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(P8) Inline fouling mitigation during food processing: A sustainable novel solution

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Fouling within the food industry has an impact on both capital and operation costs. There is a great demand for cost effective antifouling solutions. An increase in internal fouling results in poor thermal efficiency during food processing. This is coupled with poor heat and mass transfer local to the metal surface of designed heat exchangers and other equipment. Internal fouling could also potentially increase fluid flow pressure due to restricted flow.

We demonstrate in this article, how fouling is mitigated non-intrusively in the food industry initially with heat exchangers by introducing ultrasonic energy during production. Ultrasonic transducers are attached external to plate and tubular heat exchangers. They produce ultrasonic wave frequencies preferably between 19 and 59 KHz. Extended trials conducted on plate heat exchangers at Jacob Douwe Egberts R&D during continuous processing indicate that the fouling resistance can be significantly improved. Without any ultrasonic effect, over 5 days the heat exchanger targeted at 140 °C attains only 128 compared 138 °C with an ultrasonic transducer. It must also be noted that significantly less cleaning (downtime) of the heat exchanger is required with an ultrasonic transducer compared to without. Typical liquid flow rates (with coffee solids) through the plate heat exchanger are between 50 and 240 kg/hr.

Further trials on a tubular steam heat exchanger showed reduced fouling with an ultrasonic transducer. With a trial length of about 20 hours, the run length until complete fouling increased from 10 to 25 hours with an ultrasonic effect.