

# Influence of Branched Rapeseed Oil Fatty Acid Alkyl Esters on Biodiesel Cold Filter Plugging Point

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## I. INTRODUCTION

In Latvia rapeseed oil is the most important raw material for RME (rapeseed oil methyl esters) synthesis. It is mainly due to the Latvia's favorable climate conditions for seed growing and the fact that the quality measurements of produced biodiesel are similar to those of diesel fuel. Even though RME production is ever increasing as it serves as a valuable substitute for the traditional fossil fuel its use can be problematic during winter conditions [1-3]. The cold filter plugging point of RME is at approximately -10 °C, this is almost 20 °C higher than that of the regular winter diesel fuel.

## II. RESULTS AND DISCUSSION

In this research five different RAE (rapeseed oil alkyl esters) (R.O. 2-butyl esters, R.O. 4-methyl-2-pentyl esters, R.O. neopentyl esters, R.O. isobutyl esters, R.O. 2-methylbutyl esters) were synthesized in order to discover the possibilities of using these esters in blends with RME to improve the properties of biodiesel at low temperatures (see Fig. 1). The RAE synthesis was done using three-step synthesis in reaction with different alcohols in the presence of concentrated sulfuric acid. After the crude biodiesel purification RAE were distilled using fractional vacuum distillation at a 0.1 mm Hg pressure in order to get rid of unwanted impurities and to obtain RAE with the ester content > 96.5%.

RME with CFPP ~-11 °C was synthesized at the same conditions. Flash point (EN ISO 3679) 173 – 185 °C and Carbon residue (EN ISO 10370) 0.010 - 0.036% of prepared RAE correspond to standard (LVS EN 14124). This compliance with the standards confirms the chemical purity of the produced RAE and the reliability of results. The resulting R.O. 2-butyl esters, R.O. 4-methyl-2-pentyl esters, R.O. neopentyl esters, R.O. isobutyl esters and R.O. 2-methylbutyl esters of high purity have CFPP -24, -24, -24, -22 un -22°C respectively. It is established that in order to reduce RME CFPP by 4-5 °C an approximate ~30% content of RAE is necessary; ~70% RAE content reduces the RME CFPP by 8-9°C.

## III. SUMMARY

In this research five different RAE (R.O. 2-butyl esters, R.O. 4-methyl-2-pentyl esters, R.O. neopentyl esters, R.O. isobutyl esters, R.O. 2-methylbutyl esters) were synthesized with the purpose to estimate the possibilities of using these esters in blends with RME to improve the properties of biodiesel at low temperatures.

## IV. REFERENCES

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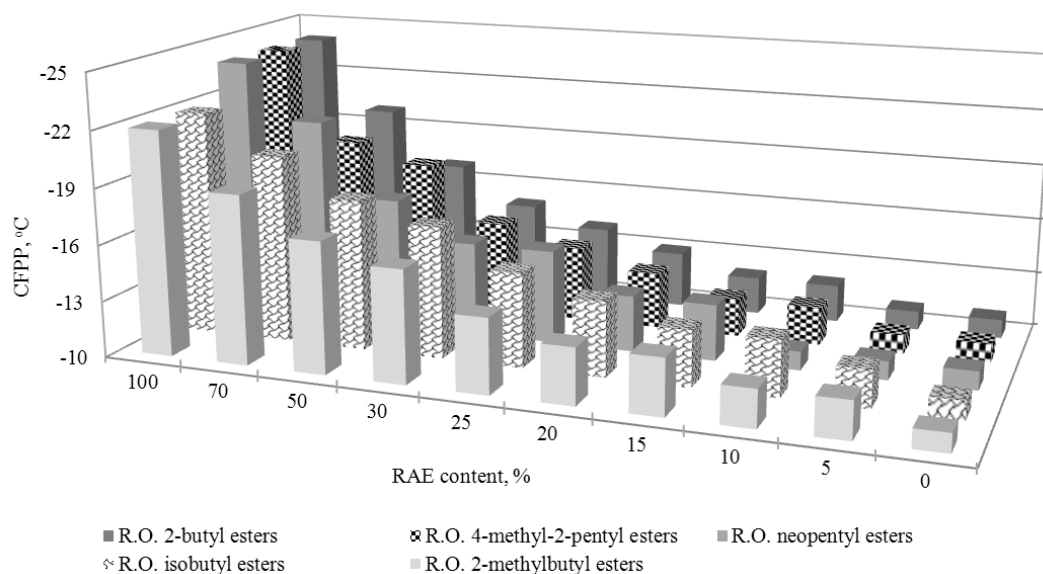


Fig. 1. Influence of RAE concentration on RME CFPP

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