Safdy Systems

Computerised Telemetry Technologies (Pty) Ltd

AIR VELOCITY DETECTOR

MODEL SAF11

The Safdy range of Air Velocity detectors are used in the mining environment to continuously monitor the "airflow rate" of the mine ventilation. The Safdy Velocity Detector connects to a Telemetry System and displays the information on software Scada package.

DESCRIPTION

- Remote sensing head for continuously monitoring airflow.
- Designed to be interfaced to a remote Telemetry System.
- The output of the Airflow sensor can be displayed as trend graphs on a Scada software program.
- Originally designed for the South African mining industry, specifically to monitor underground in the gold, coal or diamond mine, but can also be used for Industrial applications.
- Airflow speed maximum range of 40m/s or 144 km/hour.
- Linear output proportional to airspeed.
- Highly accurate, dependant on the width of the "accentuater" bar.
- Calibration is a function of the width of the bar.
- Rapid response of change of airflow.
- Excellent repeatability inherent to the vortex principles.
- Very low lifecycle costs due to no moving parts.
- Insensitive to small particles, dust or water droplets in the air stream.
- Internal DIL switch for different ranges of airspeed.
- Output is a standard 4mA to 20mA.
- Or can be used on the Anglo System to give a 0mA to 1mA output.

TEST CERTIFICATES AND APPROVALS

- Approved as intrinsically safe for use in coalmines.
- SABS approved for explosion prove.
- CSIR report on suitability.

CONSTRUCTION

- Solid-state design airflow sensor.
- Measures airflow using the VORTEX method.
- Vortex method is a proven way to measure the airflow very accurately.
- Vortex method is independent of small particles present in the air stream – like water triplets.
- The airflow sensor is housed in a stainless steel box
- The lifespan of the airflow detector can be in excess of ten years.

METHOD OF OPERATION

The solid-state airflow sensor was developed for monitoring airflow to ensure that the mine ventilation system is in order.

In underground mining activity the air is mixed with all sorts of contamination – to an extent that it is becoming toxic for human life. This air has to be mixed with enough fresh air in order to keep contamination to an acceptable level. Air circulation in the underground mines is achieved by using various extractor and / or intake fans.

When an extractor and / or intake fan fails, the airflow will decrease, and the airflow sensor will give a corresponding smaller signal output – so that the ventilation officer can be alerted.

The vortex method is the proven way to measure the airflow very accurate and independent on small particles.

TECHNICAL DATA

Supply voltage	7 to 24V DC
Power consumption	5mA + loop current (4-20mA)
Range normal	0,4m/s to 15m/s DIL switch selectable
Other ranges	Any range up to 40m/s
Output	4mA to 20mA (standard) 0mA to 1mA (alternate)
Housing	Stainless steel powder coated orange
Explosion protection	SABS M/03 – 166X
	Ex ia Group I T4
Approval Rating	Supply Input 24V and 2Amp
Dimension	250 x 140 x 75mm
Weight	1,6kg

VORTEX SHEDDING METERS

PRINCIPLE OF OPERATION

The operating principle of the vortex meter is based upon a natural phenomenon known as vortex shedding. When a fluid passes over an obstacle, boundary layers of slow moving fluid are formed along the outer surface. If the obstacle is not streamlined (i.e. if it is a bluff body) the flow cannot follow the contours of the obstacle on the downstream side and the separate layers become detached and roll into eddies or vortices in the low-pressure area behind the body (see drawing below). An example of vortex shedding is the sound from telegraph wires in a breeze where the wire acts as the obstacle.

Over the given range of Reynolds number $Re = \frac{D.V.\rho}{\mu}$

the frequency at which these vortices are shed is directly proportional to the flow velocity, and inversely proportional to the diameter of the obstruction.

The Strouhal number $S = \frac{f.D}{V}$

is a constant for the given obstruction over the normal operating range.

As a vortex is shed from one side of the bluff body the fluid velocity on that side increases and the pressure decreases. On the opposite side the velocity decreases and the pressure increases, causing a pressure differential across the bluff body. The entire effect is then reversed as the next vortex is shed from the opposite side. Consequently the velocity and the pressure distribution adjacent to the bluff body changes at the same frequency as the vortex shedding frequency.