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OZONE SOLUTIONS

CHEMICAL FREE DISINFECTION
WITH OZONE IN THE DAIRY INDUSTRY

CHALLENGES AND CONCERNS IN THE DAIRY INDUSTRY

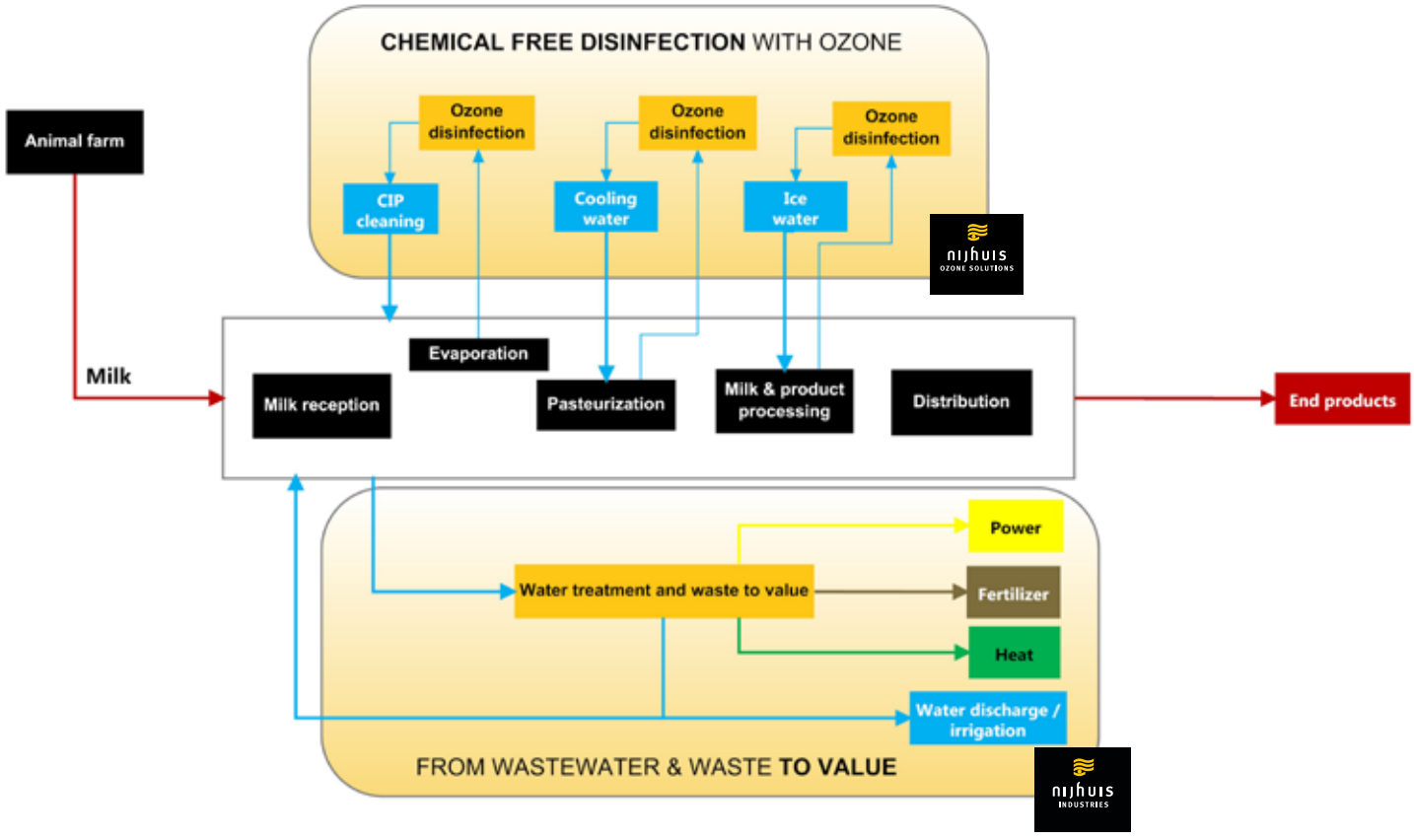
The dairy industry continues to apply more focus on the importance of reducing water cost and the recovery of valuable raw materials. Water consumption in this industry is mainly associated with cleaning operations, cooling water and process water. The concerns for health and environmental challenges have given rise to alternative solutions for disinfection. Combining wastewater and waste streams will take the dairy industry to the next level towards self-sufficiency and enable the production of power, energy, fertilizer and recycled water to create value out of (waste)water.

