



APPLICATION NOTE Food & Beverage

Volume flow and alcohol concentration measurement at a whisky bottling plant

- Coriolis mass flow measurement from tanker offloading to reduction and bottling of whisky
- Built-in alcohol concentration measurement to reduce spirit to target strength inline
- High accuracy and repeatability for consistent product quality

1. Background

A premium spirits company produces and distributes a wide range of single malt Scotch whiskys under different brands. It operates several distilleries and bottling plants across Scotland and beyond. Growth of the renowned brands has resulted in the need to expand the current spirit processing plant near Glasgow.

2. Measurement requirements

At the plant, the whisky from the distillery is unloaded from road tankers and processed through the Vat Hall before being fed forward to bottling. Spirit processing includes reduction from ~70% ABV to 40% ABV using demineralised water, colour adjustment with a small quantity of caramel and finally chill filtration. To monitor the volume flow of whisky during offloading as well as in the transfer lines to bottling, the bottling plant required high accuracy flowmeters.

In addition, process instrumentation for alcohol strength and concentration measurement was needed to reduce the whisky accordingly prior to bottling. Precise measurement of alcohol concentration is key to maintaining the same percentage of alcohol in every bottle. For a long time, alcohol concentration had been a complicated and timely process to measure either by manual lab testing and/or by implementing additional processes with expensive analytical instrumentation. To partly automate their dilution process and to make things easier for their staff, the company was searching for an all-in-one flowmeter suitable for inline concentration measurement of alcohol.

3. KROHNE solution

The OPTIMASS 6400 was able to prevail over competitors in an independent field test lasting several months, meeting all the customer's needs and requirements for measurement accuracy and repeatability. The twin bent tube Coriolis mass flowmeter is a standard measuring device for gas and liquid applications in the food and beverage industry.

A total number of 12 KROHNE flowmeters have been provided in stainless steel with different nominal sizes from DN25 to DN50. The flowmeters have been installed with standard flange connection in different locations of the plant, particularly in the following processes:

Whisky offloading and transfer

Flowmeters monitor flow and volume transfer during offloading from tankers and transfer from storage to reduction, reduction through filtration to bottling vats, water and caramel addition and finally feeding forward to the production lines in the bottling hall. As an all-in-one flowmeter, the OPTIMASS 6400 also outputs the alcohol temperature in these transfer lines to bottling. This is used in the control loop to reheat the spirit to a manageable temperature after being stored in outdoor vats.

Dilution of whisky

OPTIMASS 6400 flowmeters are also used for inline addition of demineralised water to reach the desired alcohol concentration. The built-in alcohol concentration software of the Coriolis mass flowmeter enables the customer to prevent under/over shooting the strength. During this process, the operator inputs spirit transfer volume and required strength. When the spirit transfer starts, the Coriolis meters register volume flow and concentration, which is provided in the control room. The control system monitors concentration until the value is stable over a certain period. Once stable, the percentage of alcohol by volume (ABV) is taken by the control system. Based on the original bulk spirit volume set point and target strength, the control system then calculates the volume of water required. All parameters from volumetric flow to density/alcohol concentration to temperature are communicated over the PROFIBUS PA output of the Coriolis mass flowmeters.

4. Customer benefits

Using the OPTIMASS 6400 has helped the whisky maker considerably increase the accuracy and repeatability of measurement. This is particularly true for the inline alcohol concentration measurement that helped the process add the right amount of water to the whisky directly inline. The accuracy of the concentration measurement was tested against lab samples and proved to be very accurate with an uncertainty of only $\pm 0.3\%$ ABV and the measurement can still be further optimised on site. In this way, the Coriolis mass flowmeters allow the distillery operator to better meet the production quality criteria and ensure that their high standards are the same in every bottle of whisky. The OPTIMASS 6400 has a track record of alcohol concentration measurement in the beverage industry. It is for this reason that the KROHNE flowmeter has become the device of choice for this application in several Scottish distilleries today.

5. Product used

OPTIMASS 6400 C

- Coriolis mass flowmeter for advanced food and beverage applications
- High accuracy flow measurement of mass flow, volume flow and density/concentration (incl. concentration option for alcohol)
- Communication options: HART®, FOUNDATION™ Fieldbus, PROFIBUS® PA & DP, Modbus, PROFINET, Bluetooth®



Contact

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