REDUCTION OF FOULING IN WHEY EVAPORATORS: MODELLING OF MINERAL FOULING

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ABSTRACT

Fouling in whey evaporators results in an increased energy consumption, product losses and reduced runtimes. The fouling is usually mineral-based, mainly containing calcium phosphate and calcium citrate. Additionally, lactose and whey proteins can be incorporated. Optimization of evaporators with respect to fouling will lead to an increase in the runtime and production capacity. However, little is known about the exact mechanism and rate of fouling, which usually makes optimization a trial-and-error based process, often resulting in sub-optimal solutions.

A predictive model was developed to describe mineral fouling in whey evaporators in collaboration with the Dutch dairy industry. This model describes the fouling process as a three stage event: formation of calcium-containing particles, transport of the particles to the evaporator wall and adherence of the particles to the wall. Model parameters were determined in experimental equipment and implemented in NIZO Premia, a software platform to model process-product interactions in food production processes. The resulting model was compared to an industrial scale whey evaporator, showing a good comparison between the model and practice. The resulting model can be applied to optimize whey evaporators with respect to fouling or design solutions resulting in less fouling.

This paper will describe the background of the project, the designed model, experimental results and the comparison with an industrial scale evaporator.