

# Continuous gas pressure control – achieving ultimate process reliability

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Many manufacturing processes in the food and beverage industry and pharmaceutical sector require careful control of pressurised vessels to ensure optimum product quality. Fermentation in bioreactors, tank blanketing in drinks production, or pressure transfer of fragile products are just a few examples where accurate gas pressure control is essential for process reliability.

*Kieran Bennett, Industry Account Manager - Food & Beverage at Bürkert, looks at some of the key aspects of controlling gas pressure in vessels.*

The basic principle involved in pressurised vessels containing a liquid and a gas, says that as liquid is removed, the gas pressure drops. However, the gas pressure directly affects the dosing quantity, assuming the valve opening time remains constant. It is therefore important to carefully control the gas pressure to ensure that a stable and reliable process is maintained.

## High-quality products

Take as an example, fermentation processes, which are used in the production of medicines and vaccines. As such, the manufacturing procedures are subject to very strict regulation and the fermentation process needs to be repeatable to the exact same criteria. Only in this way will a consistent, high-quality product be delivered.

During fermentation, carbon dioxide is produced, while gases such as nitrogen or oxygen are added to the vessel. Maintaining the delicate balance requires precision gas control to ensure the quality of the final product.

With the food and beverage sector, tank blanketing is used to retain product quality. For producers that bottle naturally carbonated mineral water, it is essential the water does not lose carbon dioxide during the storage and bottling processes. The gas pressure above the water must be high enough to prevent the CO<sub>2</sub> from being released, affecting the taste and reducing quality.

### **Delicate process control**

Returning to the pharmaceutical sector, some manufacturing processes involve fragile molecules or cells, whose structure must remain intact. The centrifugal force of conventional pumps can damage the delicate ingredients if they are used for filling containers. Instead, a pressure-controlled measurement process offers precision and reliability as well as product integrity.

At the same time, both industries discussed require hygienic conditions within the process equipment, which means clean-in-place (CIP) or sterilise-in-place (SIP) procedures need to be accommodated. This can cause some issues with proportional control valves, which over time suffer from reduced lubrication caused by aggressive CIP media.

Further challenges are presented by the control infrastructure, whose design can affect process responsiveness. Centralised control systems, working through a PLC, can unwittingly introduce a delay of more than two seconds between the detection of a reduced pressure in the vessel and the corrective action restoring it to the nominal value.

## **Industry expertise**

Having looked at the system requirements and some of the drawbacks with conventional designs, there is an opportunity to review the alternatives. Bürkert has applied its expertise in flow control equipment, with considerable experience in hygienic applications, to create local pressure monitoring and gas control systems.

For liquids that need to avoid contact with air, inert gases may be used to maintain liquid stability. Bürkert's control valve system is equally adept and well-suited to operating with other gases. Expertise in sealing materials and precision gas measurement ensure all components are selected to match each application.

The ideal solution is centred around a manifold that connects the tank directly to the process controller and control valves as well as the pressure sensor. Pneumatic controls and the proximity of all the process control devices means the response time is at least halved compared to conventional systems. This equates to a more precise control of vessel pressure and therefore more accurate dosing.

## **Reducing costs**

A compact solution, connected directly to the vessel and designed to withstand all CIP/SIP chemicals, offers a more robust installation with a greatly reduced maintenance workload. Conventional tank pressure controllers contain valves with pistons that require regular lubrication. These systems need to be replaced up to six times per year, which equates to increased maintenance costs on top of any lost production.

Modern production processes need continuous operations with cost-effective running costs. Compared to a conventional process setup that could require an

annual maintenance budget of up to 42,000 euros (without the cost of downtime and lost production) Bürkert's solution has been proven to operate without any maintenance costs for over eight years.

There is an opportunity for process engineers to assess their current and future requirements involving gas pressure control systems. Establishing maintenance costs alone may be sufficient to seek an alternative solution, but combined with the increased precision and reliability, there is a compelling argument to investigate alternative designs.

**Image captions:**



**Image 1:** The ideal solution is centred around a manifold that connects the tank directly to the process controller and control valves as well as the pressure sensor.



**Image 2:** Bürkert's hygienic control valve system is effective in maintaining product quality in tank blanketing solutions.



**Image 3:** Pneumatic controls and the proximity of all the process control devices means the response time is at least halved compared to conventional systems.

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## **About Bürkert**

Bürkert Fluid Control Systems is one of the leading manufacturers of control and measuring systems for fluids and gases. The products have a wide variety of applications and are used by breweries and laboratories as well as in medical engineering and space technology. The company employs over 2,200 people and has a comprehensive network of branches in 35 countries world-wide.

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