TRANSCAT
Visit us at Transcat.com!
35 Vantage Point Drive // Rochester, NY 14624 // Call 1.800.800.5001
GE Industrial Sensing

Sanitary Flow Measurement in a Dairy Plant

Application

With 40 separate facilities, a large milk and juice packaging company in Japan has a dual need for liquid flowmeters: (1) to ascertain when the process of cleaning the pipes and tanks has been completed and (2) to ascertain when the flow velocity and volumetric flow rate have been properly adjusted in trial runs when new equipment is installed.

1. Since these plants are processing foods for human consumption, pipes and tanks must be kept free of contamination by frequent cleaning. Although the cleaning schedule varies, the pipes and tanks are typically cleaned at least once per day. This is accomplished by flushing them with a 2% alkali and water washing solution several times. A method is needed to determine when they have been sufficiently cleaned.

2. For economy and efficiency, new equipment installations must be properly adjusted. Flowmeters provide a means of checking the volumetric flow rate and velocity in order to determine the capacity of a pump, the pressure of the drawdown, and to locate any leakage that might occur.

Background

Each facility uses sanitary stainless-steel (either SS 304 or SS 316) pipes ranging from 1.5 to 4 inches in diameter in combination with various tanks and other pieces of small equipment.

The portable ultrasonic flowmeter makes it easy to monitor flow velocity and Reynolds number during the cleaning process. The company has established minimum values for each parameter as indications that the cleaning process is complete. For example, in 2 in pipes the cleaning process is continued until velocity exceeds 1.5 m/s and Reynolds number exceeds 25,000. Values below either of these levels indicate that solid milk is still adhering to the inside wall of the pipe and that further cleaning is required.

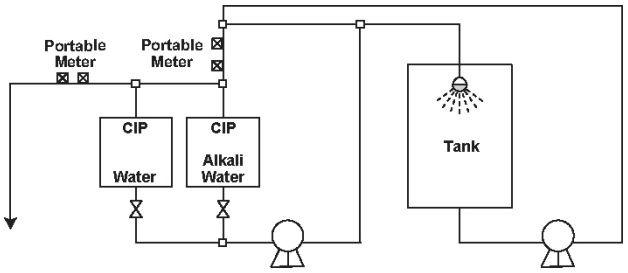
Problem

Only clamp-on transducers can be used since the product in the pipes must be kept sanitary. A portable flowmeter is preferred since each facility consists of many, many pipes and tanks. The measuring process is complicated still further by the fact that milk is a multiphase fluid containing both liquid and solid (i.e., calcium) materials.

How Previously Handled

The previous method for ensuring the effectiveness of the cleaning process was quite primitive. A flange was removed from the pipeline being cleaned so that the cleaning solution would drain into a barrel below it. By measuring the time it would take for the draining solution to reach a certain level in the barrel, the flow rate and velocity would be calculated manually. The Reynolds number would also then be calculated manually. This method was both cumbersome and inadequate because it was imprecise, inconsistent, and required many man-hours of work.

Similarly, the assessment of new equipment (e.g., the capability of the particular pump, pipe, etc.) could only be judged based on an in-line positive-displacement flowmeter situated at the end of the pipeline. Flow rate could not be measured at all in any of the branch pipes.



The ultrasonic portable flowmeter is used to monitor the cleaning process in a milk packaging plant

Advantages

The GE Portable Transit-Time Flowmeter has proven to be an ideal solution to this problem – particularly since its cross-correlation circuitry enables it to work in the transit-time mode even with multiphase fluids. Using only the lightweight, compact, easy-to-operate portable transit-time flowmeter, it is possible to store site parameters from as many as 20 separate sites. This dairy plant is now able to measure flow rate accurately in many different pipes in a very short period of time. Furthermore, the portable transit-time flowmeter data-logging function together with the instrument interface software has greatly improved their data-acquisition capabilities. Since the portable transit-time flowmeter also calculates and displays the Reynolds number, the milk plant is now saving many man-hours of work, thereby achieving a significant reduction in operational costs.

Equipment

- Portable Ultrasonic Transit-Time Flowmeter
- General Purpose liquid flow clamp-on transducers
- Universal clamping fixtures
- Small pipe liquid flow transducers with clamping fixtures

Typical portable ultrasonic transit-time flowmeter

Installation

Clamp-on transducers are positioned on the sanitary stainless steel pipes with 10 diameters of straight pipe upstream and 5 diameters of straight pipe downstream for both horizontal and vertical pipes.

Procedure

During the pipe-cleaning process, the portable transit-time flowmeter allows the velocity and Reynolds number to be certified, and in the milk packaging process the volumetric flow rate is certified.