6 Tips for Pumping Sodium Hypochlorite

Mechanically actuated diaphragm metering pumps can eliminate many operational concerns, including the occurrence of harmful off-gassing.

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NEPTUNE

There are not many among us who have not experienced an unintentional bleach-related laundry room mishap. You know, the time liquid bleach was mistakenly added to the wash cycle and your blue jeans came out of the washer dotted with white splotches. But considering how dangerous sodium hypochlorite—the chemical compound that is dissolved in water to create liquid bleach—can be, a couple of pieces of ruined clothing is a small price when compared to the hazards that can occur when sodium hypochlorite is mishandled.

Stanford University's SLAC National Accelerator Laboratory spells out the dangers associated with the handling of sodium hypochlorite and things to be aware of in its Sodium Hypochlorite Safe Handling Guide:

"Incompatible with strong acids, amines, ammonia, ammonium salts, reducing agents, metals, aziridine, methanol, formic acid, phenylacetonitrile. When combined with an acid or ammonia may produce chlorine and chloramine gas. [. . .] Contact with metals may evolve flammable hydrogen gas. Containers may explode when heated. Releases chlorine gas when heated above 35 C (95 F). Anhydrous sodium hypochlorite is very explosive. Hypochlorites react with urea to form nitrogen trichloride, which explodes."

Sodium hypochlorite has a pronounced irritant effect and may cause severe burns to the skin and eyes. Any chlorine gas that is created is corrosive to respiratory passages, and sodium hypochlorite is poisonous if ingested. The handling of sodium hypochlorite and the manufacture and use of its components come with inherent risks, all of which must be taken seriously in order to prevent spills, releases or contact that can harm the user or environment.

6 Steps to Optimized Pump Operation

In many industrial applications where sodium hypochlorite is used, metering pumps are the preferred technology for accurate dosing of this chemical. While the main challenge is ensuring that the pumps do not leak, which can lead to dangerous exposure and skin contact for the technician, another concern is sodium hypochlorite's propensity to off-gas when it is being pumped. When off-gassing occurs, the operation of the metering pump will suffer due to the creation of air binding and a subsequent loss of prime, which will adversely affect the efficiency and reliability of metering pumps and result in compromised metering operations.

To minimize the potential for off-gassing during sodium hypochlorite-handling operations, operations managers can satisfy these six basic considerations that will help optimize the operation of their metering pumps in these applications:

1 When determining the best pump type to use in sodium hypochlorite metering, always select a high-stroking model with a short stroke length. This pump's short stroke length will help lower the chance that there will be an accumulation of gas in the pump head.

2 In pumps that do not operate continuously, any gas that is present can build up in the suction line or pump head when the pump is idle. For applications that require the pump to sit idle, the inclusion of a bypass line with an automated valve that can recirculate the sodium hypochlorite when it is not feeding is recommended.

3 In terms of pumping system setup, the best configuration should 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 enable any gas bubbles to travel back to the storage tank, rather than to the head of the metering pump. Due to the parameters of this setup, it is advised that the metering pump that is used not be top-mounted, unless the sodium hypochlorite concentration is very low.

4 Position the sodium hypochlorite's feed tank so that it is not located in direct sunlight. Direct sunlight and higher temperatures will increase the rate and volume of off-gassing for sodium hypochlorite.

5 The amount of off-gassing can be minimized if a sodium hypochlorite solution with the lowest concentration possible for the application is used in consort with the largest-capacity metering pump possible, creating a combination that will result in less off-gassing.

6 If possible, use a purge valve or an air vent in the head of the metering pump. This will aid in evacuating any trapped sodium hypochlorite gas that may reach the metering pump.

Finding The Perfect Pump

The type of metering pump that can meet all of the above considerations for handling sodium hypochlorite—especially in combating the operation-hampering effects of off-gassing while providing accurate metering—are mechanically actuated diaphragm pumps that can be either electronically powered or motor-driven. These pumps excel because their piston is attached to the diaphragm and compresses a spring during its forward (positive) movement, ensuring positive diaphragm return and improved levels of suction.

Another key characteristic for metering pumps in sodium hypochlorite applications are high stroking speeds. Many solenoid-actuated pumps are available with high stroking speeds (at or above 200 strokes per minute) with shorter stroke length, which makes gas less likely to accumulate in the pump head. In addition, most models of this type can be outfitted with an automatic vent valve that will allow any trapped gas to be purged from the pump head. Most models are available with a choice of manual control, automatic control or a fully programmable control system that allows them to realize flow rates of up to 20 gallons per hour (gph).

Image 1. Metering pump compatible for use in most sodium hypochlorite applications (*Courtesy of Neptune*)

Motor-driven metering pumps can feature a straight-through flow path pump head, which eliminates the presence of any areas where gas can nest. These pumps are generally self-priming and capable of producing flow rates up to 300 gph. They can be outfitted with an automatic frequency control, while their built-in micrometer dial enables the operator to adjust the flow capacity while the pump is running, with a 10:1 turndown ratio achievable. Typical materials of construction include PVC and Kynar, which are most compatible for sodium hypochlorite-handling applications.

Conclusion

Users of sodium hypochlorite and its related end products must be aware that they need to select and rely on the best pump technology when metering sodium hypochlorite is required. Finding the right pump technology is especially crucial when considering the negative affects that off-gassing can have on sodium hypochlorite-metering operations.

That's why industrial operators who need to optimize production rates, safety and costs need to identify and incorporate the proper pumping technology. To that end, many are choosing to rely on mechanically actuated diaphragm metering pumps to reliably deliver accurate and safe operation in critical sodium hypochlorite-handling applications. ■

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