

Advancing Green Sanitation in Breweries Through Onsite Hydrogen Peroxide Production



Introduction

Sanitation is the unsung hero in the beer making process, having significant implications for product quality and public health. However, traditional sanitation methods in the beer industry have not always been environmentally friendly or efficient. As the brewery industry evolves to adopt more sustainable practices, there is an increasing need for green surface sanitation methods. Among the various alternatives that have emerged, one is particularly promising: the use of hydrogen peroxide (H_2O_2), especially when it is produced onsite from electricity and water.

Brewery Sanitation: Traditional Methods and their Limitations

Conventionally, breweries have used chemical sanitizers such as chlorine-based solutions, caustic soda, or acid-based sanitizers for equipment and surface sanitation. While these methods are generally effective, they are fraught with environmental concerns and safety issues. They generate harmful by-products, pose risks to worker health, and can potentially taint beer if not completely rinsed off surfaces.

In addition to environmental concerns, these methods also have inherent inefficiencies. Large volumes of water are needed for their application and subsequent rinsing, leading to high water consumption. Moreover, the lack of onsite production of these sanitizing agents means that breweries rely heavily on external supply chains, which can pose challenges in terms of logistics and cost.

Therefore, the brewery industry is actively exploring more sustainable, efficient, and safer alternatives for surface sanitation. This is where hydrogen peroxide comes into play.

Hydrogen Peroxide: A Powerful Green Sanitizer



Hydrogen peroxide is a potent oxidizing agent, which, according to scientific research, makes it effective in killing a wide range of microorganisms, including bacteria, yeasts, molds, and viruses¹. It has a proven efficacy against a broad spectrum of organisms, including *E. coli*, *Listeria* and many others, according to an American Chemical Society study². As an additional benefit, hydrogen peroxide decomposes into water and oxygen after use, leaving no harmful residues or by-products. This attribute not only ensures product safety but also significantly reduces the environmental footprint of brewery sanitation practices.

Furthermore, hydrogen peroxide does not require extensive rinsing, thereby reducing water consumption compared to traditional sanitizing agents. Users have observed that its effectiveness at lower concentrations and temperatures also contributes to energy savings.

While hydrogen peroxide has been used as a sanitizer in various industries for some time, its adoption in the beer industry is relatively recent. This delay can be attributed primarily to concerns about the handling and storage of concentrated hydrogen peroxide solutions, which are highly reactive and potentially hazardous.

Onsite Hydrogen Peroxide Production: A Game-Changer in Brewery Sanitation

To circumvent the issues related to the storage and handling of concentrated hydrogen peroxide, innovative solutions have been developed for its onsite production from electricity and water. One such solution is offered by HPNow, a company that leverages advanced electrolysis technology to generate hydrogen peroxide on demand.

The HPNow system utilizes an electrochemical process known as the 'Direct Synthesis Method.' In this process, oxygen from the air and water are recombined in the presence of a catalyst, forming hydrogen peroxide.

The onsite production of hydrogen peroxide has several benefits. First, it eliminates the need for storage and handling of hazardous concentrated solutions, significantly reducing safety risks. Secondly, it also allows for the generation of hydrogen peroxide at the required concentrations, preventing the waste associated with overproduction or degradation over time.

Moreover, the process can be powered by renewable electricity sources. It reduces dependence on external supply chains, offering increased resilience and cost savings in the face of market fluctuations and logistical challenges.

The Science Behind the Effectiveness of Hydrogen Peroxide in Brewery Sanitation

Hydrogen peroxide's efficacy as a sanitizer is due to its strong oxidizing properties, research has shown. When it comes into contact with microorganisms, it disrupts essential cellular components, such as proteins, lipids, and DNA, leading to cell death³. Following use, hydrogen peroxide will break down into water and oxygen, without leaving any byproducts behind.

A study by the Australian Wine Research Institute has demonstrated the effectiveness of hydrogen peroxide against common spoilage organisms. The researchers found that even at low concentrations, hydrogen peroxide effectively eliminated these organisms without affecting the quality of the wine⁴.

The Future of Green Sanitation in Brewery: Advantages and Challenges

The adoption of onsite hydrogen peroxide production in breweries holds immense potential, allowing breweries to significantly reduce their environmental footprint, in their quest to enhance product quality and safety.

However, as with any emerging technology, the widespread adoption of this method faces challenges. Breweries must invest in the necessary infrastructure and train staff in the operation and maintenance of the new systems. The initial cost might be a deterrent for small-scale breweries. However, the long-term savings in terms of reduced water and energy use, decreased dependence on external suppliers, and enhanced product safety and quality are compelling arguments for this investment.


In conclusion, onsite production of hydrogen peroxide is a promising pathway towards greener surface sanitation in breweries. While initial investment and training requirements might pose challenges, the environmental, safety, and efficiency benefits it offers make it a compelling alternative to traditional methods. As the beer industry continues to evolve towards more sustainable practices, solutions such as those offered by HPNow could become central to the beer making process.



About HPNow

HPNow is a technology and market leader in onsite green oxidation through its range of safe, sustainable, onsite hydrogen peroxide generation solutions. HPNow's solutions address growing global challenges in clean water and sanitation through autonomous, safe and sustainable green-oxidation solutions. Headquartered in Copenhagen, and with representation across Europe, the Americas and Asia, HPNow addresses their clients' water treatment needs in market segments ranging from agriculture and aquaculture, to industrial and drinking water treatment.

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¹<https://pubmed.ncbi.nlm.nih.gov/30594743/>

²<https://pubs.acs.org/doi/abs/10.1021/bk-2015-1203.ch024>

³<https://pubs.acs.org/doi/abs/10.1021/bk-2015-1203.ch024>

⁴<https://pubmed.ncbi.nlm.nih.gov/30594743/>