

Precision Right Down to the Smallest Detail

Flow rate - a classic process parameter

Even today, tasting is still among the monitoring methods used in the manufacture of foodstuffs - and that not only in small businesses. But it goes without saying that laboratory apparatus is also used to assist the process of finally approving beverages for bottling or packaging. Producers are well advised to ensure that every step in production, right down to this last one, is continuously monitored - from the raw material all the way to the bottled or packaged product ready for dispatch to the shops. Subjects such as quality, optimum use of resources and effective production processes, not to mention error avoidance and the like, are constant issues in a modern production facility today - and that is true not only of the beverage industry.



by Hermann Hartmann

If samples are taken for analysis in the laboratory, it is only ever possible to obtain a momentary snapshot of the process concerned, and always with a time lag; process measurement devices, on the other hand, offer a continuous flow of information in "real time". It is thus possible to react immediately to changing circumstances.

Among the classic process management parameters in beverage manufacturing are the measurement of pressure and temperature. Over the last 40 years, a further important parameter, flow metering, has become indispensable.

The following procedures are used for metering the flow of liquids, each of them having its own advantages and disadvantages:

- Mechanical meters (the rotary piston, oval disc and turbine principles)
- Differential pressure meters (the orifice principle)
- Ultrasound meters (in-line or clamp-on systems)
- Vortex meters ("Von Karman's vortex street")
- Electromagnetic meters (Faraday

principle)

- Mass flow meters (Coriolis principle)

By their very nature, all these procedures involve pure process measurement devices installed directly in or on the product pipe. The great variety of possibilities offered by metering technology has led to a rapid increase in the number of measuring points at a whole variety of different process stages in plants.

In the beverage industry, a particular position among the different types of flow metering technology is occupied by the electromagnetic flow meter (EFM). The measuring principle is outstandingly suitable for use in this industry, and is characterized particularly by the following technical advantages:

- freedom from maintenance and wear, since no internals and no moving parts are required
- a completely hygienic design, unrestrictedly suitable for CIP and SIP
- a simple smooth tube that causes hardly any additional pressure loss
- a high degree of metering dynamism and accuracy
- a high level of reliability
- an outstanding cost-benefit ratio

Our company has been producing these EFM meters for more than 20 years, and has continuously pursued the further development of its IZM series devices to meet the particular requirements of the foodstuffs industry (Figure 1).

Simple flow metering with an integrated control function

One of the performance parameters in the process of manufacturing beverages



Figure 1: Electromagnetic meter of the IZML type

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Figure 2: Officially approved beer delivery equipment gas separator and printer

is the "throughput" of the product, as measured (for instance) in liter, hectoliter or cubic meter per hour. For EFM devices, such a metering task is of course a piece of cake. Among the typical applications are the monitoring of filtration processes or CIP circuits, and of course also use in continuous blending equipment.

Thanks to the various diameters and the broad range of amplification available, flows of between 1l/h and 2,000 m³/h can be measured. Sophisticated functions such as empty pipe detection to prevent inaccurate metering when the measurement pipe is not full or the automatic switchover between measurement ranges afford the user simple and reliable metering.



Figure 3: Mobile metering unit with integrated quantity preselection

It is often the case that within a single process stage (e.g. short-time heating) the flow velocity must be kept constant. As an option, the 4-20 mA output port of the device can control the regulating valve directly or actuate a frequency converter - a practical and also economical solution.

In the production of seasonal "fashion drinks", modern beverage facilities must be able to react flexibly to market requirements. A second meter and a regulating valve allow simple proportional regulation to be realized. If all the devices and equipment are mounted on a mobile frame, the blending point can be set up wherever it is required within the facility.

Official volumetric metering

The electromagnetic metering principle is fundamentally a measurement of flow. By using integration to total the individual flow values over time, measurements of volume can also be obtained. By contrast, the mechanical rotary piston meter (for example) is a primary volumetric metering device ("liters per revolution"), the flow signal having to be generated afterwards. In the early days of this type of technology, such conversions were quite difficult. But thanks to the introduction of high-performance electronics and in particular of the microprocessor, modern devices

can carry out such conversions without any loss of accuracy.

In the beverage industry, official volumetric metering is required in various areas; in the spirituous liquors field, for example, Customs and Excise require volumes to be officially registered, as does the Inland Revenue in the brewing area. For accounting purposes, e.g. when milk is collected by tankers or beer is discharged from beer tankers to the storage tanks of pubs, there is a legal requirement for the entire metering unit to be approved by the weights and measures authorities.

