Recording and control of carbonation processes
Monitoring and controlling accurate carbonation levels

Easy adjustment of ratio and bias terms for carbonation
Measurement made easy

Introduction

CO₂ levels in carbonated drinks vary between manufacturer and product. Each manufacturer requires different CO₂ levels depending on the final product. For example, cola-type drinks require a different carbonation level to carbonated orange drinks.

Manufacturers demand accurate CO₂ injection and high consistency in the packaged product. To achieve this, it is necessary to control and record the CO₂ gas pressure and record the temperature of the product as part of the quality control procedure.

The correct amount of carbonation for a product is achieved by injecting a predetermined volume of CO₂. The CO₂ pressure set-point varies due to the type of product and the temperature of the product. Therefore the CO₂ pressure set-point is a function of the product temperature. The product temperature is taken as a remote set-point from the process and ratio bias settings are applied to it to produce the process set-point.

\[ P = 2.0 + 0.1t \]

Where:
- \( P \) = final CO₂ pressure set point
- \( t \) = product temperature

In the above example, to achieve the correct amount of carbonation in a product, a final CO₂ pressure of 3.0 bar is required when the product temperature is 10°C. If the product temperature increases by 1°C, the CO₂ pressure must be increased to 3.1 bar to compensate.

By varying the bias and ratio values, different CO₂ levels can be produced for the complete range of carbonated drinks.
The process

- CO₂ pressure
- CO₂ pressure setpoint (a function of the product temperature)
- Control output

Carbonation process overview
What ABB Products are suitable?

ControlMaster controllers

ABB’s ControlMaster controllers (CM10, CM30 and CM50) offer a wide range of control functions and feature straightforward operator controls to simplify adjustments of ratio and bias terms for different carbonated drinks.

With their full-color, TFT displays, all controllers in the ControlMaster range provide engineers with a clear and comprehensive overview of process status and key information. These displays can be tailored to show specific process data, while a chart display provides short term trending information.

Other ControlMaster features include:

- A choice of communications options including Ethernet and MODBUS
  - Ethernet communications can provide automatic notification of critical process events via email or remote monitoring of the controller and process via the ControlMaster’s integrated webserver by simply addressing it in a standard web browser.
  - MODBUS (RTU or TCP) enables easy integration with larger control systems (for example, Freelance or 800xA), and allows both read and read / write access to real-time process value data as well as most other variables.
- NEMA4X (IP66) rating as standard, making them suitable for use in almost any location in a modern food processing plant, where cleaning of all surfaces takes place.

ScreenMaster paperless recorders

ABB’s ScreenMaster recorders offer a versatile, secure and proven alternative to traditional paper-based devices.

ABB’s ScreenMaster range is ideal for recording the carbonation process, including CO2 pressure, product temperature and flows.

ScreenMaster features include:

- High specification 21CFR Part 11 complaint data security
- High visibility process displays
- Remote access and operation via Ethernet
- Hosedown protection to IP66 and NEMA 4X
- Automated process data management
- Flexible recording capability including alarms, totalizers, math and batch recording
- Batch recording option enables simple recording and reviewing of batch processes