

OPTIMIZATION OF THE CLEANING OF DENATURED WHEY PROTEIN WITH PROTEASES

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ABSTRACT

Cleaning operations are crucial to ensure food quality and safety in food processing industries. However, these operations have a huge impact on the environment. The build-up of denatured protein over the inner surfaces of heat exchangers is one of the most common and severe problems in the operation of dairy factories. In this work, the Bath-Substrate-Flow device was used to test and optimize the cleaning of heat-denatured whey protein from stainless steel surfaces by proteases, comparing the results to those achieved with NaOH solutions, which are commonly used in food factories. The software package Modde[®] 6.0 was used to generate the experimental designs and to analyse the results of the experiments. Cleaning efficacy or Detergency (%) was defined as the only response. In cleaning tests with proteases an optimal detergency of 61.6% was found under the following conditions: 60°C (the highest tested temperature), an enzyme concentration of 6.5 g L⁻¹ and a pH of 8.8. However, when cleaning was carried out with NaOH solutions, a lower optimal detergency (only 29.3%) was achieved at the highest tested temperature (60°C) and at a NaOH concentration of 0.62% (w/w). These results show the great potential of proteases for the removal of denatured protein deposits from hard surfaces. Additionally, proteases work efficiently at moderate temperatures and pH values, thus decreasing water pollution and reducing operation costs.