Why the need to monitor CO\textsubscript{2} in a beverage plant?

The carbonating process

Everybody loves a refreshing sparkling drink during the summer heat.

CO\textsubscript{2} does not only bring the bracing sparkling effect into your drink but even helps to conserve the beverage. A chemical reaction of CO\textsubscript{2} and water forms carbon acid which has an antibacterial effect.

All well known soft drinks come with the right fizz.

The beverages are treated with a carbonating process just before the final bottling or canning.

Carbonating systems mainly consist of a booster pump, a CO\textsubscript{2} saturator, a carbonating tank and an optional CO\textsubscript{2} analyser to check the carbon acid content of the final product.

With the aid of a booster pump the beverage mixture is conveyed to the saturator which works according to the Venturi principle. An optimizing control keeps the flow velocity through the saturator within a constant working range. This generates a partial vacuum at the smallest cross section of the saturator which causes a reduction of the pressure level. This suction effect then mixes the CO\textsubscript{2} with the beverage liquid. The short-time increase of the flow velocity guarantees a fine distribution of the gas and homogenous mixing.

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Carbonating processes use most of the CO\textsubscript{2} in the beverage industry. But beside that the gas also occurs during fermentation or it is used for refrigeration - so CO\textsubscript{2} is omnipresent in such facilities.

High concentrations of CO\textsubscript{2} in closed areas where workers attend to their jobs can become a lethal risk. Extensive CO\textsubscript{2} levels can lead to bad headaches, drowsiness, unconsciousness and even sudden death. A CO\textsubscript{2} level above 5000ppm is considered as alarming.

The gas can neither be recognized by its odour nor by its visual appearance. Soft-drink factories or breweries therefore require an accurate CO\textsubscript{2} control and alarm system to maintain their high standard of operational safety.

To assure hygienic conditions and to reduce the risks of CO\textsubscript{2} incidents, bottling lines which fill carbonated drinks are often operated in separated areas of a factory.

There is a controlled loss of CO\textsubscript{2} during the bottling or canning process of sparkling drinks which is minimal, but the amount adds up considering that industrial lines are able to fill up to 30,000 bottles an hour. With each filling a tiny amount of CO\textsubscript{2} gets exposed to the surrounding atmosphere.

The process essentially depends on the tank pressure which has to be set slightly higher then the saturating pressure of a specific product.

Right after that, the drink is ready to be bottled automatically to preserve its texture.

Facts & figures:

- A large bottling line can fill up to 30,000 bottles or cans an hour
- Coca-Cola operates 65 bottling plants in India only.
- Ireland is the second largest per capita consumer of soft drinks with 126l behind the US with 216l per year.
- You can reduce the risk of cardiovascular diseases by drinking plain sparkling water according to a scientific study.

The small insight shows how beverage manufacturers depend on reliable CO\textsubscript{2} monitoring systems.
What solution can Rotronic offer?

Rotronic offers a wide range of fix-mounted CO₂ only and CO₂ temperature transmitters. All of them are based on the principle of NDIR technology. They are pre-calibrated and have a lifetime of over 15 years under normal conditions. Multiple analogue outputs like current loop, voltage and relay contact allow for the easy adaptation to every application. A major advantage of the current sensor is the stability of the measurement over the entire temperature range, whereas some sensors are temperature dependant, Rotronic remains stable.

Transmitters provide various kinds of signals to keep track of the CO₂ level and to trigger alarms to protect people.

Rotronic products:

Transmitter:
- **CF3 series**
  - 0...2000ppm or 0...5000ppm
  - ±30ppm, ±3% of reading
  - Optional display, IP54.
- **CF8 series**
  - 0...2000ppm or 0...40000ppm
  - ±30ppm, ±3% of reading or ±300ppm, ±3% of reading
  - Optional display, IP54,
  - Optional visual alarm,
  - Optional relay,
  - Optional CO measurement,
  - Optional temperature measurement.

Hand held device:
- **CP11**
  - Measurement of CO₂ temperature and relative humidity,
  - -20...60°C, ±0.3°K,
  - 0.1...99.9% rh, ±2.5%rh,
  - 0...5000ppm, ±30ppm, ±5% of measured value,
  - Data logging function (18000 values) with time stamp.

Wall mount display
- **CO₂ Display**
  - Measurement of CO₂ temperature and relative humidity, adjustable, visual CO₂ indicator
  - 0...50°C, ±0.3°K,
  - 0...100% rh, ±2.5% rh,
  - 0...5000ppm, ±30ppm, ±5% of measured value,
  - Data logging function (18000 values) with time stamp.

Customer benefits:

**Accuracy and long term stability**

Choosing Rotronic gives you the best accuracy on the market.

The Rotronic CO₂ sensors can easily be calibrated, to guarantee highest possible precision of the measured concentration.

**Calibration**

The ABC function autonomously avoids baseline drift. A calibration and adjustment is carried out within a user defined time where the lowest value is automatically calibrated at 400ppm. Optionally a 0ppm calibration unit is available from Rotronic.

**Connectivity**

Rotronic CO₂ devices can be connected to control systems via analogue signals such as current or voltage. Relays energize alarm sirens or flashing signals. Log data can be transferred via USB from the CP11 or the CO₂ display to any PC for further evaluation.
Contact us:

Rotronic is represented in more than 40 countries around the world. An up to date list of all our partners is available at www.rotronic.com/international

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