High Viscosity Food Production

High-precision sensor-controlled system monitoring for high-viscosity food production

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Contribution by:

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Problem description

In the hygienic production of viscous foods, such as fruit pastes, porridges, doughs, condiments or syrups, the precise control of production equipment is a key factor.

The ingredients should be processed with maximum efficiency and resource utilization to consistently offer high quality and safe food, ensuring the greatest possible convenience for customers and consumers. Flowmeters are an important measuring instrument in process control. Due to the special conditions of production in viscous foods conventional measuring devices are often not suitable.

Such conditions are:

- High viscosity of pastes
- Low flow rate due to larger nominal pipe diameters
- Varying viscosity when the process temperature changes

A possible consequence is:

- Inaccurate measured values when mixing the ingredients

This can in turn lead to the following effects:

- Fluctuations in taste, consistency, or other product properties
- Fluctuations in product quality, due to measurement inaccuracy
- Product losses due to measurement inaccuracies

These requirements relate in particular, but not exclusively, to the following process steps:

· Mixing / dosing, with blending system
· Pasteurization (Excluding Grade "A" Pasteurization) / UHT / HTST (The highly viscous consistency of food poses a particular challenge here. The HTST pasteurization process requires a compliant protocol in many countries and therefore requires highly precise and reliable measurement).
· Filling

Examples of common food viscosity [cP]

Product viscosity cP		
Milk	1.0 to 2.0	Low Viscous
Cream 50% fat content	55 to 112	
Edible oil	55 to 75	
Bee honey	2000	High Viscous
Jam	6000 to 8000	
Mayonnaise	1500 to 2500	
Ketchup	1000	
Chocolate	200 to 2000	
Glucose syrup	5000 to 6000	

Problem solution for flow control

Magnetic inductive flow meters, Coriolis mass flow meters or turbine devices are the most used technologies for flow control.

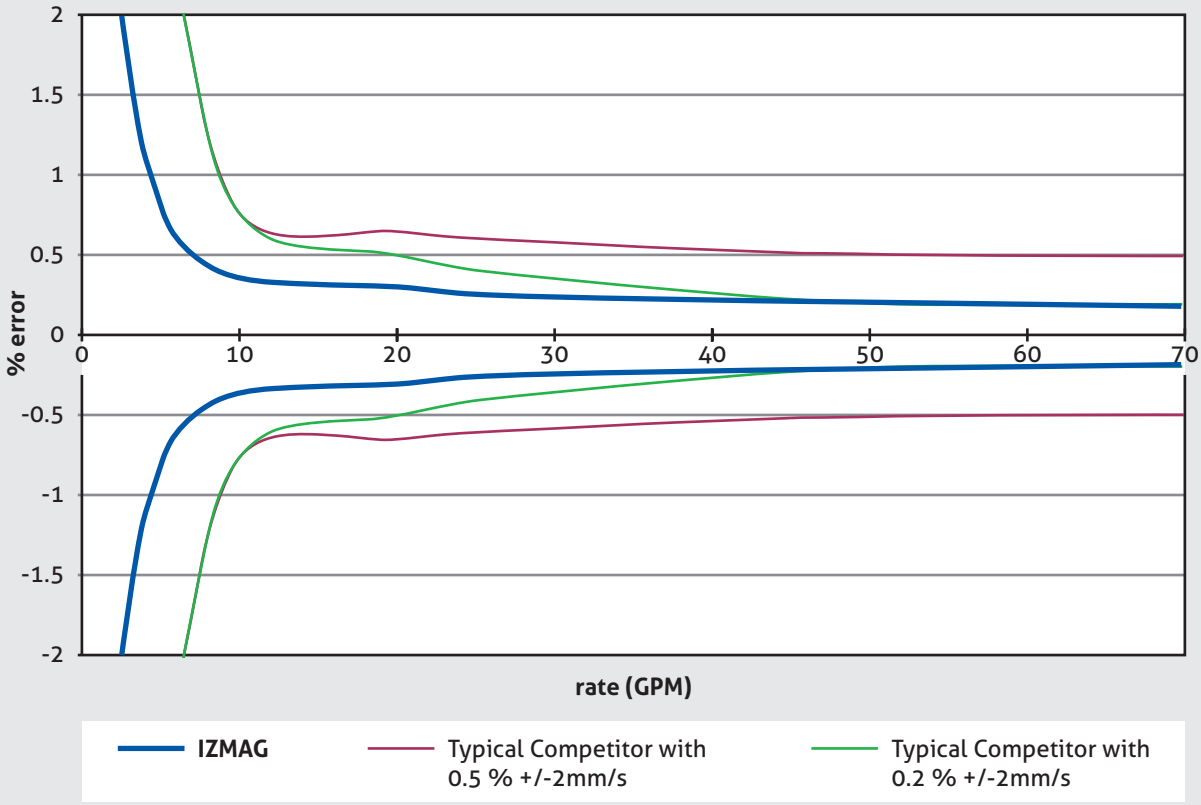
Turbines are suitable for low-viscosity liquids due to their mechanical measuring technology with a rotor integrated in the pipe. Coriolis flow meters are also suitable for highly viscous products, as no mechanical components come into contact with the product and a wide range of nominal pipe sizes are available for the design. However, Coriolis flow meters are the most expensive alternative in most applications, so they are particularly recommended if a density, mass or a Brix measurement is to be carried out at the same time.

Electromagnetic flow meters offer a precise and cost-effective solution for flow monitoring in the production of viscous food ingredients. Under the production conditions mentioned, this technology promises high levels of measuring accuracy, especially at low flow rates.