Process water in the dairy factory

When taking a closer look at a dairy factory processing plant, it is a common fact that process equipment has to be cleaned and disinfected continuously to comply with hygienic regulations. Cleaning is usually related to pipes, tanks and vessels. Most companies apply the conventional method of using chemicals and disinfectants for cleaning purposes,which are subsequently discharged to the sewer, using a large amount of fresh water to dilute the chemicals in the water. Pasteurization, sterilization and evaporation lines for example need to be free of bacteria at any time to guarantee food safety. The presence of heated water and product spills in process water is an ideal environment for bacterial growth. Any recycled water flows are susceptible to pollution and bacterial growth as well due to the circulation of warm water streams which are exposed to air for cooling purposes. In order to remove these undesired side effects that arise from the cleaning process, ozone technology provides a chemical-free solution. It helps lower the environmental footprint, reduce water costs and achieve numerous sustainable and economical goals at the same time.

Recently Nijhuis Ozone Solutions has successfully developed and delivered the following smart applications to leading dairy processing companies:

- CIP cleaning by re-use of condensate water.
- Pasteurization / Autoclave recycle flow disinfection.
- Ice-water disinfection.



SOLID SOLUTIONS IN A FLUID WORLD

CIP CLEANING BY REUSE OF CONDENSATE WATER

Vreugdenhil Dairy Foods based in Gorinchem, the Netherlands is a leading producer of milk powders and dairy ingredients. Milk powder is not only used for instant milk but also widely used as pharmaceutical and food additive. The process used for the production of milk powder is called freeze-drying. The water fraction in the milk is cooled down until ice crystals can be vaporized out of the milk. The remaining (vaporized) water is called the “condensate” and is normally treated as wastewater. Besides the environmental impact this flow creates unnecessary costs because of the freshwater usage as well as the water discharge costs. When however this flow is disinfected it can be re-used and recycled as CIP cleaning water. This results into a green and sustainable solution saving a large amount of water and consequently reducing water cost both on the intake as well as on the discharge side.

Challenge

By disinfecting condensate water it can be used for CIP cleaning. As water streams in the dairy industry typically are high on pH, conventional chemical disinfectants like hypochlorite are not applicable. An alternative chemical disinfectant like chlorine dioxide would result in high consumption cost and a complex make-up system. Besides this it would create chemical handling and (food) safety issues. Therefore Vreugdenhil was looking for a chemical-free disinfection solution with lower operational costs and found the Nijhuis Ozone Solution.

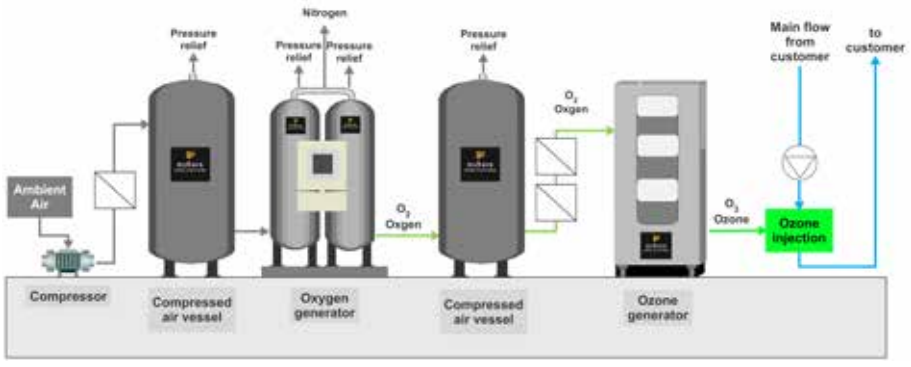
The Smart Solution: Ozone treatment disinfection.

Ozone (O_3) disinfects the water and prevents the formation of bacteria like e-coli without any chemical addition.
The advantages of using Nijhuis Ozone Solutions instead of chemicals are:

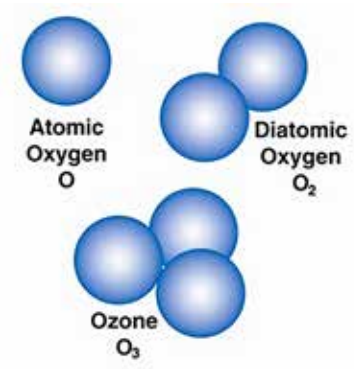
- Guaranteed bacteria free, disinfected water.
- No danger of chemical residues in the CIP water (O_3 will re-generate to O_2, harmless oxygen is the residue).
- No chemical handling or chemical safety issues.
- Sustainable, environmentally friendly technology (ambient air and electricity are used as raw materials).
- Working range is independent on pH level.
- Most energy efficient ozone system available on the market.
- Operational costs are 5 x lower compared to chemicals (typical ROI 1,5 year)

