

The effects of nano-additives on exhaust emissions and toxicity on mankind

M. Norhafana^{a,b,†}, M.M. Noor^{a,†}, A.A. Hairuddin^b, S. Harikrishnan^c, K. Kadirgama^a, D. Ramasamy^a

^aAutomotive Engineering Research Group (AERG), Faculty of Mechanical and Automotive Engineering Technology, Universiti Malaysia Pahang, 26600 Pekan, Pahang, Malaysia

^bDepartment of Mechanical & Manufacturing Engineering, Faculty of Engineering, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

^cDepartment of Mechanical Engineering, Adhi College of Engineering & Technology, Tamilnadu, India

ABSTRACT

Nanoparticle additives and water emulsified fuels have been reported by many researchers to be the best methods in emission control and improving engine performance. The effects of nano additives the engine combustion and exhaust emission are thoroughly discussed from numerous researches from the past. The temperature of the carbon combustion is lowered by Cerium Oxide which improves the oxidation of HC. Complete fuel combustion is then achieved this way. The nano additives are then further discussed of its effects to humans by way of toxicity, engine corrosion, real time applications and limitations that ensue. The liver and kidney are seen to be affected by nano materials due to its toxicity. In dosing nanoparticles additives in diesel and biodiesel that are dosed with nanoparticle additives are reported by most researchers to enhance the performance of engines and reduce emission characteristics. Ce₂O₃, Copper, water-based coolants and Al₂O₃ are the targeted nanomaterials. Thus, there are advantages and disadvantages of application nano-additives on engines and effects on humans.

KEYWORDS: Nano-additives; Toxicity; Nano particles; Cerium oxide; Copper nano-materials

DOI: <https://doi.org/10.1016/j.matpr.2019.12.110>

ACKNOWLEDGEMENTS

The financial support by Universiti Malaysia Pahang under Research Student Grant PGRS190336 Grant and UMP Research Grant Scheme, Ministry of Higher Education Malaysia through the research project RDU190386 were grateful.