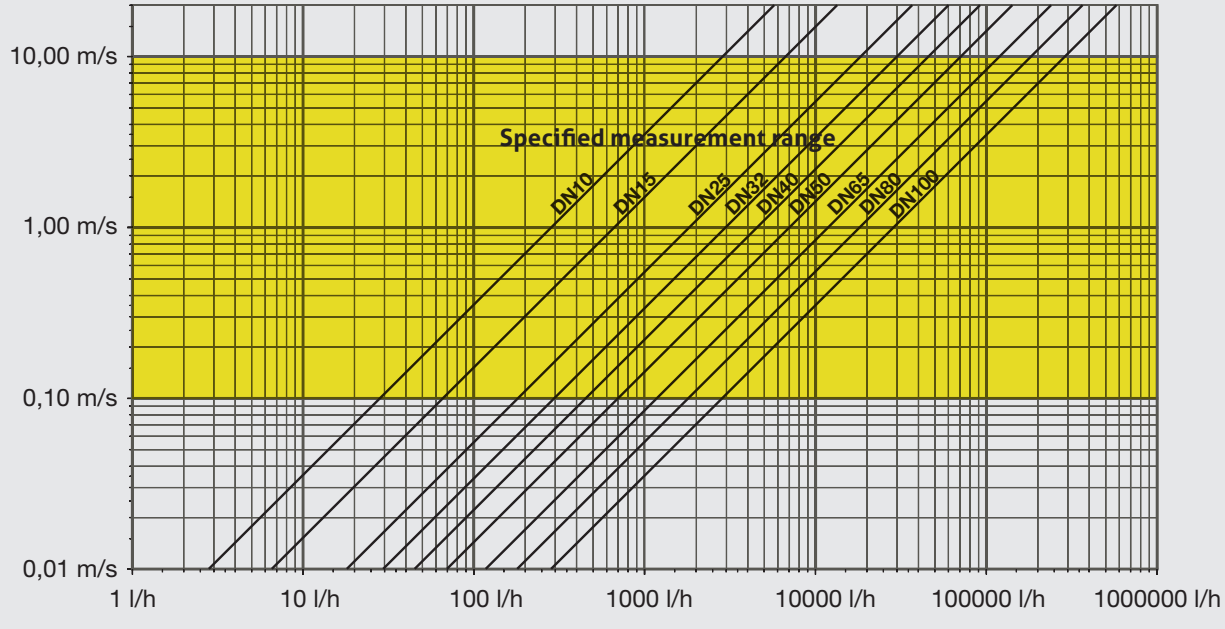
With its measuring accuracy of ±0.2 % ±1 mm/s, the IZMAG is more precise than other commercially available sensors. A seemingly small difference has a major impact, especially at low flow rates, as is common with highly viscous products. The first graph shows the comparison of the IZMAG with a competitor's product with a measuring accuracy of ±0.2 % ±2 mm/s. At a flow rate of 10 GPM, the IZMAG achieves an accuracy of 0.3%, the comparison product only approx. 0.8%, i.e. half a percentage point lower. Even at the minimum flow rate of 8 GPM, the IZMAG still delivers an accuracy of approx. 0.5%, while the reference sensor is about three times worse. This makes the IZMAG predestined for applications such as food blending, even with high viscosity and low flow rates, as it enables the best possible recipe control.

The IZMAG features hygienic, FDA, 3A and EHEDG-compliant materials and construction, robust and compact design, process temperatures of up to 165 °C / 266 °F for the remote version and an operating pressure of 0.1...17 bar / 1.5...246 psi absolute.

Measurement accuracy by flow rate



Flow rate nomogram



For monitoring other process steps such as pasteurization (Excluding Grade "A" Pasteurization), intermediate storage or filling, a slightly lower measuring accuracy is often sufficient. In such applications, the **FMQ Flow Meter** offers the best price-performance ratio, as the acquisition costs are lower.

Electromagnetic:
IZMAG

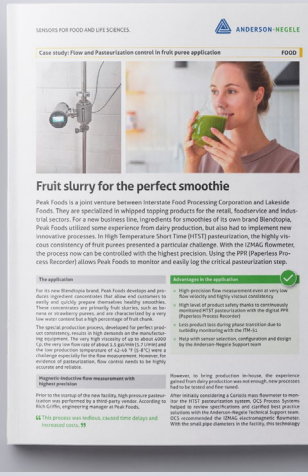
- From the compact, robust, all-arounder to the high-end version
- Measuring range 30 l/h to 280000 l/h (8 gal/hr to 74000 gal/hr)
- Measuring accuracy up to ±0.2 % ±1 mm/s
- Process temperature up to 165 °C / 325 °F, CIP up to 130 °C / 266 °F (30 min.)

Examples for applications with high-viscosity products

Fruit slurry for the perfect Smoothie (PEAK Food / Blendtopia, USA):

Flow control in a fruit puree production

https://www.anderson-negele.com/us/application/fruit-slurry-for-the-perfect-smoothie/

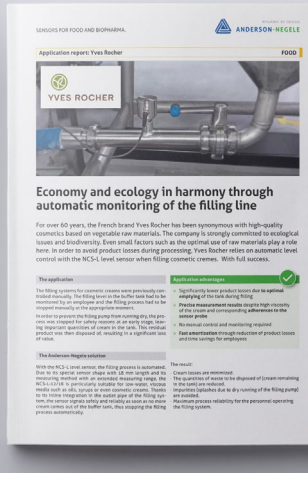


No more production downtimes in rice pudding production due to potentiometric level control (Friesland Campina, Germany)

https://www.anderson-negele.com/us/application/foam-insensivite-level-sensor-nsl-f/

Economy and ecology in harmony in a cosmetic creme filling line (Yves Rocher, France)

https://www.anderson-negele.com/uk/application/economy-ecology-harmony-automatic-monitoring-filling-line/



Sensor based on modular platform
IO-Link integrated as a standard
Remote version available

= Product category online link

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