Making our world more productive

SOLVOCARB® carbon dioxide for alkaline wastewater neutralization

A sustainable way to achieve optimal wastewater pH levels at the Plzeňský Prazdroj brewery

Pilsner Urquell is a premium lager that has been brewed exclusively in Pilsen for 175 years.

Customer

Plzeňský Prazdroj is one of the most renowned breweries in the world, achieving a record-high sales volume of 11.5 million hectoliters in 2018. The company's premium lager, Pilsner Urquell, enjoys great popularity around the globe and has been brewed exclusively in Pilsen (Plzen), a city in Czech Republic, since 1842. Plzeňský Prazdroj is committed not only to top product quality but also to sustainability. Consequently, the company drives long-term activities in sustainable business conduct, while also striving to positively influence suppliers and other business partners.

Challenge

Brewing operations generate large amounts of mostly alkaline wastewater from cleaning and rinsing activities. Before discharging this water, companies need to make sure that they follow government regulations concerning wastewater pH levels applicable in the Czech Republic. These stipulate that the pH levels of wastewater discharged to municipal wastewater treatment plants (WWTP) for further processing must be in the range of 5 to 10. For discharge into bodies of water such as rivers after biological treatment, the ideal pH range to sustain aquatic life is set at between 6 and 9.

To meet these targets, Plzeňský Prazdroj was applying a two-step approach. As a first step, the company used the traditional method of "natural" wastewater neutralization, which involved mixing the predominantly alkaline wastewater from the rinsing process in the brewhouse with the acid wastewater from the sanitation treatment. Even though this helps to balance out the pH, alkaline wastewater still predominated, meaning that the resulting water did not yet meet the required pH limits. Hence, as a second step, the company added a strong mineral acid (50% w/w sulfuric acid). However, the high volumes of alkaline wastewater and high volumes of sulfuric acid required to neutralize it made this process inefficient and overly hazardous.

Plzeňský Prazdroj was experiencing difficulty in controlling the precise pH value of the wastewater, often either overshooting or undershooting the pH setpoint. Furthermore, the highly corrosive properties of mineral acids

Installation of the SOLVOCARB® inline injector at the Plzeňský Prazdroj brewery.

meant that the company's traditional copper vessels were not suitable for neutralization operations. After examining the ecological, safety and process aspects of the various pH control treatment alternatives, the company decided to turn its attention to a simpler, safer, more precise and ecologically friendly alkali pH regulation agent for its new neutralization system.

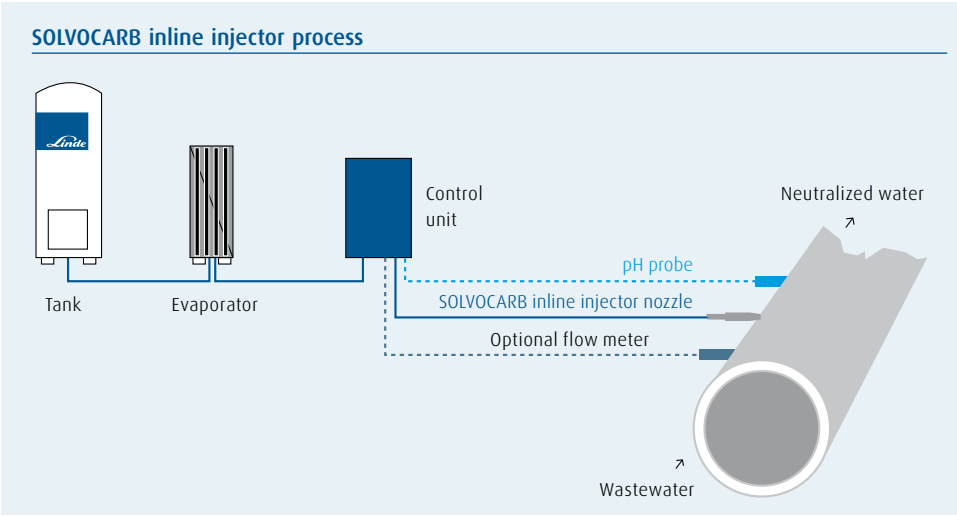
Solution

Carbon dioxide (CO_2) offers many advantages over mineral acids as a neutralization agent in the treatment of wastewater. These include:

- precise pH control thanks to the self-buffering properties of carbonic acid (making over-acidification of wastewater almost impossible)
- the avoidance of excessive salt accumulation (such as chlorides and sulphates, which are also monitored and subject to charges by the municipal WWTP); and most importantly
- the elimination of health and safety risks usually associated with the handling of highly corrosive, strong acids.

After considering different CO_2 dissolution technologies, Plzeňský Prazdroj selected Linde's SOLVOCARB® inline injector for its ease of installation, robust design, ability to deliver precise and automatic dosing of CO_2 and low operation costs. The company also rated Linde's vast application expertise in this area. The system was designed and installed around the brewery's existing neutralization plant specifications and required no operational downtime of the existing on-site wastewater treatment plant.

The entire SOLVOCARB system was integrated into the existing alkali pH control wastewater plant. The selected configuration included Linde's proprietary SOLVOCARB inline injector nozzle for CO_2 dosing, a complete CO_2 supply scheme and a tailored three-way gas regulation manifold for managing the CO_2 pressure and flow. The latter is connected to the neutralization unit control center, which is fully automated and doses CO_2 directly into the sidestream recirculation line of the 120 m^3 wastewater neutralization vessel according to the wastewater pH value measured online at the neutralization plant outlet.



Overview of a complete SOLVOCARB® inline injector system.

Results

After an initial trial of the new system, the technical team confirmed that the response to CO_2 dosing into the neutralization tank was quick, precise and effective in terms of pH neutralization. The final discharge pH values of the wastewater had been stabilized within the prescribed limits and the corrosion issues had been eliminated. Following this successful demonstration, Plzeňský Prazdroj decided to adopt Linde's technology for pH control as its permanent wastewater treatment technique, which has been running since 2011.

Benefits at a glance

- Precise and accurate pH control
- Fully automatic DCS (Distributed Control System) using flow and other process signals
- Efficient CO_2 utilization
- Simple installation and operation
- Prevention of pipework and copper vessel corrosion
- Low investment and operation costs
- No energy source needed
- No moving parts
- Non-clogging design

Our SOLVOCARB portfolio includes reliable gas supply schemes and efficient injection equipment to perform neutralization and remineralization treatments and applications with carbon dioxide. We offer fully-tested and competitively-priced metering and dissolving systems, with application equipment that can be applied flexibly to meet your specific requirements. Furthermore, our engineers will assist you with extensive know-how to make sure that all processes run smoothly, from installation to operation.

Visit www.linde-gas.com/watertreatment to find out more.

Getting ahead through innovation

With its innovative concepts, Linde is playing a pioneering role in the global market. As a technology leader, it is our task to constantly raise the bar. Traditionally driven by entrepreneurship, we are working steadily on new high-quality products and innovative processes.

Linde offers more. We create added value, clearly discernible competitive advantages, and greater profitability. Each concept is tailored specifically to meet our customers' requirements – offering standardized as well as customized solutions. This applies to all industries and all companies regardless of their size.

If you want to keep pace with tomorrow's competition, you need a partner by your side for whom top quality, process optimization, and enhanced productivity are part of daily business. However, we define partnership not merely as being there for you but being with you. After all, joint activities form the core of commercial success.

Linde – ideas become solutions.

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