Supplementary instructions

NORM compensation

For self-radiating medium

FIBERTRAC

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Contents

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1 Product description

NORM compensation is one way of using a FIBERTRAC 31 to measure in media that are themselves radioactive.

In addition, two redundantly measuring sensors can be preset to a uniform sensitivity.

1.2 NORM compensation

The NORM compensation is a possibility to measure also in media that are themselves radioactive.

NORM stands for "Naturally Occurring Radioactive Material" and means that the sensitivity of a sensor has already been calibrated to a fixed value in the factory.

Sensors with such compensation can be recognized by the label on the large housing cover.

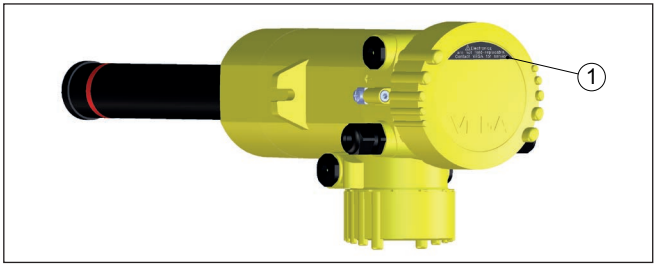

Fig. 1: Information label on the housing cover - NORM compensation - in radioactive self-radiating medium

1 Information label

Functional principle

In some applications it is required or desired to adjust the sensitivity of the sensor to reference conditions.

Sensitivity is the average number of measuring pulses generated per second in a known radiation field.

The sensitivity of scintillation detectors is always constant, but generally not uniform.

Two factors influence the sensitivity:

- Scintillation material
- Photomultiplier

Scintillation material

The light flashes generated in the scintillator when radioactive radiation strikes are reflected in the scintillator until they hit the photomultiplier. The photomultiplier converts the incoming light into an electrical signal.

The optical properties and the quality of the plastic fibers influence the ability of the material to transmit light. Variations in the fiber manufacturing process lead to differences in transmission efficiency from device to device.

Photomultiplier
Photomultiplier tubes vary in their output gain. Each device is factory calibrated to achieve optimum performance. This adjustment process results in a stable performance, but with different sensitivity depending on the system.

For most applications a uniform sensitivity of the sensors is insignificant. However, the overall gain of the FIBERTRAC can be calibrated for specific applications to achieve a uniform sensitivity. This calibration requires additional production steps at the factory.

1.3 Application area

There are two applications where the calibration of the sensitivity is crucial for the measurement result.

1.3.1 Radioactive self-radiating medium (NORM)

Some media may contain radioactive isotopes. Such substances are frequently found in ore and raw material extraction in particular.

In crude oil refineries, for example, the element radon occurs, which is frequently and in varying concentrations contained in hydrocarbons.

These fluctuations in the radon concentration lead to considerable measurement errors. As soon as the radon concentration increases, the device detects more radiation and thus a supposedly lower level.

The measures to compensate for radon concentration fluctuations include the installation of a second identical detector to the primary measuring detector at a 90° angle to the effective beam of the source container.

This also means that both sensors must have NORM compensation.

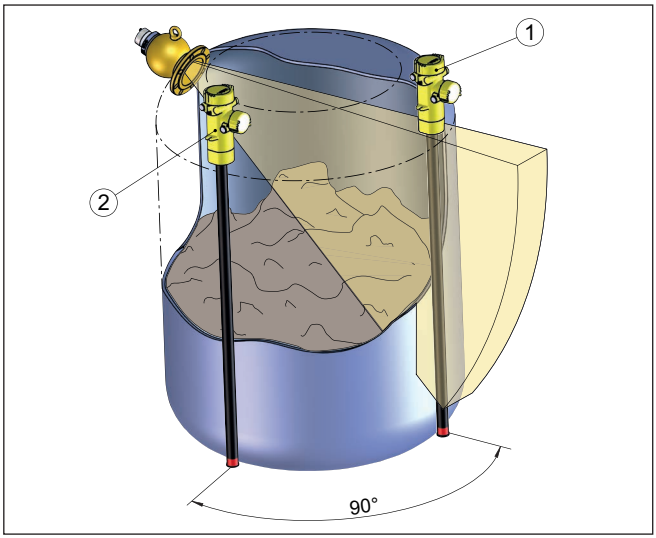

Fig. 2: NORM compensation - in radioactive self-radiating medium

1 Level sensor FIBERTRAC
2 Compensation detector FIBERTRAC for measurement of product radiation

The second NORM detector (2) must be installed at the same height as the primary detector (1) and at the same distance from the vessel. The second NORM detector (2) emits its radiation pulses to the primary device (1), which subtracts them from its own measuring pulses. This effectively compensates the radon pulses during the measurement. In order for the primary detector to calculate the NORM pulses accurately, the two detectors must have identical sensitivities.

The setting of devices with NORM compensation must be carried out at the factory.

1.3.2 Redundant measurements

Some applications involve two identical devices using the same radiation source for safety reasons.

This is an effective way to realize two redundant measurements with only one radiation source.

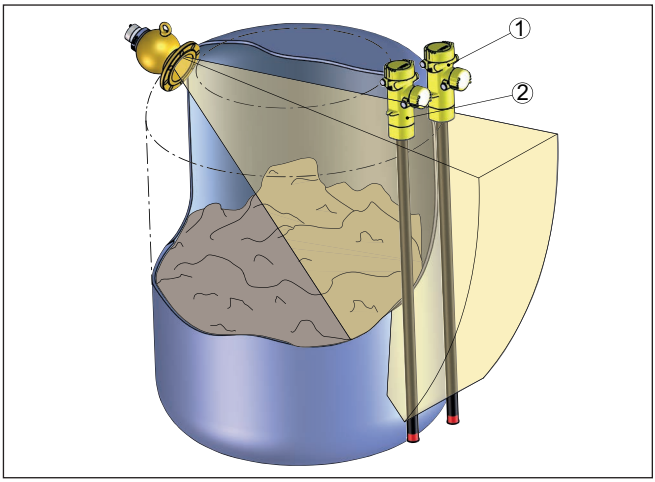

Fig. 3: Redundant measurement

1 Level sensor FIBERTRAC
2 Level sensor FIBERTRAC as redundant measurement

Since the sensitivities of the devices differ, the standard calibration process would result in different linearization curves.

A table can be used to compensate for these differences mathematically. This can be created in two ways:

- If the two devices have already been ordered with factory set sensitivity (NORM compensation), the linearization table of the primary device can be copied to the redundant device without subsequent adjustment. Real value correction is not necessary
- Without the NORM compensation for self-radiating medium, the linearization table of the primary device must be copied to the redundant device. In addition, however, a manual real value correction is required to adapt the redundant detector to the sensitivity of the primary device

1.3.3 Prerequisites

The sensitivity adjustment is only possible for detectors with a length of more than 1,524 mm (60 in) möglich.

Due to the special factory setting, it is not possible to exchange or replace the electronics module in devices with NORM compensation.

In the event of an electronic defect, the affected device must therefore be sent to the factory for an electronics exchange.

Contact our sales staff for more information.

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