Comparative Study on the Tunnel Fire Driven Flow using Numerical Simulation with RANS and LES Method

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Summary

In this study, comparative analyzing on the tunnel-fire driven flow is performed using numerical simulation with LES and RANS method. FDS code is employed to calculate turbulent flow for LES and SMARTFIRE code for RANS. C. C. Hwang[1]'s experimental results of scaling tunnel fire are employed to compare with the numerical simulation. The Geometric dimension of tunnel is 5.4m(L) × 0.4m(W) × 0.3m(H). HRR of fire is 3.3kW and ventilation-velocity is 0.33m/s in the scaling tunnel. Applied models to simulation with FDS code are Smagorinsky model for viscosity, Mixture Fraction for combustion and FVM for radiation. Modified k-ε model is applied for turbulence, the Mixture Fraction for combustion and Six-Flux for radiation in SMARTFIRE code. Methane is used as the main fuel of natural gas in the both code. Non-Scattering gas are assumed for radiation transport. The variously dense grid-distributions are studied in the simulation results.

References

1. C. C. HWANG and J. D. WARGO, 1986, "Experimental Study of Thermally Generated Reverse Stratified Layers in a Fire Tunnel", COMBUSTION AND FLAME 66, pp.171–180.

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