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# Development of fuel-efficient engine oil concept for motorcycle application maintaining hardware protection and wet-clutch performance

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The automotive industry urged to reduce $CO_2$ emissions as a measure against climate change. By the IPCC reports, it must maintain a 1.5°C temperature rise due to greenhouse gases from economic activities. It is required the reduction of $CO_2$ emitted from the product in use for both automobiles and motorcycles.

This study focused on improving the efficiency of internal combustion engines by lowering the viscosity of the engine oil to reduce $CO_2$ emissions without compromising the merchantability of motorcycles.

However, it is not an easy way to apply the low viscosity engine oil to motorcycles due to its unique requirements that differ from those of automobile engine oil. We also examined this point and studied the formulation of new engine oil additives for motorcycles application which satisfy each fuel economy target and industrial spec, JASO T903:2016.

In this study, we focused on the additive that can maintain viscosity even in high temperatures and evaluated its fuel efficiency performance by comparing it with 10W-30 marketed engine oil designated for the test vehicle.

The fuel economy test had conducted using a typical 125cc class scooter marketed in Japan with the WMTC cycle typically used in the industry as the homologation test.

The fuel economy improvement with the samples prepared in this study showed in Figure 1. This graph represents the fuel efficiency improvement each from the referenced Mo-DTC containing 10W-30 oil. The fuel efficiency improvement rate of the 0W-20 sample was more than 1.0% without Mo-DTC, and we observed roughly 1.7% gain with Mo-DTC in this study. We could comprehend that the viscosity design in the motorcycle engine oil has a significant role in the fuel economy gain by comparing the sample with and without the Mo-DTC sample. In addition, we observed that the fuel efficiency improvement by adding Mo-DTC was about 0.5% under these conditions and that the type of viscosity modifier does not have much effect on the fuel efficiency performance.

We estimated the fuel economy gain with various viscosity grade oils in Figure 2. From this extrapolation, we expect the fuel economy gain with the 0W-20 oil from the 10W-40 oil will be around 4% under WMTC test conditions.

Finally, we could not find any side effects of the low viscosity engine oil for the motorcycle application by confirming the clutch performance and other performance items described in the JASO T903:2016. We hope this study will help the industry to lower the $CO_2$ emissions from the product in operation in the market.

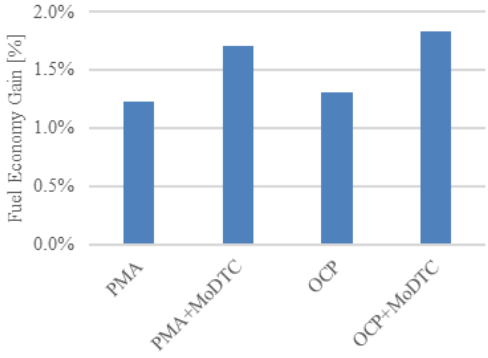


Figure 1 WMTC fuel economy test result on 0W-20 samples compared 10W-30 REO

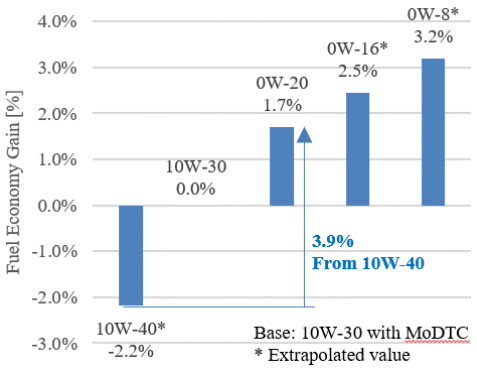


Figure 2 Extrapolation of fuel economy gain in other viscosity grade