CLEAN-IN-PLACE SYSTEMS – W5

Eco-efficiency resources for the food processing industry

Improve CIP system efficiency

CIP systems can save labour, water, chemicals and money.

A clean-in-place (CIP) system automatically delivers a standard number of wash and rinse cycles to the internal surfaces of a closed system. CIP systems can allow equipment, tanks and pipes to be cleaned without being disassembled, saving labour and eliminating human contact with chemicals.

A CIP system usually consists of several chemical and rinse water-holding tanks, associated pumps and piping to allow the recirculation of rinse water and cleaning chemicals. Full recovery systems can recover up to 99 per cent of the cleaning solution.[1] CIP systems are usually custom designed for specific applications and incorporated into the full process design.

Portable CIP systems are also being developed that are usually cheaper and can, in some cases, offer greater flexibility than fixed centralised CIP.

Auditing

Microprocessors and computers are commonly used to control CIP systems and to validate exposure times and cleaning temperatures providing traceability and security for the processor.[2]

Regular review of CIP systems is essential. As numerous factors interact during the cleaning process it is important to trial all modifications as even small changes can affect cleaning effectiveness and product quality. The effectiveness of CIP systems can be improved by:[3]

- maintaining and calibrating in-line monitoring instrumentation
- reviewing cleaning cycle length to ensure they have not become excessive
- assessing chemicals, blends and concentrations to ensure that they achieve effective cleaning, but are safe for the operator, and environment
- checking for excessively high or low temperatures
- checking for opportunities to recover more rinse water and spent solution
- training operators and adequately supervising to improve efficiency and safety
- regularly monitoring equipment and repairing promptly.

1 Daufin G., Escudier, J.P., Carrere, H., Bérot, S., Fillaudeau, L. and Decloux, M., 2001, 'Recent and emerging applications of membrane processes in the food and dairy industry'. Trans IChemE, vol. 79(C2), 89–102.

2 Higgins, K, T., April 11, 2003, Tech update: Clean-in-place continues to evolve, Food Engineering Magazine, www.foodengineeringmag.com/CDA/Archives/23f45103942f8010VgnVCM100000f932a8c0

3 UNEP Working Group for Cleaner Production, 2004, Eco-efficiency for Australian dairy processors, Fact sheet 8: Optimisation of CIP systems www.gpa.uq.edu.au/CleanProd

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WATER SAVINGS THROUGH CIP AUDIT

National Foods, a dairy in NSW, undertook an audit of their CIP system and found the flush times of the pasteuriser could be reduced by 12 minutes per day, saving 15,000 kL per year.[4]

EFFECTIVE CIP FIRST RINSE REDUCES WATER USE

Trials conducted by Golden Circle on the hot fill/cordial line CIP unit found that the second rinse step could be eliminated by extending the time of the first rinse. This led to savings of about 1,700 kL/year. Tanks were also installed to allow the final rinse to be collected and used as the first rinse in the next wash, saving an additional 4,350 kL/year. (Golden Circle is an ecoBiz participant.)

Validation

Cleaning must be validated, especially after implementing any changes, to prevent food safety problems. For example, riboflavin testing is currently being undertaken in the pharmaceutical industry to highlight potential contamination risk by flushing riboflavin through the process followed by CIP. Ultraviolet light is then used to identify any riboflavin remaining in the system highlighting locations where the CIP system is not adequate and contamination may occur.[5]

Alternative chemicals

Alternative sanitising agents to chlorine can be used to reduce staff exposure to chemicals. For example, using ozonated water for sanitation can reduce chlorine requirements and can also save water as it does not leave any residual chemicals and therefore requires no rinsing.[6] Refer to the Cleaning and sanitising options fact sheet (W6) for more information on alternative sanitising chemicals.

This series of fact sheets provides examples and suggestions to the modern food processor on how to achieve both economic and environmental benefits from eco-efficiency. Visit the project website www.ecoefficiency.com.au for more ideas and case studies.

4 Prasad, P., Pagan, R., Kauter, M. and Price, N., 2004, Eco-efficiency for the Australian dairy processor – Fact Sheet 8:Optimisation of CIP systems, UNEP Working Group for Cleaner Production in the Food Industry, Dairy Australia, Southbank Victoria, www.gpa.uq.edu.au/CleanProd

5 Higgins, K, T, 2003, Tech Update.

6 Pascual, A., Llorca, I. and Canut, A., 2007, "Use of ozone in food industries for reducing the environmental impact of cleaning and disinfection activities." Trends in Food Science and Technology 18, S29-S35.

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This series of eco-efficiency fact sheets will demonstrate the importance of water in a modern food factory and suggest areas where savings can be made. The project website www.eco-efficiency.com.au has more ideas and case studies on water savings across the food industry.

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