Key Messages from AMF Research

Annex 47 **December 2018**

Reconsideration of DME Fuel Specifications for Vehicles

Operating Agent: National Institute of Advanced Industrial Science and Technology (AIST), Japan
Partners: Korea, Sweden, Thailand

Major Conclusion

The idea for DME fuel specifications for vehicles is that ISO16861: 2015 will be based with revision of “Residue after evaporation” for lubricity improver. Test methods of lubricity will be explained in the annex (informative) because it is hard to standardize the test method of lubricity by special HFRR at this moment. It’s necessary to discuss continuously with VOLVO regarding the lubricity test method.

Background

Although the price of crude oil has come down to a stable level, continuous energy security is still imperative worldwide. In the view for reduced environmental impact from vehicles and for relieved oil dependence, the expectation for DME (Dimethyl ether) is still large. Currently, DME is produced from coal and natural gas. If the techniques to produce DME using synthetic gases from waste paper fluid (black liquor) or wood-based biomass from unused wood including thinned wood can be realized, dramatic Well-to-Tank reduction of greenhouse gases would be achieved, and DME could be the most attractive next generation bio-fuel. ISO has started to discuss standardization of DME fuel through TC28/SC4/WG13 from 2007. The Operating Agent of this Annex is convenor of the WG13. The scopes of DME standardization can be classified as three categories: 1) feedstock for home and industrial use, 2) blend stock with LPG and 3) alternate of diesel for power systems including vehicles. The WG13 has a draft value of DME fuel specifications. However, it is not for final DME product for vehicles but for the base fuel to make any kinds of utilizations. Therefore, it is necessary to standardize the DME specifications for vehicles and it is the time to do by a new annex of IEA-AMF considering the current situation of DME fuel commercialization.

Research Protocol

Participants investigated the effect of fuel impurities and additives on DME diesel engine systems and/or DME vehicles in their country individually, and then shared the data and opinion with each other. Especially, some critical issues such as limit of hydrocarbon number (up to C4 currently) and use of odorant were discussed to gain a consensus among participants. The information was referred to discuss the standardization of DME fuel specifications for vehicles (as a final fuel) which was proposed as a new work item on ISO/TC28/SC4/WG13.

Examples of investigation items are as follows; (1) Materials immersion test: To evaluate the effects of fuel specifications on tolerance of materials for fuel supply and injection system. (2) Engine performance and emission test: To evaluate the effects of fuel specifications on engine performance and emission characteristics. (3) Durability test: To evaluate the effects of fuel specifications on durability of engine system.

Key Findings

Key findings from the project can be summarized as follows:

- The following ISO's DME fuel specifications for basic fuel (not for vehicles only, but included for diesel engines), and the test methods were published completely in 2015.- ISO16861:2015, "Petroleum products -- Fuels (class F) -- Specifications of dimethyl ether (DME)", 2015.5.15- ISO17196:2014, "Dimethyl ether (DME) for fuels -- Determination of impurities -- Gas chromatographic method", 2014.11.15- ISO17197:2014, "Dimethyl ether (DME) for fuels -- Determination of water content -- Karl Fischer titration method", 2014.11.15- ISO17198:2014, "Dimethyl ether (DME) for fuels -- Determination of total sulfur, ultraviolet fluorescence method", 2014.11.15- ISO17786:2015, "Dimethyl ether (DME) for fuels -- Determination of high temperature (105o C) evaporation residues -- Mass analysis method", 2015.5.1
- The idea for DME fuel specifications for vehicles is that ISO16861: 2015 will be based with revision of "Residue after evaporation" for lubricity improver. Test methods of lubricity will be explained in the annex (informative) because it is hard to standardize the test method of lubricity by special HFRR at this moment. Japanese Industrial Standard (JIS) will be also revised with the same way. It's necessary to discuss continuously with VOLVO regarding the lubricity test method.
- A new set of Round-Robin Test for test methods of DME fuel specification was started by three laboratories in Japan first, then other laboratories including from a few foreign countries joined in 2016. These data will be used for future's regular revision of the ISO test methods.
- Good relationship between IEA-AMF and ISO/TC28/SC4/WG13 was established (The operating agent, "Mitsuharu OGUMA" is a convenor of WG13). The operating agent will continue the convenor of WG13 in another three years, so, information exchanging can be continued.
- The Annex 47 is closed, however, further discussion will be continued in ISO/TC28/SC4/WG13 and WG14.