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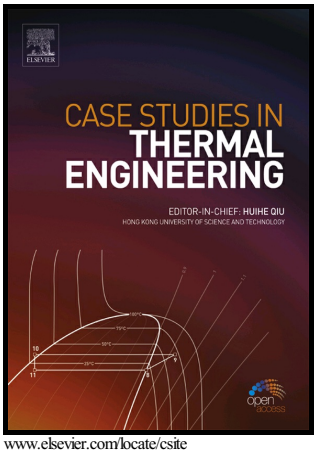

www.elsevier.com/locate/csite

PII: S2214-157X(18)30064-9
DOI: https://doi.org/10.1016/j.csite.2018.03.007
Reference: CSITE268

To appear in: *Case Studies in Thermal Engineering*

Received date: 9 March 2018
Revised date: 16 March 2018
Accepted date: 16 March 2018

Cite this article as: Du Cuifeng and Bian Menglong, Numerical simulation of fluid solid coupling heat transfer in tunnel, *Case Studies in Thermal Engineering,* https://doi.org/10.1016/j.csite.2018.03.007

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Abstract

In order to obtain the fluid solid coupling heat transfer law of the roadway, the coupled heat transfer between rock and air is analyzed through Fluent, Steady-State Thermal and Static Structural module in ANSYS. The heat flux and thermal strain of rock and the influence of air which under different wind speed and inlet temperature are obtained. The heat flux in the rock is approximately uniformly distributed in the circular ring shape, and the distribution of the heat flux from high to low is as follows: the roadway wall > rock mass > air. The heat flux of the rock near the wall is greater than that in the far side wall. The maximum is located at the wall, and the value is 160 $W \cdot m^{-2}$. The thermal strain of rock is greatly influenced by local heat source, and the maximum value is $5.1 \times 10^{-5} m \cdot m^{-1}$. Compared with the loader, the hydrothermal water which has greater influence on the temperature of rock and wind can be regarded as the focus on the control of heat damage.

Keywords: tunnel; fluid solid coupling; heat transfer; temperature; numerical simulation

1. Introduction

As mining moves deeper, more and more heat problems are faced.[1] Heat damage is generated by the surrounding rock, mechanical and electrical equipment, hot water or other heat sources. [2-3] Obtaining heat transfer is the premise of heat treatment, a