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Numerical analysis for smoke spread in an aircraft hangar

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Smoke is one of the most dangerous factors in an aircraft hangar in case of fire. As it causes the reduction in visibility and fatality due to high temperature or toxicity also prevents applying evacuation plan for workers. This paper presents a numerical analysis for improving the traditional system of the ventilation system to manage smoke produced due to push-back vehicle on fire at an aircraft hangar. Through studying the effect of changing extraction and supply flow rates, the number of extraction and supply fans, as well as the effects of extraction and supply fans arrangement on the visibility, temperature and air velocity at the human level to ensure not to exceed limits stated by NFPA to apply evacuation plan for workers. The present investigation is performed using fire dynamic simulator to simulate 16 case studies in the hangar of airports in Brandenburg. The hangar has the outer dimensions of 83.40m width and 77.60m depth and thus an inner area of approx. 6,472m2. The hangar has a medium interior height of approximately 18.20m. The present results demonstrate that using extraction fans with rate (ACH) double the supply rate for the traditional ventilation system yields very good results in controlling the smoke behavior and spread. As well as, decreasing the number of supply fans will result in reduced smoke spread rate inside the hangar, which would help to control the smoke spread of fire in less time. The hangar has a medium interior height of approximately 18.10m. The hangar has one large wide aircraft (Airbus A330-300). The following are the main conclusions.

Biography

Essam Eldin Khalil did BSc (1971) with honors and MSc (1973) Mechanical Engineering, Cairo University and PhD (1977) from Imperial College of Science and Technology, London University, UK. Currently Professor of Mechanical Engineering, Cairo University since June 1988. Over 45 years of experience in Design and simulation of combustion chambers and furnaces for terrestrial and aerospace application. Had published over 728 articles, conference papers and journal papers on the subjects of Combustion Chamber Design, energy and indoor air quality within AIAA conferences, ASME and ASHRAE publications. Such activities were also disseminated through more than 190 presentations worldwide and 60 articles. Developed advances courses in air conditioning, heat transfer, gas turbine combustors and terrestrial energy-related areas and ABET program evaluator.

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