Emission of methane from Moonidih underground coal mine in India

B K Prusty*
Assistant Professor
Indian Institute of Technology
Kharagpur – 721 302, West Bengal, India
Email: bkprusty@gmail.com

V A Mendhe
Scientist
Central Institute of Mining and Fuel Research
Barwa Road, Dhanbad-826 015, India
Email: avmendhe@yahoo.com

ABSTRACT

Emission of greenhouse gases (GHG) is contributing towards global warming and climate change. Emission of methane from underground coal mines is an important part of the anthropogenic GHG emissions from the mining industry. The methane emitted from the coal mine is usually in a very low concentration mixed with the ventilation air and is known as the ventilation air methane (VAM). While the VAM from coal mines is a harmful greenhouse gas, it also represents a "wasted resource" of immense value. During the last few years, VAM combustion/utilization technologies have been developed and tried in coal mining operations in Australia, US and China, although it has not been tried in India so far. Combustion of VAM for generation of useful energy is technically feasible only when the VAM volume is substantial, methane concentration is relatively constant and it is above a threshold value. A preliminary study was undertaken to assess the emission of methane from the Moonidih mine which is one of the gassiest mines in India. The study also investigated the potential of utilization of this methane. This paper presents the preliminary results of the case study to quantify and characterize the methane emission from the Moonidih mine in order to evaluate its utilization potential.

Keywords: Methane, coal mine, VAM, greenhouse gases, climate change

INTRODUCTION

Coal mining industry in India is growing at a rapid pace to keep up with the energy needs of the country. The annual coal production for the year 2008-09 was 492 million ton (MT). The opencast mines account for approximately 85% share of the total coal production. Although the share of underground mining has gradually decreased over the last three decades, it has now stabilized at 15%. It is expected to increase because of enhanced focus of Coal India Limited, the major coal producer in the country, to produce more coal. Increased production of coal from underground mines, however, will require efficient management of methane emission from deeper coals while optimizing the cost of circulating increased airflow in order to fulfill the ventilation and safety requirements.

Methane emission from underground coal mines

Coal serves as a storehouse of natural gas consisting primarily of methane, CO_2 and other hydrocarbons. Methane constitutes more than 80% of the total gas present in coal. The methane rich gas is released into the mine workings of underground mines causing increased risk of explosions. To prevent such explosions, sufficient volume of air is circulated in the mine to ensure dilution of methane and its discharge to atmosphere. Atmospheric methane, being a stronger greenhouse gas, abets the global warming significantly. Methane emission into atmosphere from Indian coal mining and handling activities for the year 2000 was estimated to be 0.72 MT using CIMFR methodology (CMRI, 2003). If IPCC emission factors are used, the estimate is between 0.54 to 1.69 MT (Singh *et al*, 2009). However, at this time, there is no data available for estimates of methane emission from specific underground coal mines in India.

As per the Directorate General of Mines Safety (DGMS) in India classification, underground coal mines in India are categorized into three different degrees of gassiness, namely degree I, II and III, depending on the volume of gas emitted per ton of coal mined. Mines in Degree III typically emit methane at a rate greater than 10 cubic meters per ton of coal mined. At this time, there are 16 degree III mines in the country, many of which are located in the gas-rich Jharia and