RECP Best Practice Catalogue

Ice pigging

Developed within the framework of MED TEST II

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UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

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SECTOR:	**Food & Beverage**
SUBSECTOR:	Processing and preserving of fruit and vegetables
PRODUCTS	Fruit pulp and concentrates
CATEGORY	Technology upgrade/Eco-innovation
APPLICABILITY	Utilities

COMPANY NAME	---
COMPANY SIZE	Medium

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Description of the problem (Base scenario):	As the company works in production of food and beverage, with some processes in closed pipes (preheating, sterilization, homogenization,….), it has to conduct Clean In Place (CIP) process to clean the pipeline according to a quality schedule (normally 2 hours for CIP every 6 hrs of operation). The company uses the traditional method, in which a hot water cycle pushes the product out of the production line, followed by a chemical cycle (caustic soda and/or nitric acid) to remove any sticking product or bacteria from the production line, and finally a second water cycle is conducted to rinse the pipelines from the chemicals. The conventional CIP process results is loss of some product which is in direct contact with the first rinse water as the product is diluted. That quantity of lost material was estimated to be 300 kg/batch, with each batch running on 180 tons production.

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Description of the solution	Introduction of an eco-innovative solution of ICE pigging to push the product out from the production line instead of the conventional water push, shall eliminate the need for hot water in the CIP first rinse, as well as enabling a full recovery of the product without the possibility of dilution. The ice pig is generated in an external ice generator, and then introduced to the production line pushing the product out, and in the same time scrubs the pipe surface. Thus assists in the removal of sticky products. Once the line is cleaned, the ICE pig indicates a clear separation for the product. Advantages of ICE pigging include: • Full recovery of the product • Elimination of first rinse water • Reduce the stop time for the CIP
Schematic for the solution	

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Economic Benefits	220 kg of product recovered/batch * 608 CIP cycles per year (4 months operating 24/7, and 3 months operating 10/5) results in 133.75 tons of product recovered per year ~ 133,750 Euro/year Water savings is approximately 4m^3/cleaning cycle, equivalent to 2,432 m^3/year of water savings ~ 693 Euro/year **Total saving = 134,443 Euro/year**
Environmental Benefits	Reduce water consumption by 2,432 m^3/ year (7% of baseline). Reducing the wastewater generated by 2,432 m3/ year and thus reducing both hydraulic and pollution load on the final End-of-Pipe.
Health and safety impact	Not applicable

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Capital investments & financial indicators	Estimated cost of Ice generator and installation cost is 267,500 Euro Payback is estimated as 2 years.
Suppliers	Imported
Other aspects	Conventional metal pigging was thought about, but it wasn't suitable as the heat exchanger to be cleaned had sharp edges, and several deflectors installed in the straight pipes (the deflectors serve as mixers during normal production). The company feared from the metal pig to break the deflectors, which is a constraint avoided in ICE pigging.
Implementation	The company not fully convinced by the measure practicality. They need to see it in operation at other sites.

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Replicability sectors	The same concept can be replicated in • Fruit Pulp and tomato paste, • Dairy industry
Aspects to investigate for replicability	• Number of CIP cycles. • Quantity of water used for the first rinse.
Useful resources	https://www.carbontrust.com/media/628609/cts400-ice-pigging-for-dairy-applications.pdf