Metering devices with a high level of accuracy have been a trademark of our company for more than 40 years. Right from the initial design phase of each individual unit and as far as the installation of the complete plant, care is taken to comply with the regulations of the German national metrology institute the Physikalisch-Technische Bundesanstalt (PTB) in Brunswick. The company's many years of experience in this sensitive field of application are documented by its possession of official approval certificates for the widest variety of liquids and processes.

As an expert in these important special applications, we not only manufacture the metering devices itself, but also produce a multiplicity of additional equipment such as displays, gas separators or official printers at our own factory (Figure 2).

Volumetric metering with integrated pre-selection of quantities and filling function

The integration of quantity preselection allows a variety of process steps within beverage production to be partially or even fully automated using only a single device. The addition of an easy-to-read operator terminal and an illuminated multi-line display allow (for example) internal circulating procedures to be realised simply. The metering device itself switches the pump on and off via a relay output, so that no valuable manpower is tied up in monitoring the entire process (Figure 3).

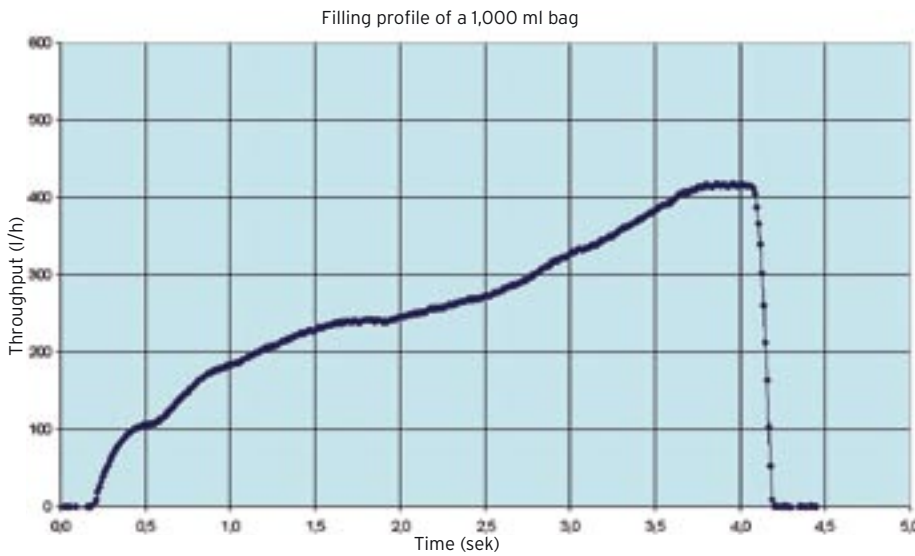


Figure 4: Filling profile

Photos & Graph: GEA Diessel

In addition to all this, the precise filling of cups, bottles, bags etc. requires very sophisticated technology. Although precise flow and volumetric metering is an important basis for this, it is not in itself enough to ensure optimum filling.

Especially when filling times are short, the speed of the signal processing and precise quantity delimitation are particularly important. Valves that close consistently and rapidly, a defined dripping behavior etc. also play a not insubstantial role in reinforcing the benefits of precise metering and switch-off technology. These functions are fulfilled by the IZM filling meter.

Internal monitoring functions and the use of modern mathematical methods to determine the afterrun correction keep operations reliable, even if there

should be slight changes in the hydraulic conditions (Figure 4).

Continuous or batchwise dosing

When only small quantities of other ingredients are to be mixed into the main product, this is called "dosing". In the beverage industry, colorings and flavorings are typical products that require dosing.

Complex in-line blending equipment which in some cases is able to handle more than ten components is to be found in operation in the most modern beverage production facilities throughout the world. The high degree of precision of the individual metering devices provides the basis for achieving the required accuracy of dosing. Compact dosing units make it possible to achieve

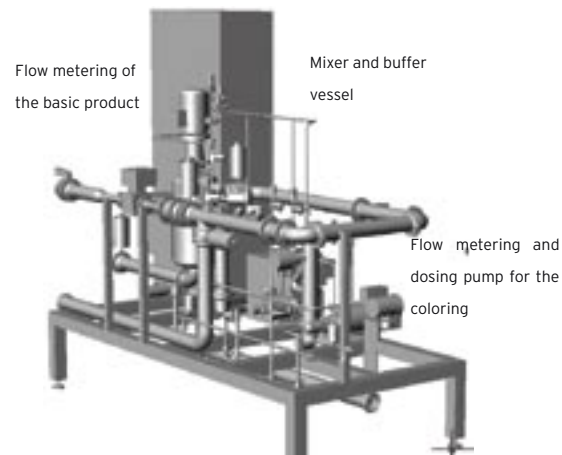


Figure 5: Dosing station for colorings and flavorings directly before the filler

total flexibility in selecting the beverage, practically directly before the filler. In the case of "stop & go" procedures, it is absolutely essential that the metering and actuating equipment should be capable of rapid reaction. Intelligent calculation and regulating processes can enable even extreme formula tolerances to be complied with (Figure 5).

