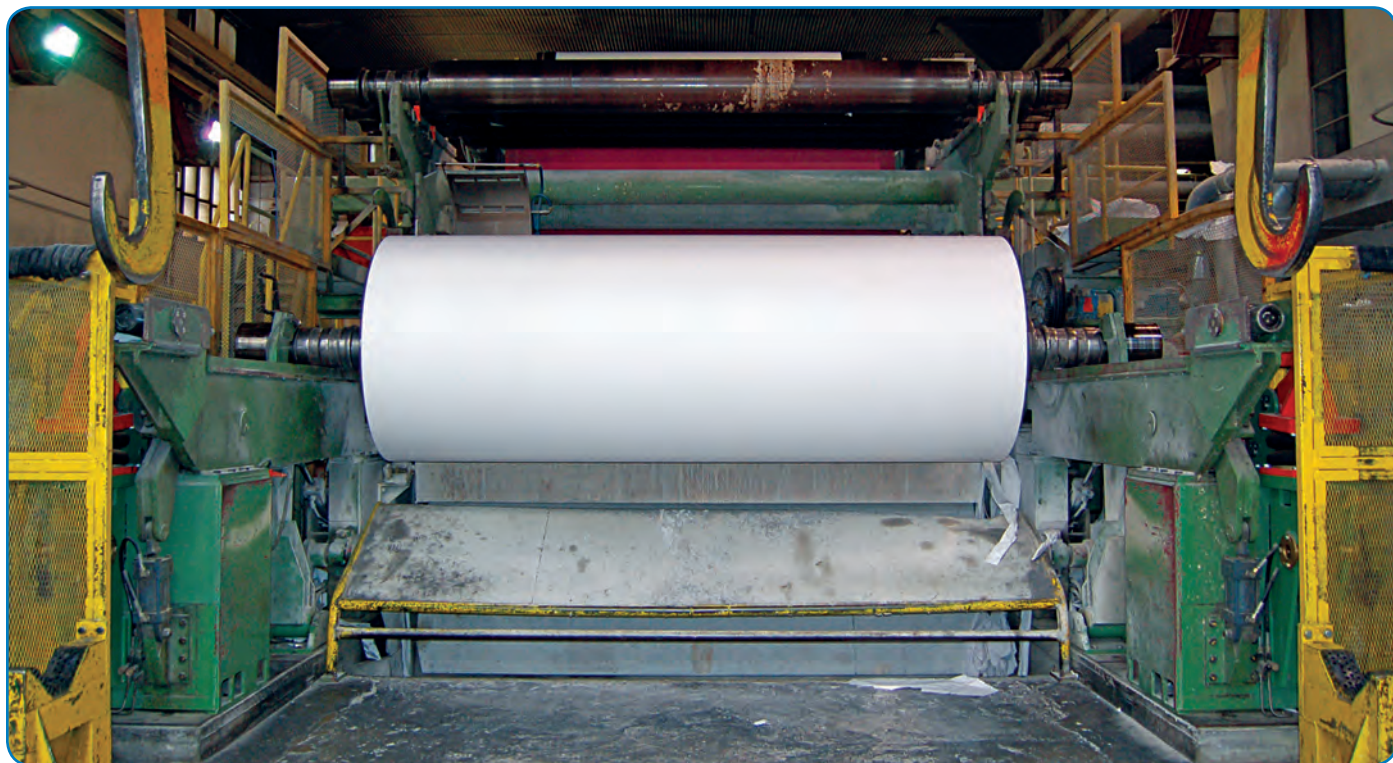


Bleach Away Your Fears

MECHANICALLY ACTUATED METERING PUMPS IMPROVE OPERATIONAL EFFICIENCIES AND ELIMINATE CONCERNS ASSOCIATED WITH OFF-GASSING IN SODIUM HYPOCHLORITE APPLICATIONS

By Tom O'Donnell



The powerful disinfection and oxidation properties of sodium hypochlorite allow it to be used in such operations as bleaching in the paper and textile industries, along with several others. However, proper handling of sodium hypochlorite is a critical concern when pumping and metering the liquid since it has a tendency to "off gas."

Introduction

To most people, sodium hypochlorite is simply known as "liquid bleach." To the people charged with producing, transporting and metering sodium hypochlorite in a wide range of industrial applications, there is nothing simple about it. Sodium hypochlorite was first produced in 1789 when Frenchman Claude Berthollet passed chlorine gas through a solution of sodium carbonate. Today, sodium hypochlorite is formed when chlorine gas is bubbled into a cold and dilute sodium hydroxide solution.

Finished sodium hypochlorite is a clear, slightly yellowish solution with a characteristic odor. In its commonly used liquid-bleach form, it has 5% sodium hypochlorite with a pH of around 11, which makes it irritating to the skin. However, in more concentrated doses, such as 10%-15% sodium hypochlorite, its pH level rises to 13, which means

it will burn and be corrosive to many substances. That's why anyone working with high levels of sodium hypochlorite must take precautions to protect themselves and the environment.

