# Real-world PM Emission Patterns according to Load Factor of off-road Construction Machinery

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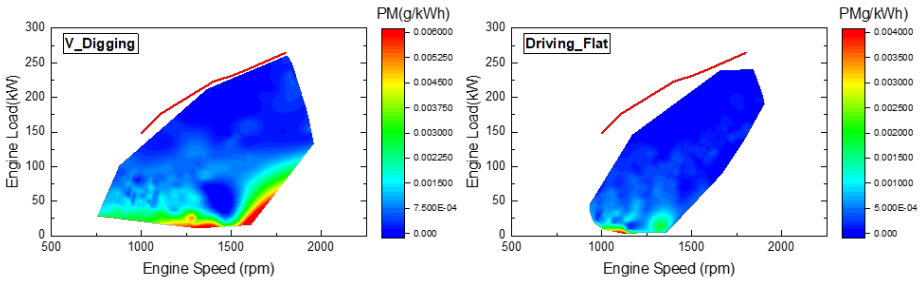
In recent decades, the construction industry has experienced rapid growth, driving urbanization and infrastructure development. Consequently, the usage of construction machinery has significantly increased, making it a major contributor to the emission of particulate matter (PM) on construction sites. PM is recognized as a key component of air pollution and has been associated with negative impacts on the human lungs. Understanding and analysing the relationship between the load factor of construction machinery and PM emissions is crucial research. The load factor refers to the ratio of the operating load applied to construction machinery and directly influences the operating conditions and fuel consumption of the machinery. Therefore, it is expected that variations in load factor would have an impact on PM emissions. Yoon et al., light-scattering sensor was used to measure PM2.5 on construction sites and compared it with the emission factor. However, this study installed sensors on the construction site to acquire PM and did not directly measure PM from construction equipment. So, to date, research on the actual relationship between load factor and PM emission patterns in construction machinery is limited, necessitating the need for empirical data and analysis.




The objective of this study is to analyse the actual PM emission patterns based on the load factor of construction machinery, aiming to identify the variability and characteristics of PM emissions associated with changes in load factor. To achieve this objective, real operation tests were conducted on construction machinery, where engine data and particulate matter (PM) were measured. Engine OBD data (power, torque, speed) were collected through an engine CAN communication device (neoVI FIRE2, Intrepid Control Systems), and PM was measured using PEMS (SEMTECH Ecostar, Sensors). Results suggest that emissions from construction machinery, specifically PM emissions, vary depending on the type and characteristics of work being performed and engine loads. Therefore, adjusting the emission factor (EF) used in the emission calculation formula to reflect the real-world load factor (LF) can prove to be a significant strategy for environmental improvement.

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