



Precise Back Pressure Control for High-Flow CO₂ Injection in Wastewater Treatment

HIGHLIGHTS

- Stable 2 bar gauge back pressure ensures consistent CO₂ dissolution into alkaline wastewater
- FOCUS-1 Smart Meter Valve replaces traditional PID valve and flowmeter setup
- Remote tuning and control via Ethernet simplifies operations
- Digital twin enables uninterrupted control even without real-time flow data

1. BACKGROUND

Siltbuster, based in the United Kingdom, is a specialist in on-site water treatment solutions, providing rapid-response systems to tackle water contamination challenges across a wide range of industries. The company designs and manufactures equipment that is frequently deployed in construction, municipal, and industrial settings where water quality compliance is critical. One of their core competencies lies in the treatment of wastewater streams containing solids and high pH levels. To meet strict discharge limits, Siltbuster integrates technologies that adjust water chemistry on the fly while ensuring process stability. In one of their wastewater treatment setups, Siltbuster sought to optimize the pH neutralization process through improved CO₂ dosing control. Their goal was to improve performance, reduce complexity, and minimize operational and energy costs.

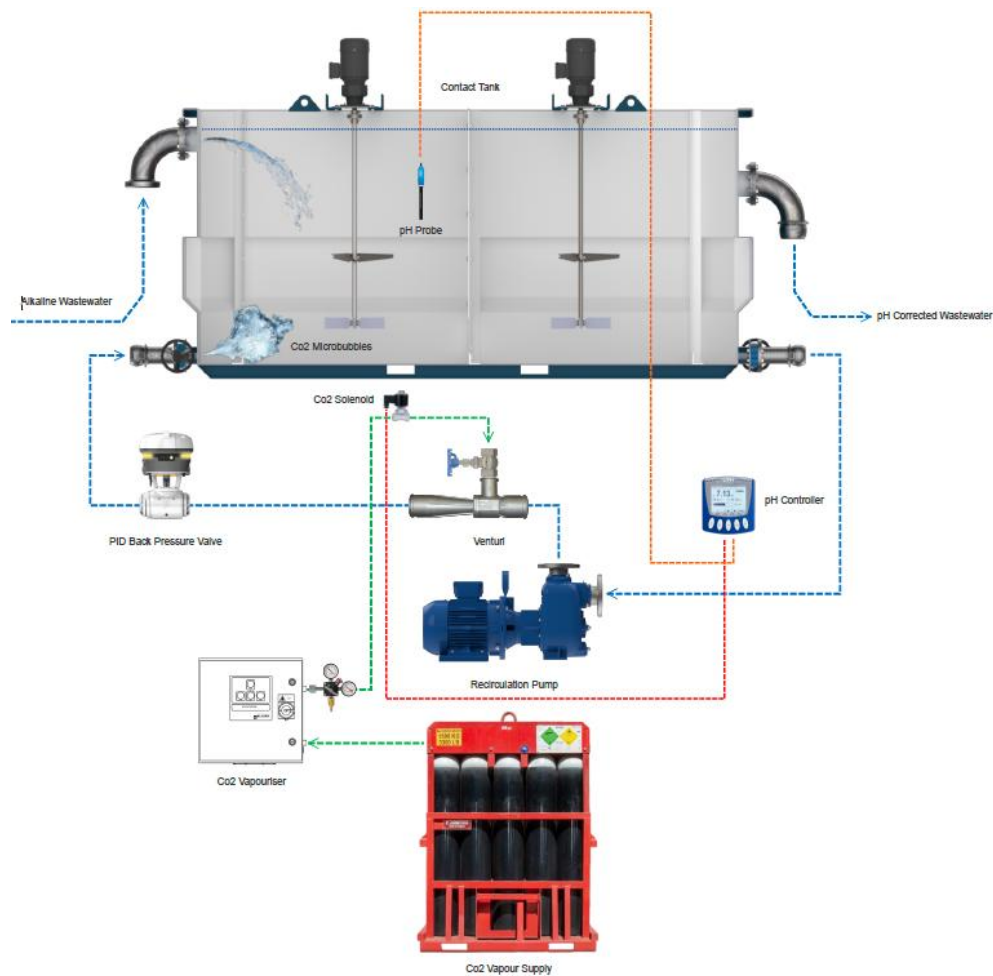
2. CONTROL REQUIREMENTS

In Siltbuster's wastewater treatment system, alkaline wastewater must be neutralized before discharge. This is achieved by injecting CO₂ into a water stream to form carbonic acid, thereby reducing pH. The process involves recirculating water from a header tank through a booster pump into a saturation vessel. CO₂ is injected via a vapor line and dissolved under controlled pressure conditions to ensure complete carbonation. A key requirement is maintaining a stable back pressure – around 2 bar gauge – to allow the CO₂ to fully dissolve before the stream re-enters the contact tank. Previously, maintaining this back pressure required a PID-controlled valve setup, often involving multiple components like solenoids, pH controllers, and manual tuning. These systems were sensitive to flow fluctuations, suffered from inconsistent pH control, and posed integration challenges. Siltbuster needed a reliable, automated solution that would reduce system complexity while ensuring repeatable, high-efficiency CO₂ dissolution in high-flow scenarios. The application also demanded real-time control responsiveness to prevent pH overshoot or under-correction.



3. FOCUS-ON SOLUTION

To optimize the CO₂ injection system, Siltbuster integrated the FOCUS-1 Smart Meter Valve into the back pressure control loop. The FOCUS-1 acts as an intelligent PID back pressure controller, ensuring stable pressure in the saturation vessel to promote maximum CO₂ dissolution. By maintaining a constant 2 bar gauge back pressure, the unit guarantees the formation of carbonic acid and consistent pH reduction of the wastewater. The built-in PID autotuner enabled fast commissioning, allowing the operator to easily identify optimal control parameters without manual trial-and-error. In the event of missing flowmeter data, FOCUS-1's digital twin feature maintains reliable flow estimation, ensuring the process continues uninterrupted. Additionally, the Ethernet connection allows remote access to tune PID settings and monitor performance, supporting operational flexibility and ease of service. Unlike conventional systems that require multiple sensors, solenoids, and controllers, FOCUS-1 consolidates all core control and diagnostic functionality into one device. This dramatically reduces system complexity, lowers the risk of failure points, and shortens installation time. Its fast-response valve actuation and integrated processing deliver tighter control and improved reliability in high-flow CO₂ injection scenarios.



4. CUSTOMER BENEFITS

- Reliable and stable back pressure control ensures consistent CO₂ dissolution
- Integrated PID controller with autotuning simplifies commissioning
- Digital twin enables uninterrupted operation even without flowmeter input
- Remote connectivity via Ethernet for monitoring and tuning
- Reduction in system complexity, installation time, and required components
- Improved pH control performance in high-flow wastewater neutralization



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