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## PERSPECTIVES ON MINIMIZING THE ENVIRONMENTAL IMPACT OF A COLLAGEN PLANT

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### **Introduction**

SC Sanimed International Impex SRL (Sanimed) develops eco-innovative systemic activities based on innovation and market-driven approaches. The enterprise is engaged in an ambitious approach within biomedical field, producing medical devices. An integrated R&D-production strategy has allowed the enterprise to increase its activity domains mainly by collaboration and partnerships with prestigious research institutes, taking into account funding policies at national and European level, with impact on the development of production framework technologies and development of a research infrastructure. The main enterprise objective is represented by production of new and high-quality bio-products with the aim to improve the quality of life. In this context, the enterprise also focuses directly on environmental protection within the partnership with ECOIND. As a starting point for this direction Sanimed has initiated the refurbishment of collagen production facility by coupling it to a Cleaning-In-Place system.

### **Materials and methods**

The technological process applied in Sanimed aims to isolate and extract collagen from animal tissues like bovine tendons by an enzymatic hydrolysis. Briefly, the raw material is added to an acidic medium containing pepsin and the mixture is continuously stirred, followed by filtration and purification of the obtained (athelo)collagen by diafiltration. Subsequently, the obtained gel is being lyophilized in order to obtain porous collagen substrates. After a production cycle, the plant is more or less soiled with partially hydrolysed protein fractions.

Considering this, technological process ultimately requires a good sanitation of the plant, pipes and fittings. This cleaning procedure is an important component of the process in guaranteeing the safety of the final products, so it must be carried out effectively and efficiently.

Until recently, this laborious cleaning procedure was accomplished by disassembling the components of the facility and the washing process was manually carried out on each individual component using a mixture of enzymatic detergents P3-Ultrasil 67 and P3-Ultrasil 69. The unclogging and sanitizing process involves three successive

stages: solubilisation of partially hydrolysed protein fractions, enzymatic and chemical hydrolysis of the dense protein fractions from the surface and pores of the membranes and deep cleanse of the pores of the filter materials.

In order to diminish the overall effects produced upon the environment by wastewater discharges the enterprise have purchased a Cleaning-In-Place (CIP) facility capable of quickly and efficiently wash the plant without removing its components. CIP is usually carried out through the circulation of formulated detergents, typically involving warm water rinse, washing with alkaline and/or acidic solution and a clear rinse with warm water to flush the residual cleaning agents. Time, temperature and mechanical force are manipulated to achieve maximum cleaning. An effective CIP procedure results in reduced downtime and cleaning costs but also reduced

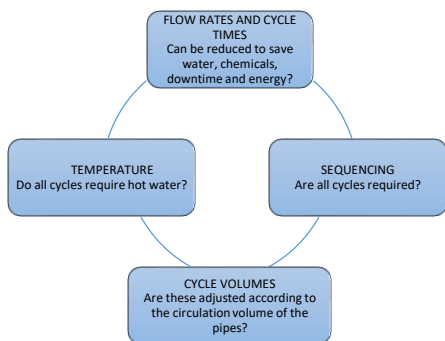


Figure 1. Checklist for optimization

environmental impact. The purchased CIP system is capable of washing with high pressure up to 8 bar, so with a high flow rate of water and with a very precise dosing of the used detergents. It has the possibility of recirculating, solubilizing and neutralizing the collagen fibrils. Water reduction consumption not only helps to save valuable resource, but also save additional consumption in energy, chemical and treatment costs. In order to optimize the CIP programme a checklist of requirements was proposed (Figure 1).

### Results and conclusions

As a conclusion, calculated amounts of hot pressurized water and accurate dosage of detergents and reagents involved in the cleaning process, as well as the precise time led to an attenuated impact of discharged effluents. CIP has advantages over manual cleaning methods, including: increased vessel cleanliness due to the use of well-designed spray nozzles and the type of chemicals and high temperatures employed, reduced water and chemical consumption, the opportunity to recover and re-use fluids, high levels of automation. This stage of purchasing and optimizing a clean-in-place system is the first step in minimizing the environmental impact of the wastewater generated by collagen factory.

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