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Effect of swirl flow on whey protein fouling and cleaning in a straight duct

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1 Effect of swirl flow on whey protein 2 fouling and cleaning in a straight duct

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8 KEYWORDS

9 Cleaning; fouling; duct; swirl; whey protein; milk.

10 Abstract

11 Whey protein fouling is a complex phenomenon involving several mechanisms. Product, surface
12 properties and process parameters interact simultaneously. This experimental work focuses on the
13 effect of a swirl flow on whey protein fouling and cleaning in a straight tube, independently of any
14 other factors. In a holding section after a heating zone composed of a plate heat exchanger, the dry
15 deposit mass obtained from a straight tube was compared with that obtained in the presence of a
16 swirl flow. For varying conditions, namely two protein concentrations, two processing temperatures
17 and two fouling durations, the dry deposit mass increases despite the wall shear stress increase
18 induced by the swirl device. Nevertheless, the cleaning time was found to be significantly shorter in
19 presence of swirl flow in laminar and turbulent conditions. These results reveal that cleaning
20 efficiency can be improved by such a swirl insert, which is seldom used in the food process industry.

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