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A MATHEMATICAL MODEL FOR DETERMINING THE DIMENSIONLESS HEAT FLUX WITH APPLICATION IN MINE ENVIRONMENT

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Abstract

A major issue in the undergrounding mining is providing the thermal comfort parameters at the work sites and among those the temperature it's the most important. Also, in calculus of underground mine ventilation, the air temperature must be taken into account. The rate of dimensionless heat flux has a major influence in the mining environment by heating or cooling the air which flows through a mine work.
The present paper studies the complex problem of heat transfer between air and the surrounding rocks, by establishing a new unsteady dimensionless heat transfer model based on *Bi* and *Fo* criteria. The dimensionless heat flux value was computed based on the dimensionless temperature. The equation which defines the dimensionless temperature and therefore the heat transfer between air and rock massif was solved using two different mathematical methods, obtaining the same result. The developed of mathematical methods were validated by conducting a case study based on data obtained from Jiu Valley underground mines. The methods may prove its efficiency in the design calculus for opening mine works where problems of thermal comfort state settlement occur.

Keywords: conduction, dimensionless temperature, mathematical model, mine environment, 8 point Gauss method

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