New measurement devices for ventilation methane content monitoring

The Strata Mechanics Research Institute of the Polish Academy of Sciences
Mine Ventilation Laboratory

Janusz Kruczkowski
Piotr Ostrogórski
Measuring methane flow rate

• Measuring methane flow rate is one of the fundamental problems to be solved in measuring air flow in underground mine headings.

• Measuring methane concentration in the other point than air velocity
• Hard to measure complicated cross-sections' area
• Lack of rules how to subtract surface area of the stationary devices such as belt conveyor
• Many mines still using old mechanical measuring instruments despite of its have identified difficulties, e.g. 1 minute measuring time.
• The measurements are not made in the same time. There is time span between measurements.
Our solution

Main technical parameters.

**Velocity sensor:**
Flow rate measuring range: ± (0.16 ÷ 15.0 m/s)
Flow rate measuring error: ± (0.5% of reading + 0.02 m/s)

**Methane concentration sensor:**
Methane concentration measuring sub-ranges:
0 ÷100% LEL; 5 ÷100% V/V
Methane concentrations measuring error: 0.1%
for the 0 ÷2% V/V range
$T_{90}$ response time: < 3 s

Certified as intrinsically safe, ATEX directive:
I M1 Ex ia I, II 2 G Ex ia IIB T4, II 2 D Ex iaD 21 IP65 T110

SOM 2303 hand-held methanoanemometer
Stationary Vane Anemometer MPP

MPP LCD (option)
dedicated display for the MPP
Stationary Vane Anemometer MPP

Possible measurement ranges:
- ±(0,20 ÷ 5,00 m/s)
- ±(0,20 ÷ 10,00 m/s)
- ±(0,20 ÷ 15,00 m/s)
- ±(0,20 ÷ 20,00 m/s)

Uncertainty: ± (0,5% rdg + 0,05m/s)

Sampling frequency: 1 Hz

Material: stainless steel 316L

Communication interfaces:
- frequency: 8 – 10 – 12 kHz
- voltage: 0,4 – 1,2 – 2,0 V
- current: 4 – 12 – 20 mA (option)
- digital: RS 485

Certified as intrinsically safe
ATEX directive:
I M1 Ex ia I, II 1GD Ex ia IIB T6
New stationary methanoanemometer MPM

The main measuring unit and an additional methane concentration sensor module

Additional methane sensor

MPM stationary methanoanemometer

Methane sensor
An example of using devices in the longwall’s duct

Measurement system to analyse the distributions of air velocity
and methane concentration fields
An example of using devices in tailgate

Measurement system to analyse the distributions of air velocity and methane concentration fields
Measurement by stationary device - MPM

Measurement by traverse method

Long time

Short time
Comparision between stationary methanometer and methanoanemometer MPM

- MPM is higher resolution
- MPM can point out trends
Family of measurement instruments for mines

- Measuring methane concentration in the same point
- Very high measurement accuracy
- Any duration of the measurement
- Air velocity and methane concentration easily can be measured simultaneously
- Reliable construction

Our website: www.imgpan.pl