

PROCESS INSTRUMENTATION

A better way to measure bitumen

SITRANS FC430 Coriolis flow meter

www.usa.siemens.com/coriolis

Bitumen is the essential glue that transforms aggregates into asphalt. But it must be delivered in accurate doses, which may not be possible if you are using traditional mechanical flow meters. Principally, this is because they can only measure volumetric flow and they can also be prone to inaccuracies and drift over time.

A positive alternative is a SITRANS FC430 Coriolis flow meter. This Coriolis flow system offers a superior solution involving a compact, reliable and accurate mass flow sensor that's easy to install and simple to operate.

This isn't your grandparents' asphalt

Covering 95% of our roads, as well as lining the surfaces of playgrounds, pedestrian walkways, parking lots, airport runways and much, much more – asphalt truly is indispensable. Globally, about 120 million tons are produced every year.

Asphalt plants are generally found inside quarries, where the bulk of the needed aggregate content is obtained. There are also "satellite" plants in urban areas, or where the demand is great, such as on site at major road or airport projects.

Asphalt today is dramatically superior to previous generations of the substance. It is safer, requires less maintenance and is more energy-efficient and environmentally friendly, as more recycled

asphalt and other materials are increasingly being used.

By weight, 95% of asphalt consists of stone, sand and filler – aggregates that give asphalt its strength. The precise composition of the individual elements depends on the end use. The remaining 5% comprises an agent that binds all of these materials together. That agent is usually bitumen derived from crude oil.

Asphalt is produced by blending the aggregates and then heating them to a temperature suitable for coating with bitumen as binding agent. With the drive toward reducing the amount of energy used in the process, there is a major shift toward more widespread adoption of process control and instrumentation. In particular, highly-auto-



The SITRANS FC430 Coriolis digital mass flowmeter provides high accuracy and is extremely compact.

ated batch and drum-drier plants are becoming more common because they can deliver the consistent quality mixes needed to meet even the most technically complex end user requirements.

Bitumen must address various factors

A key challenge in this process is ensuring proper preparation of the bitumen – especially measuring an accurate dose of it – so everything is just right in binding the mixture of aggregate and recycled asphalt (RAP).

Bitumen is transported from a supplying refinery to the asphalt plant, where the substance is moved into tanks that are continuously kept at 302 to 356°F. Bitumen must be stored at a minimum of 302°F so that it remains in a liquid state – below this temperature it starts to solidify.

Key strengths of the SITRANS FC430

- Ratios can be based on weight, not compensated volume
- Robust sensor is designed specifically for hot environments, though the device is also suitable for medium temperatures
- Readings are independent of temperature, pressure and density
- Sensor compactness physically matches mechanical meters
- Sophisticated construction enables high noise immunity
- Update rates are fast when flows change

Bitumen also has different penetration grades, which need to be stored separately so they can be used individually or blended accurately when added to the asphalt mix.

The required asphalt ratio mix is defined by weight, so that the specific gravity (SG) of the bitumen must be a compensatory factor. However, the specific gravity of bitumen varies according to both penetration grade and temperature. As a result, to correctly add the bitumen to a mix, operators must know both the grade of the bitumen as well as its temperature at the moment of mixing.

The grade can be easily established, unless a blend is being used. However, temperature compensation is extremely difficult to address. Currently, manual look-up tables are most commonly used to determine temperature compensation. Typically, this is carried out at the start of a batch or even the start of a shift. One fact that must be constantly revised is the temperature, as the temperature is constantly changing. Temperature is just one of a number of critical factors that can have a dramatic impact on the specific gravity and adversely affect the accuracy of flow readings.

Mechanical flowmeters not up to the task

Traditional flow measurement of bitumen is based on a volumetric principle. Mechanical flowmeters are typically used, however these have several disadvantages when deployed in a state-of-the-art asphalt plant. Specifically, these meters:

- are prone to inaccuracy;
- tend to drift over time;
- are difficult to integrate into a modern control system; and most importantly,
- only measure volumetric flow.

A superior solution from Siemens

The solution from Siemens is to replace mechanical volumetric meters with modern mass flow meters. The Siemens SITRANS FC430 Coriolis digital mass flowmeter not only provides the high accuracy (0.1% of rate accuracy) you would expect from Siemens, but it is also extremely compact. This means you can retrofit it into existing applications. Additionally, the sensors construction filters out plant vibration, which can cause measurement variabilities.

In addition to improved accuracy and long-term repeatability, operators also benefit as the SITRANS FC430 eliminates the need to compensate for other process variables. No other flowmeter technology can measure mass flow, volumetric flow, density, pressure and temperature – all one self-contained device.

With the SITRANS FC430, operators can accurately prepare the dose based on an actual measured weight rather than an indirectly compensated volume. For example, for 2205 pounds of aggregate, the operator can simply call for 110 pounds of bitumen to make a typical mix. All other bitumen variables then become irrelevant. The resulting specific gravity is automatically taken into account even when blending different bitumen grades.

Compact, simple to install and easy to operate and maintain

Frequently, a SITRANS FC430 can replace an existing flow meter with minimal pipeline modifications. While there are criteria related to pump and valving proximity that must be taken into account, though these are not significant issues thanks to the compactness of the flow meter.

The natural properties of bitumen mean that pipe heating and insulation need to be installed over the flow meter so that the bitumen can still freely flow at the required temperature. Remote electronics mounted away from the primary sensor location mean that system commissioning and maintenance are easily handled from a safe area.

Unique support tools provide direct access to all operational and functional data, certificates and audit trails. The SITRANS FC430 is among the first Coriolis flow meters to offer hazardous zone and SIL certification options, ensuring the highest standards of safety and reliability.

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