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Computational Fluid Dynamics Simulation to Study the Effect of Ambient Temperature on the Ventilation in a Metro Tunnel

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Abstract : Various large-scale trends have characterized the current century thus far, including increasing shifts towards urbanization and greater movement. It is predicted that there will be 9.3 billion people on Earth in 2050 and that over two-thirds of this population will be city dwellers. Moreover, in larger cities worldwide, mass transportation systems, including underground systems, have grown to account for the majority of travel in those settings. Underground networks are vulnerable to fires, however, endangering travellers' safety, with various examples of fire outbreaks in this setting. This study aims to increase knowledge of the impacts of extreme climatic conditions on fires, including the role of the high ambient temperatures experienced in Middle Eastern countries and specifically in Saudi Arabia. This is an element that is not always included when assessments of fire safety are made (considering visibility, temperatures, and flows of smoke). This paper focuses on a tunnel within Riyadh's underground system as a case study and includes simulations based on computational fluid dynamics using ANSYS Fluent, which investigates the impact of various ventilation systems while identifying smoke density, speed, pressure and temperatures within this tunnel.

Keywords : fire, subway tunnel, CFD, mechanical ventilation, smoke, temperature, harsh weather
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