Feeding sodium hypochloride using innovative drinking water disinfection technology

Water disinfection is the most critical process in the treatment of water and wastewater. The world's most universal and reliable means of water and wastewater disinfection is chlorination. Two fundamental methods include gas chlorination (Cl_2) and liquid chlorination (NaOCl), otherwise known as sodium hypochlorite. Chlorination was introduced as a commercial water purifier in 1908 and has since been acknowledged as the optimum method for water disinfection due to its ability to provide residual protection throughout the water distribution system.

As a result of safety concerns with handling gaseous chlorine, the application of Cl_2 continues to decline while liquid chlorination and other alternative yet more recent technologies such as UV (ultraviolet light) and Ozone (O_3) strive to be more promising and possibly safer means of disinfecting water and wastewater. Yet, liquid chlorination water disinfection has been proven to be the most effective, economical, and reliable application for treating water globally for over 50 years.

Sodium hypochlorite is widely used in various processes for disinfecting and bleaching. Also referred to as NaOCl, bleach, hypo, or chlorine, it is typically supplied and dispensed in 5-20% concentrations by weight, with the higher concentrations being progressively less stable. It is subject to degradation within the piping and pump systems as it releases oxygen gas and results in crystallization of the residual.

If the gas or vapour is allowed to build up within the piping and reagent head in sufficient volume, a typical reciprocating piston metering pump, used for accurately feeding chlorine to the process, will not function properly as gas in the pump head is compressed. This minimizes the discharge check valve's ability to open upon discharge stroke of the pump. Consequently, this effect could require that the pump be reprimed for operation.

Reciprocating piston metering pumps or diaphragm metering pumps have been historically preferred in the dispensing of sodium hypochlorite because of their ability to accurately dose chemicals into a process stream with great precision and repeatability at a constant pressure. Additionally, the diaphragm metering pump is sealless and leak proof by design, with negligible maintenance and simple commissioning.

Traditionally, the diaphragm metering pump industry has promoted the use of degas valves on the discharge port of the pump which diverts gas back to the suction supply source of the bleach. This method has been widely accepted and successful in many applications. However, the small diameter ports in the valve system tend to plug and require continuous flushing or cleaning through human intervention since the system is open to the atmosphere on the discharge side of the orifice. Additionally, an external bypass piping system and degas valve assembly require additional costs and maintenance while presenting more opportunities for undesired chlorine leak paths.

Description of technology

Pulsafeeder, a Unit of IDEX Corporation, in Rochester, New York, has developed a technology that provides a simple and intuitive pressurized flushing system integral to the pump head, specifically designed for metering sodium hypochlorite solutions with great accuracy and repeatability.

The Pulsar HypoPump.

The Pulsar HypoPump® was explicitly designed to meter the full range of concentrations of sodium hypochlorite and its vapours associated with heat and degradation of composition. It features a patented design that allows pressurized process fluid to cyclically flush vapours and liquids through the pump's discharge check system while maintaining high performance and chemical dosing accuracy. The design is integral to the pump head and eliminates the need for bypass systems including piping, valves, fittings, and instrumentation. Most notably, this system is closed-looped and not open to the atmosphere at any point, therefore eliminating crystallization of the sodium hypochlorite.

The distinctive design also enhances self-priming capabilities since the pump system automatically evacuates entrained air in the piping system and pump head.

The HypoPump has been installed in hundreds of significantly troublesome installations throughout the world.

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