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SIMULATION OF FOULING BEHAVIOUR IN A HELICAL TRIPLE TUBE ULTRA-HIGH-TEMPERATURE (UHT) MILK STERILIZER

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ABSTRACT

The occurrence of fouling is very common on the surface of milk sterilizer. Usually fouling includes the minerals and denatured protein deposits on the surface of the sterilizer. The performance of UHT milk sterilizer declines as fouling occurs on the heating surface. It causes increased resistance to heat flow, thereby milk outlet temperature decreases with increase in fouling thickness. Using hydrodynamics and heat balance concept, a mathematical model was formulated and then simulated for accurate estimation of milk outlet temperature, fouling thickness and Biot number (i.e. local fouling factor) as a function of time and position within the helical triple tube UHT milk sterilizer. At an early period of operation, the uniform fouling deposit occurs throughout the length of the UHT milk sterilizer due to constant sterilizer wall temperature. With progress of time, the fouling deposit and also Biot number increases towards the outlet of the sterilizer since the interface temperature between fouling deposit and milk approaches towards the bulk milk temperature, which increases towards the sterilizer outlet. The fouling deposit stabilizes after 105 min since no net deposit occurs after that time.