Environmental Engineering and Management Journal

November 2023, Vol. 22, No. 11, 1801-1811
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu
http://doi.org/10.30638/eemj.2023.156

"Gheorghe Asachi" Technical University of Iasi, Romania

REAL-TIME INDOOR ENVIRONMENT QUALITY MONITORING FOR VEHICLE CABIN

Daniel Lawrence Iruthayaraj[1]*, Rehash Rushmi Pavitra Arockiam[2], Jayabal Subbaian[3]

[1]*Department of Mechanical Engineering, Agni College of Technology, Chennai, India*
[2]*Department of Data Science and Business Systems, SRM Institute of Science & Technology, Chennai, India*
[3]*Department of Mechanical Engineering, Government College of Engineering, Thanjavur, India*

Abstract

The indoor environment quality is more significant and essential for comfort and safe journey for dynamic indoor passenger compartment. Over the last several years, there has been an increase in awareness of ventilation and indoor air quality in India. Furthermore, by using optimization methodologies, study inquiry concentrates on identifying the crucial elements, such as occupants' comfort in a vehicle internal cabin. Comprehensively examining the impact of developing pollutants and their possible health impacts in dynamic vehicle inside environments, however, remains a study need. In addition, estimation for comfortable air quality parameters was developed over the design of experiments together with measurements were conducted in dynamic vehicle cabin with distinct variables such as human densities, fresh air, and air velocity. For the interior of an occupied vehicle cabin, the analytically recorded pleasant indoor air conditions and better optimized indoor air quality variables were acquired by using Response Surface Methodology and Multi-Objective Genetic Algorithm. Consequently, effective non-linear regression models were derived and validated for each measured response parameter. The overall results interpreted that the comfort level maximizes in terms of fresh air supply and finally the proposed investigation was performed to determine the optimized comfort parameters over dynamic passenger indoor cabin as per Indian Standards, ASHARE 62, and so on. Ultimately, the experimental and optimized results were validated through error evaluation technique hence observation of error percentage is not beyond 5% respectively.

Key words: fresh air, human load, indoor air, pollutants, ventilation

Received: October, 2022; Revised final: September, 2023; Accepted: September, 2023; Published in final edited form: November, 2023

* Author to whom all correspondence should be addressed: e-mail: danilawernce@gmail.com