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E-fuel from CAC gains recognition from industry and business

Chemnitz, 07/02/2021, **International car and motorcycle manufacturers as well as development service providers such as FEV certify that the synthetic gasoline of Chemieanlagenbau Chemnitz, CAC for short, is 100 percent compatible with existing vehicle fleets. This means that every vehicle with a gasoline engine can be driven in an environmentally friendly manner. The technology for the manufacture of this e-fuel was developed by CAC with the assistance of TU Bergakademie Freiberg, implemented as the largest trial plant in Europe in 2009 and is now ready for large-scale production – subject to political support.**

The conclusion of the motor vehicle manufacturers and development service providers is based on the findings of the Closed Carbon Cycle Mobility co-operative project, C3-Mobility for short, which was completed at the end of 2021. The goal of this was to develop climate-neutral fuels for the mobility of tomorrow. CAC, thanks to years of collaboration with TU Bergakademie Freiberg, provides the technology for the gasoline synthesis used in the project. Based on methanol, which can be produced from sources such as carbon dioxide (CO2) and "green" hydrogen (H2), CAC developed a patented process that involves no fossil resources.
The large-scale test plant at TU Bergakademie Freiberg was used in the scope of the project to produce around 46,000 litres of synthetic gasoline, which was subsequently made available to car manufacturers for engine and fleet tests. This involved green methanol of biogenic origin, which was transformed into gasoline in the patented, ready-to-market process.

The findings of the project partners were thoroughly positive and were published at the concluding event of the project. The synthetic gasoline is equal to fossil gasoline in all aspects, such as material compatibility, CO2 emissions and consumption - and even holds the advantage with regard to oxidation stability and particle emissions. As E10 blend, the drop-in-capable synthetic gasoline fulfils all requirements of the DIN EN 228, it is registered according to REACH and can replace conventional fossil fuel directly or be blended with it – without the need for technical alterations to the vehicle. "The confirmation of the project partners is a great success for our technology, since climate protection needs openness regarding technology," declares Jörg Engelmann, managing director of CAC.
"The establishment of this synthetic gasoline process is a key step towards closing carbon cycles with the aid of electrical energy. It allows regeneratively produced electricity to be stored in enduringly stable, CO2-neutral fuel, which can also be made available at times and in regions with low levels of sunshine and wind," says Prof. Martin Gräbner, director of the Institute of Energy Process Engineering and Chemical Engineering (IEC) at TU Bergakademie Freiberg.

In addition to the main goal of reducing CO2 emissions, a further advantage of synthetically produced fuels is that e-fuels are compatible with existing car fleets (1.2 billion worldwide) as well as for agricultural and construction machinery and emergency generators. They can be supplied across the existing network of

filling stations and can be both stored and transported. “We need to act quickly, because renewing the existing vehicle fleet in Germany takes around 18 years, over 20 in markets such as Greece. We therefore need a regenerative fuel that can be used in a backwards compatible manner in the existing vehicle fleets without the need for alterations,” says Dr. Norbert Alt, managing director and COO of FEV Group GmbH.

Imports from countries with favourable energy supplies will be required to make available the quantities of regeneratively produced electricity that Germany and Europe need for the energy transition in industry, transport, private households etc. Transformed into synthetic fuels or their components hydrogen and methanol, “green” electricity can also be used in great quantities in Germany and Europe.

The aviation sector is also looking for alternatives to the fossil fuel kerosene, which CAC and TU Bergakademie Freiberg are already researching together. The International Air Transport Association IATA has set milestones for the path towards climate-friendly air travel. By 2030 alternative fuels are to make up 5 % of global requirements, rising to 17 % in 2035 and around 40 % in 2040. “We are talking about enormous quantities here. The mere planning and construction of the plant required for this takes around five years. Speed is called for here, and for this we need political backing,” says Engelmann.

Synthetic fuels from water, CO2 and green electricity

This subject is generally known under the name power-to-X. The X here may be many different things: alongside gasoline, diesel, kerosene, methanol, ammonia, gas and liquid gas can also be produced from CO_2 and water. All that is needed is electricity and various catalysts.

