FEASİBİLİTY STUDY OF METHANE DRAİNAGE İN TABAS COAL MİNE FOR POWER GENERATİON

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Abstract: Methane is one of the gases emitted from coal seams and released into atmosphere through ventilation operation. The emission of this gas causes environmental problems and loss of energy resources. According to the previous studies, several billion cubic meters of methane are annually emitted from coal mines in the world. Currently, methane drainage is in operation in many coal mines around the world; and the drained methane is collected using special methods, and transported to the surface by pipelines. The gas is then used for power generation, sales, and industrial use. Tabas Mine is the only mechanized coal mine in Iran, extracted by longwall mining. The gas content of coal seams in this mine varies from 10 tonnes per cubic meters (in depth of 100 m) to 20 tonnes per cubic meters in depth of 600 m, which has caused problems in the excavation process as the depth increases, making the methane drainage operation necessary in this mine. The aim of this paper is the feasibility study of methane drainage in Tabas Coal Mine for power generation. Considering investment and operating costs, as well as the gas sales income, results showed that the methane drainage for power generation is feasible. Finally, methane drainage operation in Tabas Coal Mine is energy efficient, due to the production of methane as a fuel, which reduces greenhouse gas emission and outburst risks in this mine.

Keywords: Acid mine drainage (AMD); Static tests; SEM; EPMA; Multivariate statistical analysis.

1- INTRODUCTION

Coal seams may be containing 60% to more than 95% methane, depending on the presence of other gasses. Coal bed methane (CBM) also known as coal seam gas (CSG) is a natural gas that is stored (adsorbed) in coal seams. In coal mine methane (CMM) method, the gas inside working coal mines is captured by underground, or surface and underground methane drainage techniques, in order to ensure the safety of the mine. In enhanced coal bed methane (ECBM) method, CO_2 gas is injected to the coal bed, the methane gas is released by some chemical reactions, and then it is extracted by drainage operation.

Coal mine methane can be a serious threat to the mine safety and productivity, due to its explosion risk. Methane drainage from coal seams leads to the improved safety of coal mine extraction process, reduced greenhouse gas emissions, and improved mine economics by allowing coal production with minimum methane levels.

Methane drainage methods involve removing methane gas prior to mining activities on a virgin coal seam, and also during extraction. An effective methane drainage process leads to an increase in the amount of gas removal from the underground mining districts thus minimizes the gas flow into the mine airways. Based on the gassiness degree of the coal seam and discontinuities in overburden, vertical borehole, horizontal borehole, gob gas vent hole, or inclined borehole can be used for methane drainage.

Coal mine methane has different uses, such as pipeline injection, power generation, or it may be used as a fuel in onsite preparation plants or vehicle refuelling stations; It can also be transported to a nearby coal fired boiler, or other industrial and institutional facilities for direct use.

The aim of this paper is to study the feasibility of methane drainage in Tabas coal minefor power generation.

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2- METHODS

In this research, the used financial model is based on a class of financial models, called discounted cashflow (DCF) models. DCF models are probably the most common tools used by companies or stock researchers to evaluate the financial viability of different projects.

3- FINDINGS AND ARGUMENT

The feasibility study of methane drainage in Tabas coal mine for power generation was done according to the data shown in Table 1. Then, by the estimation of investment costs, operation costs, and income, the DCF table was created and the values of NPV and IRR were calculated.

Table 1: Basic information for feasibility study of Methane Drainage for power generation

Parameter	Unit	Value
Preparation period	Year	1
Number of gas drainage panels in year	-	2
Panel length	m	1500
Panel width	m	200
Seam average height	m	2
Coal volume in each panel	m^3	600000
Coal density	ton/m^3	1.6
Coal weight in each panel	ton	960000
CH4 volume in each panel	m^3	17
Gas volume in each panel	m^3	16320000
Extraction recovery	Percent	50
Production recovery	Percent	60
Produced gas volume in each panel	m^3	4896000
Project life	year	20
Gas prices per cubic meter	Rial	2500
Discount rate	Percent	15
Taxes	Percent	9

4- CONCLUSIONS

Currently, methane drainage operation is done in Tabas coal mine and the drainage gas is released into the atmosphere. However, the drained gas can have many practical application,such as power generation, sales, town gas, and industrial use. In this research, the most important results of studying the feasibility of methane drainage for power generation were as followed:

- The values of NPV and IRR were estimated to be 952.44 million Rials and 26.5 percent, respectively. These values showed that the project can be feasible.
- The results of sensitivity analysis showed that whenever the gas price is lower than 2000 Rials, the project would be uneconomic. However increasing the operation costs up to 20%, the project would still be economic.

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