Lemon, lime or cherry flavorings in yellow, green or red - these are the flexible responses to quickly changing consumer behavior. An IZM device can also of course be used to realize classic dosing in the batch procedure, in which the quantity to be added is set at the device itself and the dosing process started by an electrical starting signal.

When the desired recipe quantity has been reached, the IZM stops the dosing precisely to the milliliter.

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Summary

The metering, control and regulation of flows and volumes are among our company's core competences. State-of-the-art-technology coupled with many years of experience in the field of quantity determination are offered by electromagnetic flow meters, whose variety and flexibility makes them suitable to perform a wide variety of applications within the beverage industry. On the basis of this metering technology we supply complete units, pre-assembled and tested, so that installation and commissioning make only minimum demands on the operator. For the customer, this means being able to plan time and costs reliably. Typical units from the production programme are

- Continuous in-line blending systems
- Batch mixing equipment
- Reception and delivery equipment
- Water deaeration
- Carbonation equipment
- Sugar dissolving units
- CIP equipment

Key No. 61870

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Modular Filter Housing

"Modular Baghouse" has all chances to become the new term for innovative technology in air pollution control. An international provider of dust collector systems, replaces the usual sheet metal housings with a thoughtfully designed housing to deliver efficient flow and pre-separation. Target of this development was to design a flow optimised housing for air volumes of up to 120.000 m³/h, offering both investment and operation cost advantages for a wide range of industrial applications. The first installed units already show that this target has been achieved.



Photo: Donaldson

The flow technical prerequisites in the inlet, already leads to an optimum pre-separation.

Heavier dust particles can no longer be carried along, but drop into the collector/hopper before they reach the filter. Further flow conditions enable the dust-laden air to be evenly distributed over the filters. This most efficient mechanical pre-separation increases the filter life and the dust collector installation can take up larger dust quantities.

Two to three times the filter life

The modular baghouse units can be used with any conventional filter media. The best advantages are achieved by using the new Dura-Life™ filter media generation. Bag or pocket filters equipped with Dura-Life, reach a two to three times longer service life compared to conventional media and have a clearly higher air-to-media ratio. The pleasant side-effect is that customers can select a smaller housing size if they use Dura-Life™. Important goals: Energy savings and simplified maintenance. Energy costs caused by dust collectors are usually the largest operating cost factor. By optimizing the flow conditions with the help of a computer aided flow technology clear savings with the Modular Baghouse housing could already be achieved. Also the automatic pulse-cleaning of the filter elements is substantially more efficient. Due to a new valve technology every

dedusting sequence is provided with 50% more air.

A further important aspect of costing is the service. Also here the Modular Baghouse series offers crucial advantages. During an exchange and/or inspection of the bag filters the operator or the service technician has optimal working conditions and benefits from substantially less work than with conventional units. The filters can be accessed from the clean-air side and from the platform they can easily be removed. The handle of the filter cages serves as an aide for quick removal.

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Reading Between the Lines

The SMARTEYE® STEALTH-UV from a Dutch company is a special purpose sensor designed to detect the presence of invisible fluorescent materials contained in inks, paint, grease, glue, optical brightness found in labels, paper, etc. The sensor contains an ultraviolet (UV) solid state light source that is used to excite the luminescence in materials to fluoresce in the visible range. The sensor's detector then responds to the visible fluorescing light. When the received light level as displayed on the contrast indicator reaches a level of "4" or above, the output transistors will switch to the opposite state. Typical Applications: Detection of clear tamper-proof seals; Clear label detection; Detection of invisible registration marks; Product orientation; Verification presence of adhesives. **Key No. 61874**

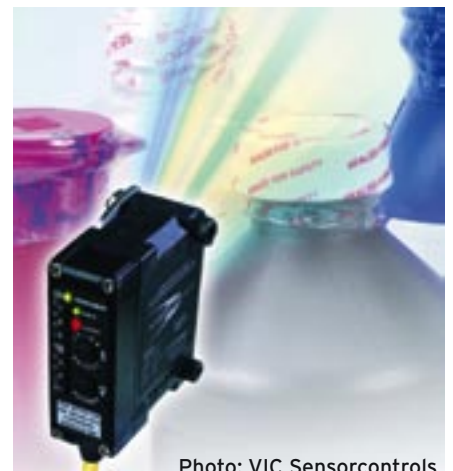


Photo: VIC Sensorcontrols