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Determination of practical friction coefficient in ventilation design by in situ tests in mines

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Abstract

Atkinson friction coefficient is one of the important factors to determinate the pressure loss for ventilation design in underground excavations. These coefficient mostly is extracted from reference books and they are related to excavations in conventional mining method; while today's tunnels and underground galleries have larger cross sections and different roughness surfaces in comparison with older underground excavations. Present study has paid attention to a method that can help to do more accurate measuring with today measuring tools. To this purpose, Nakhlak Lead mine was selected for doing experiments and considering functions of the equipment. The friction coefficient in this study estimated equal to 0.0058 kg/m^3 for air flexible tubes and it varies between 0.018- 0.0196 kg/m^3 for unsupported airways depending on direct or curved airways. These results are in the range of references' suggested numbers (0.0204-0.0056 in metric unit system of Hartman et al., and 0.0022-0.0013 in industrial metric unit system of Skochinsky and Komarov). Therefore, investigated method in this paper can be used for underground excavations specifically large scale tunnels and mines such as urban tunnels, which are excavated by modern technology and large cross sections.

Key words: Atkinson friction coefficient, air pressure loss, air speed, air resistance, Nakhlak Lead mine.

1. Introduction

The aim of ventilation system is providing a working environment that has enough oxygen without poisonous gases. The safety of a mine environment depends on ventilation system. An efficient ventilation system can provide fresh air, eliminate dangerous gases and maintain temperature and moisture in proper level [1]. Mine ventilation system is formed from required energy for ventilation and ventilation equipment. Nowadays, mine size and underground networks is going to become larger and ventilation system will become more complex; and generally, the cost of ventilation will increase. Therefore, development of environmental control and creation of a suitable underground working place are important issues and efficiency of ventilation system has significant importance from social and