Scope of supply

The highly concentrated Ozone (up to 20% wt) is generated by two NOS 600 XL Ozone generators. The condensate is collected into two different tanks. The incoming water is fed into a side-stream which will be ozonized by ozone gas. At this stage the Ozone is dissolved in the water stream and will be transferred by pumps into the injection system at the bottom of the 2 tanks. The injection nozzles are divided in a circular grid. The specially designed venturi nozzles take the water already present in the tank and mix it up with the ozonized water. At this stage the dissolved ozone will emerge out of the solution again in micro ozone bubbles that will violently react and oxidize any organic matter like bacteria in the water volume. The mixed air bubbles will rise into the tank volume and if not used re-generate to O_2 (oxygen). To prevent overdosing and save electrical consumption 2 parameters are controlled to increase or decrease the dosing levels. Firstly the Redox value is measured in the tank, the measured voltage indicates when the required disinfection level has been reached. Secondly the remaining ozone is measured at the outlet of the system before the water is entering into the CIP make-up tank.



Typical set-up of a Nijhuis ozone system



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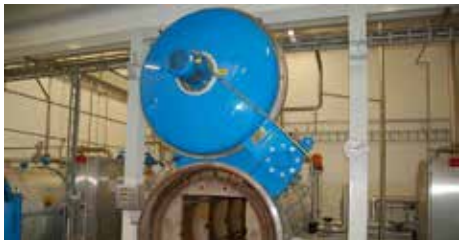
PASTEURIZATION / AUTOCLAVE (STERLIZATION) RECYCLE FLOW DISINFECTION

Challenge

At this international dairy company based in The Netherlands liquid milk products are canned and subsequently the products undergo a sterilization stage in which the product is placed in a so called autoclave. Product spills in the autoclave enter into the water and enter into the cooling tower circuit during the release of the autoclave. This is the ideal breeding ground for bacteria and excessive biofilm growth if no treatment would be applied to this water recycle flow. Conventional hypochloride or chloride dioxide are dangerous to handle, expensive and most of all not food safe. Ozone is non-corrosive to stainless steel used in the dairy industry compared to cleaning agent chlorides.



The Smart Solution: disinfection by ozone

Ozone (O_3) disinfects the water and prevents the formation of bacteria like e-coli and legionella without any chemical addition. No hazardous biocides or chemicals are required to guarantee a continuous disinfected system. Besides the fact that Ozone is one of most powerful disinfectants available, ozone (O_3) re-generates to non-hazardous oxygen (O_2) and leaves no corrosive or toxic residues in the water.

Scope of supply

The system consist of a NOS Q150 ozone generator, a oxygen generator and two sandfilters.

Additonal Smart Services " Watermanagement"

Nijhuis Ozone Solutions offers a unique "on-line Monitoring" service. All our systems can be controlled by a "NI Connect" VPN module that links the ozone system to our control and monitoring center at our headquarters in Doetinchem, the Netherlands. Crucial and critical water parameters are being monitored and controlled, 24/7 365 days a year for a guaranteed 100% disinfected solution against the lowest possible operational costs. If required our team can also adjust setpoints on-line and execute preventive maintenance by experienced and well trained service engineers. Also obligatory water sampling and regular reporting to meet the legal thresholds for legionella growth are offered as part of the Nijhuis Ozone Solutions water management and optimization program.

ICE-WATER DISINFECTION

Another Ozone application supplied to the leading dairy company Vreugdenhil in the Netherlands is ice-water disinfection.

Challenge

In a freeze-drying process a cooling medium is required. The cooling medium is water with a temperature of 0°C called "Ice-water". Since the heat exchanging process brings the ice water piping through the product, dairy companies and other food producers will not use any hazardous chemicals inside the ice water flow because of leaking risks that could occur and poison the food product. The ice-water flow is normally quite expensive due to the energy cost to keep the water at 0°C and therefore it is in a recycle flow. Despite its low temperature the ice-water flow can be contaminated by bacteria and cause health and safety risks for the food products in case of leakage. Conventional disinfection like chemicals or biocides are in this application also not an option.

The Smart Solution: disinfection by ozone.

Ozone simply cannot cause any contamination to the product because there are no residues other than O_2 (oxygen). Ozone is an absolute food safe disinfectant that enables you to recycle water with the absolute guarantee of chemical-free disinfected water.

Scope of supply

The highly concentrated Ozone (up to 20 %wt) is generated by one NOS Q120 Ozone generator.