



# APPLICATION REPORT Metal & Mining

## Hydrogen flow measurement in tungsten production

- Ensuring consistent hydrogen flow rates for the reduction of hot tungsten oxide to tungsten powder
- Reliable variable area flow measurement at only 40 mbarg / 0.58 psig
- Local and direct reading of hydrogen flow into a reactor furnace without auxiliary power



### 1. Background

New York (USA) based Buffalo Tungsten Inc. is a leading independent manufacturer of tungsten metal powders made from raw materials like tungsten oxide (WO<sub>3</sub>). These powders are sold to powder metallurgy companies and other manufacturers of tungsten finished products.

### 2. Measurement requirements

Tungsten powder production involves an industrial process in which tungsten oxide is reduced in a hydrogen furnace at 800°C / 1472°F. In the last production step the hot tungsten oxide reacts with hydrogen to tungsten and water (WO<sub>3</sub> + 3 H<sub>2</sub> = W + 3 H<sub>2</sub>O).

The reducing atmosphere can only be maintained with constant hydrogen flow rates. Therefore the customer required continuous flow measurement of the hydrogen volume flow to the reactor furnace. The line pressure in this application was as low as 40 mbarg / 0.58 psig.

Application Data	
Medium	Hydrogen (H <sub>2</sub> )
Measuring range	6 ... 60 Nm <sup>3</sup> /h
Pressure	0.04 barg / 0.58 psig
Density	0.0899 kg/Nm <sup>3</sup>
Temperature	20°C / 68°F

### 3. KROHNE solution

The tungsten producer opted for the VA 40 variable area flowmeter since it is particularly suitable for low pressure gas applications. A total of 14 flowmeters have been installed in the hydrogen supply lines of the furnace, using flanged process connections.

Since a local flow indication of hydrogen was sufficient, the devices were provided as purely mechanical flowmeters. The measuring cone of the VA 40 features a viewing glass protected by a metal sleeve that makes it easy to directly read the flow and to observe the medium. It works without need for power supply.



Hydrogen flow measurement with the VA 40 variable area flowmeter



### 4. Customer benefits

Buffalo Tungsten benefits from a very cost-effective device that allows an operator to quickly visually scan and check the float position in each meter. Constant hydrogen flow rates can thus be easily monitored just by walking by the hydrogen feed lines.

Given the extremely low pressure conditions, the VA 40 is the most suitable flowmeter that even outweighs the benefits associated with more advanced and expensive flowmeter types in this application.

Should the customer decide to further automate the hydrogen monitoring, the VA 40 can also be provided with an analogue output (4...20 mA) or MIN/MAX switches to trigger an alarm, if a certain threshold is exceeded or if the flow rate falls below a defined limit.

### 5. Product used

#### VA 40

- Variable area flowmeter for applications with liquids and gases
- Simple, low-cost measuring principle without auxiliary power
- With glass tube, optional MIN/MAX switches and 4...20 mA
- Low pressure loss for gas applications
- Flange: DN15...50 / ½...2"; also available with threads (NPT, G) and other connections
- -20...+100°C / -4...+212°F; max. 10 barg / 145 psig
- Various hazardous area approvals



## ETA Process Instrumentation

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