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ANALYSIS OF MILK FOULING IN AN OHMIC HEATER: EFFECT OF TEMPERATURE AND POWER FREQUENCY

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ABSTRACT

Rapid fouling of heat transfer surfaces in dairy industry requires frequent shut down and cleaning of heat exchangers. In conventional, indirect heat exchangers like shell and tube and plate heat exchangers, the need to have hotter heat transfer surfaces for effective heat transfer to bulk fluid is considered to enhance fouling. Ohmic heating has an advantage in this regard because the heater (electrode) surfaces are comparatively cooler since heat is generated within bulk fluid. However, this advantage can not be sustained over a period of time. As soon as some deposits are formed on electrode surfaces, they not only restrict outward flow of heat but they themselves become a source of heat. As a result, the surface temperature of the electrodes starts rising and eventually they become much hotter than the bulk fluid.

Corrosion of metallic electrode surfaces in the presence of a power supply affects the fouling process during ohmic heating process. The use of different surface materials or surface coatings with lower corrosion tendencies may be one possibility to reduce corrosion. Increasing the power frequency is considered to be another option to mitigate corrosion effects.

In this study, we have analysed the changing temperature profile and its impact on the fouling process during thermal processing of milk in a cylindrical ohmic heater. Furthermore, the impact of power frequency on the electrolysis of the metallic electrode surfaces has been investigated. The use of higher frequency power supply has been found to slow down the electrolysis process as a result of shorter cycle times.