Using carbon dioxide, highly concentrated from industrial exhaust or from the air, as the starting material for the manufacture of synthetic gasoline is a promising way to apply the CAC technology and enables the use of carbon dioxide in a cycle. Using CO2 to manufacture fuel transforms an unwanted by-product into a desirable commodity. Industrial companies with high CO2 emissions would not need to release the carbon dioxide into the environment, but could instead incorporate it directly into the power generation cycle as raw material. CO2 savings can be offset with emissions certificates - if the statutory basis for this is provided. The additional hydrogen required for this is extracted from water using the electrolysis process, ideally with electricity from sustainable energy sources.

Collaboration between CAC and TU Bergakademie Freiberg

CAC and the IEC institute at Technische Universität Bergakademie Freiberg co-operate closely in the area of power-to-X. The first co-operation agreement was concluded as early as 2008. In this, the focus is on joint research projects as well as bilateral developments.

Technische Universität Bergakademie Freiberg contributes many years of experience in the field of hydrocarbon synthesis and applied research, up to demonstration scale. In addition, with its unique infrastructure, it provides the basis for large-scale generation and analysis of the products.

As an engineering company, CAC adds years of expertise in the planning and realisation of complex chemical plants. The demonstration plant for synthetic gasoline was erected in 2009 on the basis of laboratory findings, as the first and thus far largest of its kind in Germany. In the years that followed CAC has worked with its own funds as well as in the scope of multiple funded research projects, including with the IEC, to further development, patent technology and prepare for market-ready, large-scale production.

Since 2017, research co-operation has also continued within the KEROSyN100 project. Seven project partners from the fields of research and industry are working together to prepare electricity and methanol-based kerosene for market. To achieve this goal, the first power-to-liquid plant for the manufacture of synthetic

kerosene via the methanol route was developed. The Heide refinery in Schleswig-Holstein is earmarked for the realisation of a corresponding demonstration plant.
More on KEROSyN100: https://www.kerosyn100.de

C3-Mobility
The Closed Carbon Cycle Mobility joint project - C3-Mobility for short - for climate-neutral fuels was initiated in 2018 and ended in November 2021. It was co-ordinated within the scope of the Energy Transition in Transport funding initiative of the Federal Ministry for Economic Affairs and Energy, aimed at the use of electricity-based fuels. The goal was to illustrate new approaches to the CO2-neutral mobility of the future. To achieve this, 32 partners joined together to form a cross-sectoral consortium ranging from energy supply, process engineering, automobile and commercial vehicle manufacturing to research and development. They examined the manufacture and use of various methanol-based fuels. The application and technical feasibility of synthetic fuels was assessed as satisfying the criteria of standard fuels already in use: for all engine sizes and serial production vehicles. This required the demonstration of all applicable test scenarios, such as long and short distances or real driving emissions, RDE for short, the measurement of emissions in actual road traffic.
At the digital closing event on 23 and 24 November 2021, 23 international project partners presented their findings to the 190 guests.
To the C3-Mobility closing event: http://www.c3-mobility.de/wp-content/uploads/2021/11/Agenda_Final_Event.pdf

Chemieanlagenbau Chemnitz GmbH
Reliable, experienced and approachable, CAC is an internationally leading plant engineering company in the field of process and chemical engineering. In the business fields of inorganic chemicals, refineries and petrochemicals, gas technology and industrial plant CAC offers the entire range of services of an engineering and plant construction company. This begins with the development of a concept, continues through the planning stage and turnkey construction to the point of commissioning of complex plant and plant units – in close co-operation with the customer at all times. With around 400 employees, 270 at the headquarters in Chemnitz, CAC has constructed over 500 industrial plants worldwide in the course of over 55 years. More information about Chemieanlagenbau Chemnitz GmbH can be found at: www.cac-chem.de
HUGO PETERSEN GmbN is the world's largest technology provider for sulphuric and hydraulic acid production as well as gas cleaning processes, it has been part of the CAC Group of Companies since 2005
In 2006 the engineering company BiProTech Sp. z.o. o. was added as a second subsidiary.

Press information: On request, I will be happy to send you a higher resolution, subject-related image with the caption: International car and motorcycle manufacturers certify that synthetic gasoline from CAC can directly replace conventional fossil fuel or be blended with it – without the need for technical alterations on the vehicle. ©FEV/C3-Mobility.

The work of project partners CAC and TU Bergakademie Freiberg in the Closed Carbon Cycle Mobility joint project for climate-neutral fuels was sponsored by the Federal Ministry for Economic Affairs and Energy (funding code 03EIV021B, respectively 03EIV021A).

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