Gas Mass Flow Measurement with Integrated Flow Conditioners for Shorter Upstream Sections

- Easy installation
- Negligible pressure loss
- Accurate measurement even with shorter upstream sections
- Saves up to 2/3 of the required upstream sections
- Accurate measurement, also for pipes of big size
1 The Problem

The efforts for process optimization in conjunction with continuously tightening environmental obligations increasingly call for high-accuracy flow measurement in many industries. On the other hand, there is a distinct tendency towards a more compact industrial plant equipment. The demand for a compact design results from the necessity to ensure a consequent and efficient use of the available space and from the commercial constraints of producing low-cost plants.

If precise measurement of all gas flows in a plant is required, this means that the available upstream sections in the piping must become shorter. The accuracy of the values measured on a measuring point, however, always depends on a sufficiently long upstream section.

In plants with big pipe sizes the pipe dimensions consequently induce the problem of insufficient upstream sections.

If, for example, a 900 mm (35,4") pipe would require an upstream section of 35 times the diameter and a downstream section of 3 times the diameter, this would result in a total path of 34.2 m (112.2 ft). This is not feasible in the majority of cases.

2 The Solution

In order to obtain an overall path of only 13 times the pipe diameter, a flow conditioner is placed in the flow upstream the thermal gas mass flow meter at a specific distance.

The flow conditioner allows for an excellent measuring accuracy, even with considerably shortened upstream sections.

The measuring path will then consist of the following sections in the below-listed order:

- Straight upstream section of 10 times the pipe diameter
- Integrated flow conditioner
- Straight pipe section of 3 times the pipe diameter
- Sensyflow thermal gas mass flowmeter
- Straight downstream section of 3 to 5 times the pipe diameter

Fig. 2-1: Measuring setup with flow conditioner and gas mass flowmeter
With this measuring setup, all flow disturbances that may occur in the upstream section are negligible and the Sensyflow measuring system can be used even in the most challenging measuring paths.

The flow conditioners have been tested in various applications throughout the world and have proven their usefulness even under difficult conditions.

Fig. 2-2: Flow conditioner in sandwich construction (left) and in massive construction up to DN 200 (8") (right)

Examples of already realized applications:

- Natural gas measurement for burner control with DN 50 (2") control valve connected directly upstream
- Test stand for big engines with DN 800 (32") air intake duct
- Air flow measurement using a 900 mm (35,4") rectifier

The flow conditioner is a both simple and reliable tool which allows you to cope with difficult measuring situations and has proven its success for all nominal diameters.

### 3 Customer Benefit

Considerable savings of raw materials (consumable gas, compressed air, natural gas, etc.) can be achieved by reliably determining the necessary gas quantities. Moreover, an efficient product optimization often requires exact control of the supplied substances.

Reliable gas mass flow measurement also reduces emissions.

The potential savings resulting from unneeded upstream sections amount to up to 80%.
4 Features of the Components Utilized

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