Energy analysis of a cleaning-in-place system

In food, chemical and pharmaceutical industries, regular cleaning of the equipment is required to guarantee hygienic production. Modern facilities use automated Cleaning-in-Place systems due to their reliability and reduction of manual operations. However, these systems and their cleaning routines are specially designed for each facility, equipment type and production schedule. Hence, detailed information about the energy consumption of the system is often unavailable. This work presents a method to determine the energy use of a Cleaning-in-Place system based on available data of the recorded cleaning routines. The case study was based on a heating in line, decentralised and re-use cleaning unit located in a dairy factory. The measured data of two cleaning lines of the unit was used to develop energy and mass balances in order to identify and quantify the sources and sinks of mass and thermal energy. The energy analysis showed that 68.96 MWh of steam was consumed during a period of 50 days, of which 76% was dedicated to heating up the base solution. Besides, a total amount of 788 m$^3$ of water was drained between the two lines, which corresponds to 20.19 MWh of thermal energy consumption. The indicators of the energy management software of the system were used to assess the method as well as the inefficiencies of the system.

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