



APPLICATION NOTE Glass industry

Flow measurement of sulphur dioxide (SO₂) and nitrogen (N₂) in flat glass production

- Effective monitoring of process gases for surface protection of hot glass ribbon
- Use of a robust and long-term stable variable area flowmeter for the supply of a roller annealing lehr
- Reliable flow measurement of SO₂ and nitrogen at low pressures and volume flow rates

1. Background

A glass manufacturer produces float glass for the building and automotive industry at one of its plants in the Czech Republic. Float glass is a flat glass of high quality and robustness, characterised by its smooth, flawless surface. It is produced in a continuous multi-step process, in which molten glass is passed over a liquid tin bath at around +1100°C / +2012°F on which it 'floats'. The result is a glass ribbon that is finally lifted out of the tin bath and transported via the dross box into a roller annealing lehr or cooling channel for further smoothing and cooling. In this way, the flat glass ribbon cools down from around +600°C / +1112°F to +60°C / +140°F in a controlled process. Finally, the float glass is cut to size and packaged.

2. Measurement requirements

With the heated glass lifted out of the tin bath and transported into the dross box and lehr, its surface must be protected so as not to be affected or damaged by the metal rollers. This can be achieved by injecting sulphur dioxide (SO₂) mixed with nitrogen (N₂), which reacts with the sodium (Na⁺) and calcium (Ca⁺) on the glass surface to sodium sulphate, forming a protective layer between the rollers and float glass surface.

Medium	SO ₂	N ₂
Flow rate	180...1800 l/h	1...10 m ³ /h
Density	2.97 kg/Nm ³	1.25 kg/Nm ³
Temperature	+40°C / +104°F	
Pressure	0.6 barg / 8.7 psig	1 barg / 14.5 psig

The operator controls the SO₂/N₂ supply to the annealing lehr via the volume flow. Reliable measurement of the low volume flow of SO₂ is crucial for the glass manufacturer. Too little or too much SO₂ can have a major impact on glass quality and occupational safety. When retrofitting the supply system, only robust instrumentation that measures with long-term stability and can be used for low flow rates of an extremely corrosive and toxic product such as sulphur dioxide, was considered.

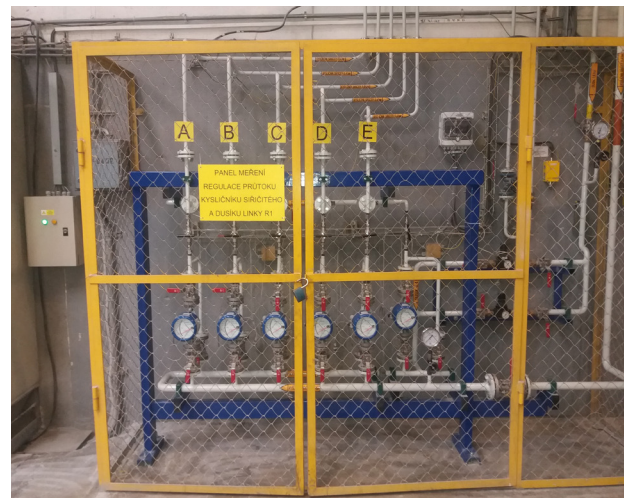
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3. KROHNE solution

The glass manufacturer has been successfully using KROHNE variable area (VA) flowmeters in the supply system for around thirty years and decided to keep it that way. The meter type has proven itself with the existing flow rates and pressure ranges.

The customer has retrofitted the SO₂ supply system with several latest generation H250 M40 variable area flowmeters. The KROHNE VA meters have been installed with flanges (DN15, PN40) into the supply lines for sulphur dioxide and nitrogen.

The KROHNE flowmeter is modularly extendable and not restricted to a simple mechanical indication. In this application it is used with extended electronics featuring a built-in signal converter with 4...20 mA/HART® output.



SO₂ and N₂ supply lines equipped with variable area flowmeters

4. Customer benefits

The robust variable area flowmeter contributes to a reliable flow control of protective gas for safe float glass transportation along the annealing lehr. The direct contact between the produced glass sheets and the metal rollers in the cooling channel can thus be effectively prevented.

In low-pressure gas applications with low flow rates, the variable area flowmeter has a particular advantage, as other measuring principles often reach their limits here or can no longer be used at all. Unlike many other types of flowmeters, the H250 M40 combines very cost-effective and long-term stable flow measurement of small volumes of gas with a high degree of flexibility. The modular design of the VA meter makes it a future-proof investment. Should the glass manufacturer decide at a later stage to further automate the process via a fieldbus protocol, the VA meter's signal converter can be easily upgraded without interrupting the process.



Flow measurement of sulphur dioxide with the H250 M40 flowmeter

The H250 M40 is just one of many KROHNE process instruments that the float glass company has been using for measurement and control applications for many years. KROHNE has an extensive portfolio for the glass manufacturing industry, from flowmeters and level transmitters to pressure and differential pressure transmitters and high temperature assemblies.

5. Product used

H250 M40

- Variable area flowmeter for liquids and gases
- Modular design: from mechanical indicator to 4...20 mA/HART®7, FF, Profibus-PA and totalizer
- Flange: DN15...150 / ½...6"; available with many other connections
- Universal Ex concept: Explosion proof and intrinsically safe



Contact

Would you like further information about these or other applications?
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