APPLICATION NOTE

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Data Acquisition for Milk and Dairy Pasteurization

Industry: **Food & Beverage (Dairy)**
Product: **Data Acquisition (DAQ)**
           SMARTDAC+ GX10/20

Introduction

Pasteurization is a process that aims to reduce and destroy the number of viable pathogens/bacteria in the product so that the unwanted pathogen/bacteria does not cause harm to human health. Pasteurization is a critical process in a wide range of products such as: milk, cheese, juice and alcohol. Food and beverage manufacturers must demonstrate and ensure that products undergoing pasteurization meet the strict requirements of international standards so that the product is deemed safe for human consumption. Significant fines and penalties may be imposed if the pasteurization process is not followed.

Depending on the product, there are specific requirements on the temperature and amount of hold time required to ensure the product is safe. There are two main types of the pasteurization process:

1. **High Temperature Short Time (HTST)**
   Product is forced between metal plates or pipes heated on the outside by hot water and product is heated to 72 °C (161 °F) for 15 seconds

2. **Ultra Heat Treating (UHT)**
   Product is forced between metal plates or pipes heated on the outside by hot water and product is heated to 140 °C (284 °F) for 4 seconds

In the United States, Pasteurized Milk Ordinance (PMO) outlines the relevant standards and regulation for the pasteurization process and is administered by the Food and Drug Administration in conjunction with U.S. Department of Health and Human Services.

Application

Pasteurization can be conducted as a batch or a continuous process. The most common process used for fluid milk is the continuous process. The milk is pumped from the raw milk silo to a holding tank that feeds into the continuous pasteurization system. The milk continuously flows from the tank through a series of thin plates that heat up the milk to the appropriate temperature. Once the milk is heated, it is sent into a "holding tube" that is set up to make sure the milk stays at the pasteurization temperature for the
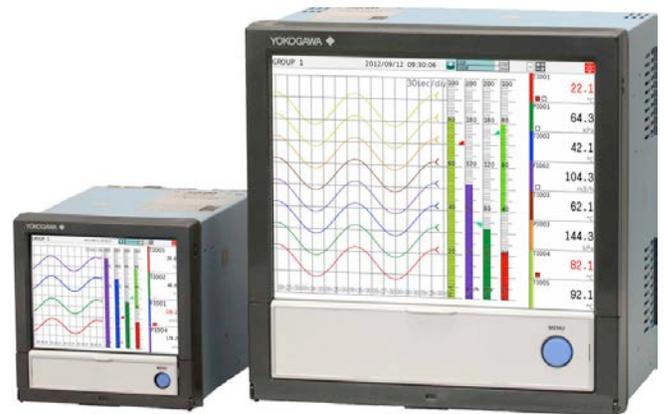
appropriate time before it flows through the cooling area of the pasteurizer. The cooled milk then flows to the rest of the processing line for packaging and bottling.

If the appropriate pasteurization temperature was not maintained at the outlet of the holding tube, then a divert valve opens to pass the milk back for reprocessing.

Typically, a paperless recorder is deployed to measure the temperature of the product (hot and cold) as well as the divert valve position. The operation of the divert valve is often triggered from the paperless recorder. It is imperative to record these variables to ensure the product is processed correctly through pasteurization. Additionally, the recorded data is often used for audit and traceability requirements.

Solution

Yokogawa's best-in-class panel mount paperless recorders are fully integrated data acquisition and display stations with secure, built-in data storage and network connectivity. Panel-mount solutions are NEMA compliant and integrate the data acquisition equipment into a control panel. Yokogawa's paperless recorder lineup meets the rigorous industry standards such as PMO, HTST and FDA 21CFRPart11.

Design
Yokogawa's SMARTDAC+ GX series paperless recorder series is the first in its class to offer multi touch panel

technology. In order to improve intuitive and smart operator control, users can scroll, zoom and pan historical data and even write freehand messages on its dust-proof and water-proof display. The GX complies with IP65 and NEMA 4 standards, as it can withstand harsh environments of dust and wash down. The protective sheets on the touch panel display have a special coating on the front and back to prevent damage from scratches, chemicals and solvents while maintaining high display clarity and resistance to light interference.

Functionality
Measured and calculated data is continuously saved to secure, internal non-volatile memory. At manual or scheduled intervals, the files in memory are copied to the removable media. In addition, the files can be copied and archived to an FTP server. The GX supports up to 32GB of external SD memory. With the advanced security function option, GX supports FDA 21CFRPart11 regulation. It gives the user access to a login function that requires user names, IDs and passwords. Furthermore, GX supports electronic signatures, audit trails, and an anti-tampering function, another security feature that meets or exceeds the requirements of CFR Part 11.

Through a web browser, the user can monitor the GX in real time and change settings. You can easily build a seamless, low-cost remote monitoring system with no additional software. Data files saved on the GX can be viewed and printed. You can also perform statistical computation over an area and export to ASCII, Excel, or PDF.

Four alarm levels can be configured for each analog input. In addition, each alarm can be assigned to a digital output relay (e.g. open/close valve, sound alarm horn, etc).

A typical paperless recorder installed on a pasteurization process may utilize the following inputs:

- Input 1: Hot temperature (with alarm triggering the divert valve's position)
- Input 2: Cold temperature
- Input 3: Divert valve position

For more information on Yokogawa's SMARTDAC+ GX series, please visit:

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