



# APPLICATION REPORT Food & Beverage

## Volume and mass flow measurements of liquids and gases in breweries

- Reliable flow measurements to ensure constant beer quality
- Measurements not influenced by different process conditions
- Precise and constant dosing of different additives at all production levels

### 1. Background

When constructing a large new brewery near Enschede, the Netherlands, the beer producer GROLSCH was looking for a variety of devices to measure the volume and mass of liquid and gaseous products.

The GROLSCH brewery placed high demands on the devices, particularly in terms of measuring accuracy, reliability and being maintenance-free. All of the devices had to be equipped with the PROFIBUS PA communication interface to communicate with the ProLeit process control system. On top of that, the measuring devices were all to be supplied by the same manufacturer if possible.



New construction of GROLSCH brewery near Enschede, the Netherlands

## 2. Measurement requirements

GROLSCH wanted to use electromagnetic flowmeters (EMF) to measure the volume flow of electrically conductive and liquid products. These devices would be used in production areas, fresh water and cooling circuits as well as in wastewater treatment plants.

The EMFs to be used in production areas were required to have industry-specific, hygienic process connections for the food and beverage industry. They also needed to be made of FDA-compliant materials, be certified according to EHEDG and 3A and cleanable using CIP and SIP.

The Coriolis mass flowmeters were required both for highly viscous as well as electrically non-conductive liquids and for gases. In the past, hops were processed in solid form as pellets. Today, hops extract in liquid form is used to improve the brewing process and achieve a more stable beer quality. The extract has a density of approx. 1.3 kg/l / 81.1 lb/ft<sup>3</sup> at a viscosity of a few thousand mPa·s. By heating it up to approx. 45° C / 113° F it was able to flow with more ease through tempering to enable processing at low flow velocities.

They were also used to measure gaseous carbon dioxide in CO<sub>2</sub> recovery plants.



CO<sub>2</sub> recovery plant

## 3. KROHNE solution

### 3.1 OPTIFLUX: Electromagnetic flowmeters (EMF) from KROHNE

KROHNE supplied approx. 300 OPTIFLUX 6000 and 4000 electromagnetic flowmeters in a variety of sizes and with various pipe connections for use in the new GROLSCH brewery. Both the compact and remote EMFs feature a PROFIBUS interface to enable communication with the ProLeit process control system.

The majority of the EMFs supplied were hygienic OPTIFLUX 6000 devices. These devices are equipped with a gasket system which prevents the gaskets from expanding into the measuring tube when heated. Some of the remote and compact versions of this EMF are fitted with the IFC 300 converter which comes standard with the application and device diagnostic system to help the user properly install and operate the measuring devices. The sizes ranged from DN 2.5 / 1/10" ... DN 150 / 6" and included industry-specific connections for the food and beverage industry and operating temperatures up to 150° C / 302° F.



OPTIFLUX 6000 F in the freshwater circuit

OPTIFLUX 4000 flange devices were used in the brewhouse. These EMFs can be used up to 150° C / 302° F when mashing. The OPTIFLUX 4000 devices are also used in wastewater treatment. These EMFs are approved for use with water in addition to their approvals for the food industry. The OPTIFLUX 4000 EMFs are also fitted with the IFC 300 signal converter. Constant checks and information regarding the operating status help detect failures early on so that appropriate countermeasures may be implemented.

All OPTIFLUX 6000 and 4000 EMFs can be easily cleaned using SIP and CIP technology. The accuracy of better than 0.2% from the measured value leaves nothing to be desired.



OPTIFLUX 4000 F in a water circuit

### 3.2 OPTIMASS: Coriolis mass flowmeters from KROHNE

KROHNE supplied a variety of sizes of OPTIMASS 7000 and 3000 mass flowmeters with different pipe connections to measure liquid and gaseous products in the new GROLSCH brewery. The compact and remote versions of these Coriolis mass flow measuring devices are equipped with a PROFIBUS PA interface.

The OPTIMASS 7000 devices are used to dose the liquid sugar and hops extract as extremely high precision and measuring accuracy are needed to guarantee the constant quality of the beer. The straight single tube without flow splitter provides decisive advantages when it comes to dosing the highly viscous hops extract. Due to the extremely low pressure loss, it is possible to work with low flow velocities. This is particularly advantageous with shear sensitive and sensitive products. The OPTIMASS 3000 devices are used for measuring the carbon dioxide in the recovery systems and offer an accuracy of up to 0.1%.

The OPTIMASS 7000 and 3000 devices can be easily cleaned using SIP and CIP technology. In addition to measuring mass and volume flow, the OPTIMASS devices can also measure current density and temperature. This makes it possible to calculate derived parameters such as Brix and Plato.



OPTIMASS 7000 F and 3000 F measuring gaseous carbon dioxide

## 4. Customer benefits

The process control system at GROLSCH measures and controls all of the areas and processes in the brewery. This includes the silo system, the brewhouse, fermenting and storage cellars, filtration and wastewater systems as well as decentralised CIP stations. The preparation and supply of media are also included. KROHNE volume and mass flowmeters perform admirably here. All devices are fitted with PROFIBUS PA.



OPTIFLUX 4000 F in the brewhouse

## 5. Products used

### 5.1 Electromagnetic flowmeters from KROHNE

#### OPTIFLUX 6000

- Hygienic and aseptic stainless steel version featuring unique gasket design
- Suitable for all CIP and SIP processes
- All industry-specific pipe connections
- PFA liner reinforced with stainless steel mesh for high dimensional stability and vacuum resistance
- Standard sizes DN 2.5...DN 150, corresponds to 1/10" ...6"
- EHEDG and 3A-approved
- Wet-calibrated on officially certified calibration rigs according to EN 17025



#### OPTIFLUX 4000

- Measuring sensor for the process industry
- Sturdy and reliable, even at high temperatures up to 150° C / 302° F
- Electrical conductivity: water from 20 µS/cm, other liquids from 1 µS/cm
- Simple installation and start-up
- Standard sizes DN 2.5...>DN 1000, corresponds to 1/10" ...>40"
- Wet-calibrated on officially certified calibration rigs according to EN 17025



### 5.2 KROHNE mass flowmeters

#### OPTIMASS 7000

- Only mass flowmeter with a single straight measuring tube made of stainless steel, Hastelloy®, titanium or tantalum
- Minimal pressure loss
- Reliable measurement of mass and volume flow, density, temperature, concentration for liquids, even with solid content
- Any installation position, self-draining, easy to clean even using CIP and SIP, maintenance-free
- High measuring accuracy even with changing process conditions, outstanding zero point stability
- Compact and remote version



#### OPTIMASS 3000

- First choice for applications with low flow volume
- One installation length for all three sizes
- Z-shaped measuring tube made of Hastelloy® or stainless steel
- All common process connections available, including hygienic connections
- Certified secondary containment in Stainless Steel 316L
- Self-draining and easy to clean, even using CIP and SIP, maintenance-free
- Simple installation and start-up



### Contact

Would you like further information about these or other applications?  
Do you require technical advice for your application?  
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Please visit our website for a current list of all KROHNE contacts and addresses.

