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Causes and Solutions for Vapor Locking in Chemical Metering Pumps

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In water treatment chemical metering pumps are used to deliver precise volumes of chemicals, including sodium hypochlorite, peracetic acid and other disinfectants, into water systems. Depending on the type of pump, the chemical being dosed, and other circumstances, operators can experience vapor locking. This phenomenon occurs when gases, typically formed due to the volatility of certain chemicals, accumulate within the pump head. Because gas is compressible, it doesn't allow for the proper movement of liquid. This creates a blockage which can result in an improper dose or no dose at all. It may even stop the pump.

This article will explain the common causes of vapor lock and provide tips for minimizing or preventing it.

Causes Of Vapor Locking

Several factors contribute to vapor locking in chemical metering pumps:

Volatile chemicals.

Chemicals that off-gas or vaporize can create air pockets that can cause vapor locking. Sodium hypochlorite, for example, is known to release chlorine gas when it breaks down.

High temperatures. Some liquids that remain stable at room temperature can vaporize when temperatures increase too much. This is particularly problematic in warmer climates or with pumps that have motors which generate too much heat during operation.

Suction lift issues. A high suction lift, or insufficient inlet pressure, can also promote vapor locking. When the pressure at the pump's inlet drops below the vapor pressure of the fluid, the liquid turns into gas, creating a blockage before the fluid even enters the pump.

Improper pump sizing. Choosing an oversized pump can also contribute to vapor lock. If a pump is too large for the system's needs or if it's running too slowly, gas can accumulate in the pump head without being pushed through.

The Impact Of Vapor Lock

The short-term effects of vapor locking are often immediately noticeable. When vapor lock occurs, the pump either stops injecting fluid entirely or fails to deliver the required dose of chemicals. This can lead to significant disruptions in the disinfection process, potentially compromising water quality and safety.

In the long term, prolonged exposure to gas buildup can cause wear and tear on the pump components, including seals and diaphragms. In extreme cases, it may also lead to pump failure, requiring costly repairs or replacements. In addition, vapor lock can damage the integrity of the entire chemical dosing system, which can result in downtime and increase maintenance costs.



Solutions To Vapor Locking

While vapor locking is a serious concern, there are several strategies and technologies available to mitigate its impact and ensure continued system performance.

Auto degassing valves. Some pump manufacturers use auto degassing valves to combat vapor locking. These valves are designed to allow trapped air to escape from the pump head without letting the liquid leak out. The valve automatically opens as air accumulates, releasing the gas and allowing the pump to continue pumping.

Auto priming. This advanced software feature which is available on some diaphragm pumps, will detect when no fluid is being injected and automatically adjust the pumping operation to prime the pump.

By running the pump at a higher speed for a short burst, the auto prime function helps expel air from the system and restore proper fluid flow.

Optimized pump sizing and operation. As mentioned, an oversized pump that is running too slow can create vapor

locking as fluid spends too much time inside the pump's chambers. Thus, using a smaller pump running at a higher speed could help to minimize gas accumulation.

Switching to peristaltic pumps. Depending on the application, operators could use a peristaltic metering pump rather than a diaphragm pump.

Peristaltic pumps are very effective when dosing fluids that contain trapped gases because they are not affected by air bubbles... bubbles simply pass through the pump tube. There is no vapor lock and no loss of prime.

However, peristaltic pumps are not always a good choice in high pressure applications.

Pump maintenance and upgrades. Older pumps prone to issues of vapor locking can often be upgraded with aftermarket degassing valves. In other cases, operators can switch to a more suitable pump design. Another option

involves regular maintenance, such as checking for leaks and ensuring that seals are intact. These simple procedures can extend the lifespan of the pump, improve overall performance, and reduce instances of vapor locking.

Vapor locking can be a challenge in chemical metering

pumps, but it is not insurmountable. By understanding the causes and consequences of vapor lock, operators can take proactive measures to prevent it, including utilizing advanced valve technologies, optimizing pump operation, and maintaining proper system design. By

addressing vapor locking effectively, water treatment plants can ensure the continued reliability and efficiency of their chemical dosing systems, ultimately helping to maintain the safety and quality of treated water.



Blue-White® CHEM-FEED® Automatic Degassing Valve