Agronomy Research **XX**(x), xx–xx, 2018

Kinematic viscosity studies for medium-speed CI engine fuel blends

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Abstract. Engine-driven power plants, run by diesel fuel or gas, will be needed for peaking power to keep the electricity grids stable when the production of renewable electricity, e.g. utilizing wind or solar power, is increased.
The choice of the alternative, renewable fuels for engine-driven power plants and marine applications is at the moment quite narrow. The amount of renewables of all liquid fuels is at present less than 2%. Biodiesels, FAMEs, have been studied for long time and apparently, despite of the problems they may have, they are still in the great interest. One important increment to the category of alternatives is fuels that are produced from e.g. oil wastes, i.e., recycled fuels. They are not renewable, but recycling of potential energy raw materials is still one step forward in increasing the suitable and more sustainable options.
To utilize the blends in medium-speed engines for power production, accurate knowledge of the physical and chemical properties of fuel blends is very important for the optimization of engine performance. The determination of the fuel kinematic viscosity is needed to create proper fuel atomization. The injection viscosity affects directly the combustion efficiency and the engine power. Consequently, this study focused on measuring kinematic viscosity curves for seven fuel blends, as well as the neat fuels used for blending. The temperature range was 10-90°C. The fuels used for blending were rapeseed methyl ester, animal-fat based methyl ester, hydro-treated vegetable oil, light fuel oil and marine gas oil produced from recycled lubricating oils.

Key words: Kinematic viscosity, alternative fuels, fuel blends, medium-speed engine, B20.

INTRODUCTION

In future energy systems, an increasing amount of renewable energy production, e.g. wind or solar power, will be installed. Due to the intermittent electricity production of those new plants, more emphasis should be put on peaking power to keep the electricity grids stable all the time. Hydro power is the best way to adjust the electricity supply so that the frequency and voltage of the electricity grid remain at a required level. Hydro power is not, though, obtainable everywhere.

Engine-driven power plants, run by liquid fuel or gas, will also be needed for peaking and regulation power generation. They are particularly suitable for this purpose because the plants can be started, loaded and stopped very quickly. They can also be feasible to ensure energy security in rural areas. To increase the share of renewable energy, new liquid and gaseous fuels produced from biomass, residues or waste should, however, be found for engine-driven power plants. These alternative fuels are also needed for marine applications. Together with energy production, in marine industry, the need for cleaner fuels is the most prompt. In 2012, marine sector