

# FOX APPLICATION GUIDE

## Thermal Flow Meters for Coal Applications

### TYPICAL APPLICATIONS INCLUDE:

- Coal Mines
- Coal Bed Methane Recovery
- Degasification Systems
- Drainage Systems
- Ventilation Air

## Captured Safely, Methane Recovered from Coal can be Used as a Fuel Source

### Compliance with regulations in coal mining operations

Coal mines must monitor and report greenhouse gas (GHG) emissions in order to comply with the EPA's Title 40 CFR Part 98 Subpart FF. Fox Thermal gas flow meters can measure the flow of GHG emissions for reporting purposes.

Methane is most commonly ventilated, flared or recovered in coal mining and coal mine methane (CMM) is a potent greenhouse gas that, if vented to the atmosphere, contributes to climate change. If not vented, however, CMM can create an explosive hazard inside the mine. Nevertheless, if CMM is recovered safely and used for energy, it is a valuable, clean-burning fuel source.

### Sources of CMM

There are three major sources of CMM:

- Degasification Systems (drainage) both Pre-mine and Gob
- Ventilation Air (VAM)
- Abandoned or closed mines

### The Importance of Flow Meter Calibration and Accuracy

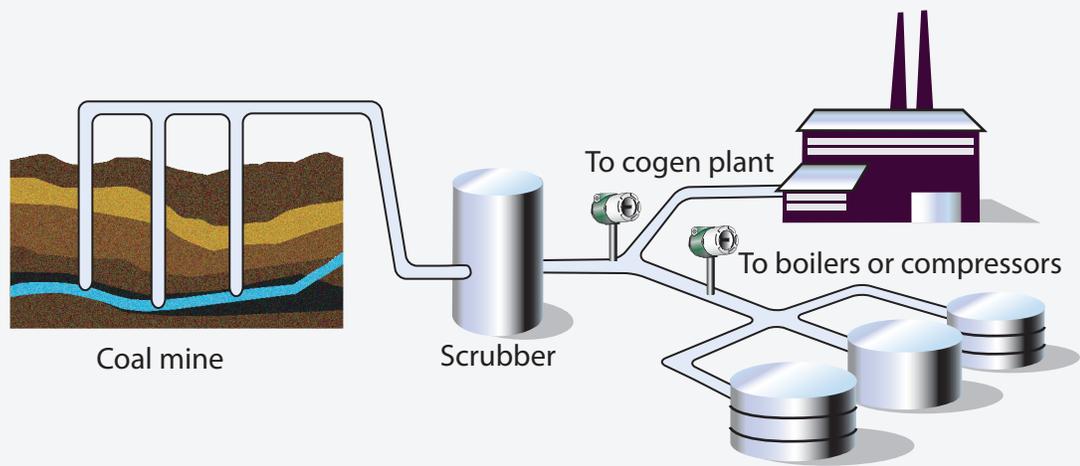
The percentage of methane in the extracted gas can be as little as 1% (in VAM processes) to more than 20% in drainage systems. Other components in the gas may include air, carbon dioxide (CO<sub>2</sub>) and/or nitrogen (N<sub>2</sub>) in various combinations. Because fluid composition anomalies can affect the performance of the flow meter, it is important that the measuring device be calibrated with an actual gas mixture.

The Fox Thermal calibration lab employs a wide range of gases, gas mixtures, pressures, temperatures, and line sizes to simulate actual fluid and process conditions. This real-world approach allows Fox Thermal gas mass flow meters to help mining operations comply with regulations, improve the operation of co-gen engines or methane oxidizers and facilitate the data management processes needed to monetize greenhouse gas emission reduction.

When the gas composition varies, Fox Thermal has developed Gas-SelectX®, a field-programmable gas selection feature, so that the gas composition settings can be changed regularly.



Stricter emissions regulations will affect the coal industry going forward.



Methane recovery from coal mines can power equipment on-site.

### Coal Bed Methane Recovery

Natural gas, or methane, can be extracted from deep underground in coal beds. Coal Bed Methane (CBM) as a clean-burning fuel source is expected to increase as more regulations force energy companies to move away from processes that produce high levels of CO<sub>2</sub> emissions, like coal-burning plants.

Coal is a very porous material and coal beds generally have ground water flowing through the seams. This ground water exerts pressure on the coal which holds methane gas on the surface of and in the pores of the coal. In order to release the methane, the water must be pumped 300 - 3,000 feet up to the surface where it can be separated from the water and used as fuel. CBM has very low solubility in water and readily separates as pressure decreases, allowing it to be piped out of the well separately from the water.

CBM processes are achieved by drilling a network of spaced wellheads that tap into the coal bed through a process called "fracking". Fracking produces a fracture in the coal bed that allows the water to be pumped up to the surface. The methane gas is released and captured at the wellhead by compressors. The methane flows out through a pipeline and the water is either reused or disposed of. A typical wellhead

can pump up to 17,000 gallons of water each day and current estimates for the annual amount of recoverable CBM in the U.S. is about 550 billion cubic meters.

As technological advances are made, as greenhouse gas reduction incentives increase, and as environmental pressure intensifies, the benefits of capturing and using CMM or CBM as fuel gases become more significant. Fox Thermal flow meters' accuracy specification exceeds the requirements defined by the EPA rule, and helps provide a reliable, cost-effective solution of GHG emissions monitoring challenges.



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