

Consideration on Regeneration Frequency and PM Collection Performance of Diesel Particulate Filter (DPF) based on Actual Road Driving Data of Heavy-duty Vehicle

Toshiro Yamamoto ¹⁾

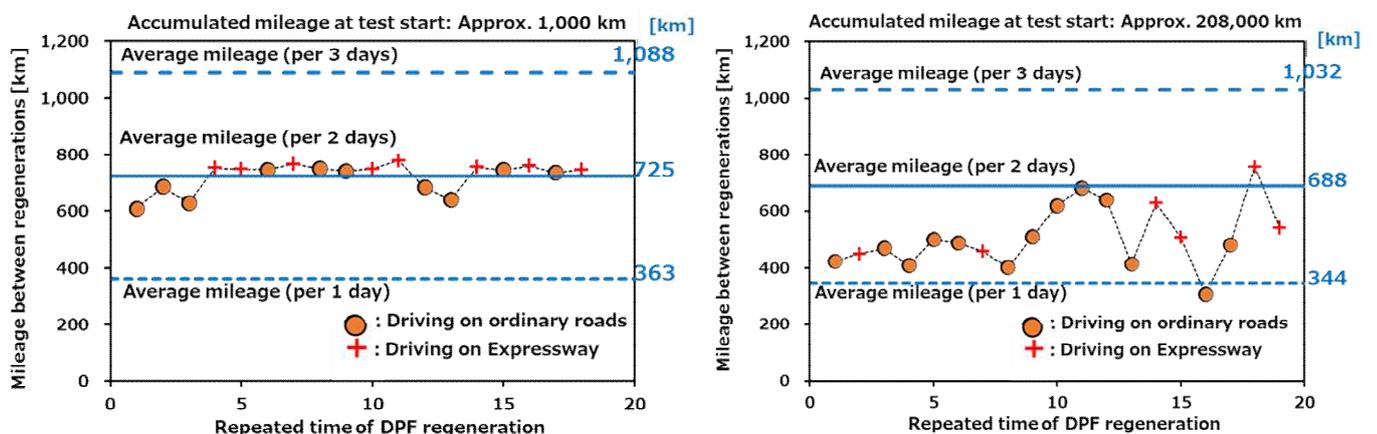
*1) National Traffic Safety and Environment Laboratory
7-42-27 Jindaijihigashimachi, Chofu, Tokyo, 182-0012, Japan*

KEY WORDS: Environment • energy • resources, Onboard measurement, Inspection, DPF regeneration, Driving test (D2)

Using a measurement system (SEMS) that consists of sensors directly inserted into the exhaust pipe, such as NOx sensors and exhaust temperature sensors, we collected data during the transportation business for four years from 2018 to 2021. Using the collected data, we investigated the following items. (1) Analysis of DPF regeneration frequency during actual road driving (2) Effect of driving conditions such as driving on ordinary roads or highways, or effect of deposition of ash (substances that cannot be removed by DPF regeneration treatment) on DPF regeneration frequency (3) Relationship between changes in automatic regeneration frequency and PM collection performance in DPF

As a result, the following points were clarified.

- (1) In order to analyze the regeneration frequency of the DPF during actual road driving, it is necessary to grasp the driving conditions at the time of data collection. It was considered that the following classifications are effective for grasping the driving conditions.
 - Categorization by driving speed, with driving speeds of less than 70 km/h considered as driving on general roads, and driving speeds of 70 km/h or more as driving on highways.
 - Classification by engine operating time, which divides the engine operating time in driving data into three types: driving time at speeds of less than 70km/h, driving time at 70km/h or more, and idling time.
 Using these methods, we grasped the driving conditions of the data collected in the transportation business driving mentioned above, and confirmed the effectiveness of them.
- (2) According to the 2021 driving data, the mileage until automatic DPF regeneration was shortened to about every 500km, and the frequency of automatic DPF regeneration increased. Since this trend was observed as a whole during two months of normal transport business driving, it was considered possible that it was caused by an increase in the amount of ash deposits in the DPF. (Refer to Figure 1.)
- (3) The increasing trend of PM emissions in the mode driving test with the increase in accumulated mileage coincided with the increase in the frequency of automatic DPF regeneration. Therefore, by monitoring the frequency of automatic regeneration of the DPF, it is possible to detect deterioration of the PM collection performance of the DPF.



(a) Transportation business driving data in 2018

(d) Transportation business driving data in 2021

Fig. 1 Frequency of automatic DPF regeneration during normal transportation driving