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UNIPETROL CENTRE FOR RESEARCH AND EDUCATION

Cars running on 2G biofuels drove around Prague. Scientists from Litvinov show the 2G biofuels from forest residuum.

Prague, May 23, 2019 – UniCRE, or Unipetrol výzkumně vzdělávací centrum a.s., has today presented a second-generation biofuel made from biomass waste and conducted test drives in vehicles powered by biofuel made from woodchips. It is namely the biofuel made from woodchips, sawdust, straw or algae that could soon be added to fuels as a second-generation biocomponent in order to meet the increasingly strict emission limits set out by the European Union. If this technology is used commercially, addition of the fuel made using the gasification of woodchip waste could help to meet the minimum energy content of advanced biofuels after 2022. The presented final biofuel is being produced at UniCRE laboratories in Chempark Záluží u Litvínova within the COMSYN innovation project that is part of the international EU research and innovation programme, HORIZON 2020.

UniCRE, or Unipetrol výzkumně vzdělávací centrum a.s., joined the COMSYN innovation project in 2017. This project is funded as part of the international EU research and innovation programme, HORIZON 2020. It focuses on the production of second-generation biofuels from biomass waste such as woodchips, straw and other waste materials. The chemical composition and possible use of the new fuel is substantially different from the current 1G biocomponents. The introduction of 2G fuels obtained through the technologies using Fischer-Tropsch synthesis will reduce the content of oxygen and mainly of unsaturated hydrocarbons which possibly cause polymer deposits in the fuel system of passenger cars. Compared to the conventional fossil fuels, the product of the technologies using Fischer-Tropsch synthesis offers a higher cetane number which is the basic performance parameter of diesel oil.

After two years of testing, the representatives of UniCRE and other cooperating organisations have today presented the current results of their research on the occasion of a scientific conference related to the COMSYN project. They showed that biofuel made from woodchips need not only be used as an additive, but also that a diesel-engine vehicle can be driven purely with this biofuel. Furthermore, it poses no risk of damage to the vehicle unlike the currently used methyl ester of rape oil.

Research aimed at testing 2G biocomponents was initiated in order to meet the increasingly stringent emission limits set by the European Union. In 2018, the EU approved the renewable energy directive (RED II) setting an ambitious plan to increase the energy content of advanced biofuels in the period after 2022 to min. 0.2%; after 2025 to min. 1%; and to min. 3.5% after 2030. The approval of the FQD regarding the quality of fuels also confirmed the commitment to reduce CO_2 emissions in relation to the production and use of fuels in transport by 6%. With the current technologies, expertise and sources of raw materials, it is fairly difficult to meet these targets. In order to meet the requirement regarding the reduction of CO_2 emissions in transport, the share of available oxygen biocomponent (MEŘO) in fuels would have to be so high that the current engines in many cars would be unable to process them. That is why UniCRE employees joined the international activities in research, development and implementation of 2G biofuels which are more efficient, cost-effective and more environmentally friendly.

"We have looked into the options of separating and subsequently processing the products of Fischer-Tropsch synthesis in refinery technologies. To this end, we used pilot distillation and experimental testing units acquired as part of the modernisation of the research centre supported from the EU funds. To put it simply, we added fractions with different boiling points to similar refinery flows and modified them to products that are suitable for the production of high-quality fuels," **Jiří Hájek**, Director of the Development and Innovation Section at UniCRE, explains.

The concept is based on a technology using gasification of various types of biomass waste to synthetic gases (carbon monoxide and hydrogen). In this concept, conversion will take place in small and mid-sized production units placed close to biomass sources (10-50 kt/year of products of Fischer-Tropsch synthesis). The technology will be used to process wood waste, straw and other agricultural residues and various waste materials. Within this concept, the technology will be integrated in local sources generating electricity and heat where biomass will be reused with 80% energy efficiency. In the chemical reaction (gasification), waste or biomass will be converted into synthetic gas (hydrogen and carbon monoxide). The

This communication activity relates to the project COMSYN. This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727476.

subsequent chemical reaction of carbon monoxide and hydrogen in heterogenous catalysts will create the required hydrocarbons and water vapour. Liquid intermediates will subsequently be transported to the existing crude oil refineries where they will be added to high-quality fuels with the required effect of emission savings. As part of this concept, the number of facilities for primary biomass conversion will go up while refineries will be gradually converted into biofuel manufacturing sites.

"The current European legislation counts on an increased share of advanced biocomponents in fuels after 2022. Therefore, UniCRE and Unipetrol are considering the integration of advanced biofuels in the existing refinery units. The COMSYN project also includes preparations for the implementation of an operational test which is expected to enable the processing of an available number of products of Fischer-Tropsch synthesis in real units in the future. The Litvínov Refinery is already conducting a similar operational test where used vegetable oil is being added to the standard fossil raw material. Benefits for drivers will include a higher cetane number of the biocomponent product. However, disadvantages will include a higher price of the input which is significantly higher than the price of refined vegetable oil in the food quality. If we get funds from public sources, we plan to examine the processes connected with the growing of algae in open tanks using waste carbon dioxide from the incineration of fossil fuels or other particular production processes and the subsequent use of biomass produced as an energy raw material," **Jiří Hájek** concludes.

What is COMSYN?

COMSYN is an innovation project that is part of the international EU research and innovation programme, HORIZON 2020. It includes research institutions, small and medium-sized enterprises and large companies from Finland, Germany, the Czech Republic and Italy. The project aims to develop a concept for the production of components for clean fuels on the basis of indirect liquefaction of biomass using the Fischer-Tropsch process. This relatively known concept is supplemented with highly innovative technological variants, thus reducing the costs by up to 35% compared to the current methods of biofuel production.

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