These precautions are being taken daily at industrial facilities all over the globe because sodium hypochlorite is a key component in thousands of production or disinfection processes in industries as diverse as agriculture, chemical, paint, lime, food, glass, paper, pharmaceutical, synthetics and water treatment. The powerful disinfection and oxidation properties of sodium hypochlorite allow it to be used in such operations as bleaching in the paper and textile industries, disinfection of drinking water, preventing the growth of algae and shellfish in industrial or HVAC cooling towers, and disinfection and odor control in wastewater facilities.

The Challenge

For the purposes of this discussion, we will focus on the use of sodium hypochlorite as a disinfectant and odor controller in wastewater treatment plant applications. In wastewater treatment plant applications, sodium hypochlorite is introduced to the system via metering pumps. In addition to needing to handle sodium hypochlorite with care because of its elevated pH levels, a critical concern when pumping and metering the liquid is its propensity to “off gas.” When this happens, the consequences to metering pump operation include air binding and loss of prime, which adversely affect the operational efficiency of the metering pump, leading to compromised metering operations.

To combat off-gassing in metering pumps during sodium hypochlorite-handling operations, facility managers can implement a number of simple steps to minimize their concerns:

- When selecting a pump style for use in sodium hypochlorite metering, always utilize a high-stroking model with a short stroke length. This type of pump is less likely to allow the accumulation of gas in the pump head.
- In pumps that are turned off for a length of time, the gas can accumulate in the suction line or pump head. In applications that require the pump to sit idle for any

period of time, it is recommended to include a bypass line with an automated valve that can recirculate the sodium hypochlorite when not feeding.

- Provide a short, flooded suction-pipe arrangement for the metering pump with the suction piping sloping down from the storage tank to the pump. This setup will allow any gas bubbles to travel back to the storage tank, rather than to the head of the metering pump. This also means that it is recommended that the metering pump that is used in sodium hypochlorite service should not be top-mounted, unless the concentration is very low.
- Ensure that the sodium hypochlorite’s feed tank is not located in direct sunlight. Direct sunlight and higher temperatures will increase sodium hypochlorite off-gassing.
- Use a sodium hypochlorite solution with the lowest concentration possible for the application and use the largest-capacity metering pump possible. This combination will result in less off-gassing.
- If possible, use an air vent or purge valve in the head of the metering pump. This will aid in evacuating any trapped sodium hypochlorite gas that may reach the metering pump.



Wastewater waterfalls: secondary treatment of sewage or industrial wastewater through use of aerating mixers/diffusers.



In the treatment of wastewater, sodium hypochlorite is introduced to the system via metering pumps.

The Solution

The type of pump that can meet all requirements for handling sodium hypochlorite in wastewater applications – especially in combating the deleterious effects of off-gassing while providing accurate metering – are mechanically actuated diaphragm pumps (electronic or motor driven). The piston in a mechanically actuated diaphragm pump is attached to the diaphragm and is normally compressing a spring in the forward (positive) movement of the piston ensuring positive diaphragm return hence assisting suction.

More specifically, the best choices for sodium hypochlorite handling are the Series PZ electronic pumps or Series 7000 motor driven pumps from Neptune™ Chemical Pump Company. The key characteristic for the Series PZ is its high stroking speed (300 strokes per minute) and short stroke length, making gas less likely to accumulate in the pump head. In addition, the pump can be provided with an automatic vent valve to allow any trapped gas to be purged from the pump head. Series PZ are offered with manual control, automatic control, or fully programmable control features in capacities to 20 gallons per hour.

The Series 7000 motor driven pumps feature a straight through flow path pump head, which does not allow any areas within the pump head for the gas to lodge. The Series 7000 pumps are self-priming, available in capacities

to 300 gph, and can be provided with automatic frequency control. A micrometer dial can adjust capacity on the Series 7000 while the pump is running (10:1 turndown). They are available with flow rates from 6 to 300 gph at pressures to 150 psi. The Series 7000 pumps are available in PVC and Kynar® construction – which are most suitable for sodium hypochlorite applications – and all parts within the gearbox are submerged in oil for extended service life.



Neptune Chemical Pump's ARPZ model electronic metering pump.

Conclusion

Sodium hypochlorite is one of the most versatile cleaning and disinfecting fluids around. From completing basic household chores to disinfecting hospitals, from being fed as a biocide to inhibit biological growth to removing odors from wastewater, sodium hypochlorite plays an ever-present role in a wide array of day-to-day operations around the world.

Sodium hypochlorite also needs to be handled with care, especially in its higher concentrations. It also has a few quirky characteristics that, if not addressed, can hamstring an industrial application. Facility managers familiar with these characteristics know that they need to select, utilize and rely upon the best metering-pump technology when metering sodium hypochlorite. Finding the right pump technology is especially crucial when considering the negative effects that off-gassing can have on sodium hypochlorite metering operations.

That's why managers of wastewater-treatment facilities who want to optimize production while simultaneously reducing maintenance costs, downtime and product loss choose mechanically actuated diaphragm metering pumps for their sodium hypochlorite-handling responsibilities. For the most accurate and reliable mechanically actuated metering pumps, operators continually turn to the Series PZ and Series 7000 pumps and accessories from Neptune Chemical Pump Company.

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