



TRANSCOM 2017: International scientific conference on sustainable, modern and safe transport

## Fire spread models and Tunnel Traffic & Operation Simulator

Peter Danišovič<sup>a\*</sup>, Eva Jančaříková<sup>a</sup>, Juraj Šrámek<sup>a</sup>, Miloš Zuziak<sup>b</sup>

<sup>a</sup>University of Žilina, Faculty of Civil Engineering, Univerzitná 8215/1, 01026 Žilina, Slovakia

<sup>b</sup>Transport Research Institute, JSC., Veľký Diel 3323, 01008 Žilina, Slovakia

---

### Abstract

The computer simulation of fire spread based on modelling of complex processes related to fire by Computer Fluid Dynamics CFD theory should be a significant contribution to increase of safety of road tunnels. This paper is about instant project aimed at creating simulation models of formation and spread of fires in the road tunnel. The simulations will be compared with real in-situ measurements of fire scenarios suggested by customer organization in two road tunnels. Within the project, Tunnel Traffic and Operation Simulator, as unique facility at University of Žilina will be extended by visualizations of smoke stratification in the virtual tunnel tube.

© 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Peer-review under responsibility of the scientific committee of TRANSCOM 2017: International scientific conference on sustainable, modern and safe transport

*Keywords:* tunnel, safety, fire spread, simulation, incident

---

### 1. Introduction

Safety of road tunnels depends on many factors. One of them is a method of tunnel operation. The correct choice of traffic-operation state and consistent the optimal managing of emergency event are a key element to achieve successful solution of an event/incident. Tunnel Traffic & Operation Simulator (hereinafter referred to as Simulator, see Fig. 1) built from the project Centre of Transport Research created the possibility to simulate a variety of tunnel incidents [1].

---

\* Corresponding author. Tel.: +421-41-513-5871.  
*E-mail address:* [peter.danisovic@fstav.uniza.sk](mailto:peter.danisovic@fstav.uniza.sk)



Fig. 1. Tunnel Traffic & Operation Simulator.

## 2. Fire spread models

One monitor from visualization wall of Simulator (Fig. 1) is free. This monitor will serve for 2D/3D visualizations of smoke stratification in the case of fire developed by computer simulation on the basis of CFD models. Visualizations should be the result of a three-year project that began in July 2016 in which University of Žilina acts as partner of Institute of Informatics (Slovak Academy of Sciences). Example of 3D visualization of smoke development from fire in the road tunnel, see Fig. 2.



Fig. 2. 3D visualisation of smoke development [2].

## 3. Tunnel traffic & operation simulator

Automatic control of technological equipment of both, real and virtual a tunnel, is generally divided into three levels (Fig. 3):

- *control level* – cover controlling of tunnel technology equipment and consist of many PLC (Programmable Logic Controller) automatons and input/output modules,
- *procedural level* – cover transformation of technological device's phases into electrical form,
- *operator level* – cover contact of person with managed technology and imply subsystems for data collection and possible next data distribution.

Download English Version:

<https://daneshyari.com/en/article/5027284>

Download Persian Version:

<https://daneshyari.com/article/5027284>

[Daneshyari.com](https://daneshyari.com)