. 1297-1

Printed in U.S.A.

Other mixing methods may be employed, depending upon the installation. For example, excellent mixing can be provided by placing a static mixer between the application points of ammonia and chlorine, when both of those points are in a pump suction line.

HARD WATER CONSIDERATIONS

Users should be aware that there exists a problem when an Ammoniator is installed in a water system where the ejector supply water is considered “hard”. Hard water is high in calcium salts. This causes a reaction with the ammonia gas that causes the mineral to precipitate out of the water and deposit on the walls of the nozzle. These deposits can form rather quickly in severe “hard” water conditions, and will eventually cause the ejector to stop producing vacuum. The only cure at that point is to remove the nozzle and clean it in muriatic acid.

The question has arisen with regard to “What is HARD water?”. Generally, water is considered ideal at approximately 120 PPM (7 GRAINS) hardness content. That’s ideal for people and washing clothes, not necessarily for ammoniator ejectors. At 120 PPM (7 GRAINS) there will definitely be some deposits forming in the nozzle, but it will not be serious and probably will not plug things up within the first 3 or 4 months, possibly more. Above 120 PPM (7 GRAINS) things start to go downhill fast! For this reason, it is highly recommended that ammonia solution lines running from the ejector to the point of application be avoided. These solution lines are subject to the same build-up of deposits as the ejector nozzle. Ammonia ejectors should always be installed directly at the point where the amonia/water solution will be added to the system.

Some installations have been known to install softeners in the ejector supply water line. This works well, but in some states the softener backwash cannot be dumped by a commercial treatment plant (considered a ground water pollutant). Another method for coping with (not solving) the problem is to install two ejectors in parallel and use ball valves to operate one at a time. The ejectors have unions or other quick disconnect fittings so they can be easily removed to clean the nozzles. There are many possible variations on these ideas.

1 GRAIN HARDNESS = 17.1 PPM

CAUTION!!!!!

Do not store chlorine gas cylinders with Ammonia Gas Cylinders!