

Automatic and Continuous Monitoring of the Beer Fermentation Process (with a Liquid Density Meter)

Industry: Food & Beverage

Product: Liquid Density Meter

Introduction

One of the critical control points in the brewing process is the monitoring of the progress of the fermentation stage. Fermentation takes place in a tank, where temperature and pressure are controlled by a computer program. As fermentation proceeds, the extract (sugar) value decreases. Since there is a correlation between the decrease in the extract value and the specific gravity (density) of the wort (the liquid mixture that is fermented to make beer), the degree of fermentation can be known by measuring the specific gravity.

While this testing has conventionally been performed by regularly taking a manual grab sample of the wort and measuring it on the Baumé scale, more and more brewers are turning to the use of density meters that automate this process and perform

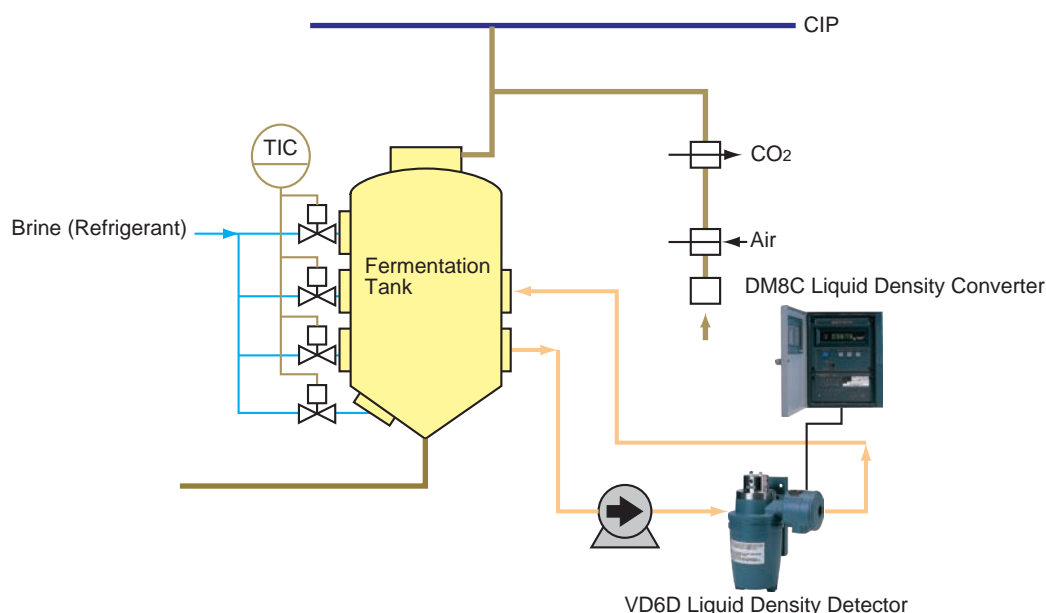
it continuously. The DM8 Vibration Type Liquid Density Meter offers high sensitivity and stability, realizes precise control, reduces workload, and reduces instrument costs. With these benefits, the DM8 has even replaced a refractometry-based continuous monitoring method that uses the Brix scale.

Expected Benefits

- Ensures stable, continuous liquid density measurement
- Reduces operating costs

Process Overview

Before fermentation, the wort is boiled and then cooled to approximately 5 °C. The cooled wort is placed in a fermentation tank and yeast is added. Fermentation proceeds for seven or eight days as the sugar in the wort breaks down and the sugar content changes, which is indicated by changes in the wort's density. This process is controlled by a computer program that adjusts the temperature and pressure inside the tank based on the measurement of this density.



Solution Details

Measurement System

Detector (sanitary use): VD6DS-S3*B
 Converter: DM8C-A□*C
 Dedicated cable: DM8W-L□□□□*A
 Sampling unit:

The VD6SM sampling unit cannot be used for sanitary applications.
 If a sampling unit is required, contact Yokogawa.

Utilities

DM8C converter/VD6DS detector:

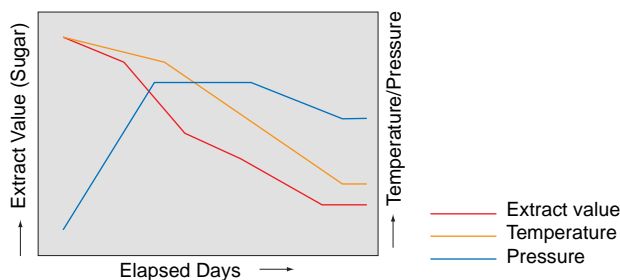
Power supply (to converter): 90 to 132/180 to 264 V AC, 50/60 Hz

Power consumption: 20 VA

Notes

- As fermentation proceeds, the carbon dioxide content of the wort increases. Vaporization of carbon dioxide in the detector may interfere with accurate measurement, producing effects such as reading hunting. Measures such as increasing the sample liquid pressure should be taken to prevent bubble formation. This is done by installing a valve in the piping from the detector outlet. This allows the action of the pump to increase the sample pressure in the piping to the inlet. Also note that the sample should be returned to the top of the fermentation tank.

Field Data



- The relationship between changes in the sugar content and temperature/pressure in the tank during fermentation
- Density meter parameter settings

Temperature compensation coefficient: -1.5×10^{-5}

Reference temperature: 20 °C

Measurement span: 0.06 g/cm³



DM8C Converter



VD6DS Detector

