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PTT Research and Technology Institute
PTT Public Company Limited

Newsletter

PTT RTI's Research Update

Demonstration of Ethanol ED95 Bus

27/01/2011- On behalf of PTT Public Company Limited (PTT), **Mr. Chaicharearn Atibaedya,** Executive Vice President, PTT Research and Technology Institute, co-signed a Memorandum of Understanding (MoU) on "Demonstration of Thailand's First Ethanol ED95 Bus", together with nine partners namely the Energy Policy and Planning Office (EPPO), the Department of Industrial Promotion (DIP), King Mongkut's University of Technology Thonburi (KMUTT), the National Metal and Materials Technology Center (MTEC), the Pollution Control Department (PCD), the Bangkok Mass Transit Authority (BMTA), Petro Green Company Limited, and Scania Siam Co.,Ltd. (SCANIA). This collaborative project aims to conduct a feasibility study for the use of ethanol ED95 as alternative to diesel for buses.

The project target is to enable the efficient usage of 95% ethanol (ED95) in the specifically-developed heavy duty engines. The project coincides with the 15-year renewable energy development plan of Ministry of Energy's policy to encourage the usage of ethanol in Thailand as an alternative major fuel substituting for imported fossil fuels. **In this regard, PTT is engaged in ED95 storage, blending & distribution, additives' development as well as studying of effects on use of ED95 to heavy duty engines.**

Ethanol blended with additives (ED95), is a fuel developed by Swedish ethanol producer SEKAB, Sweden. It consists of 95% ethanol and 5% additives (ignition improver, lubricity and wear inhibitor) by volume. ED95 can be used in passenger cars or buses passing SCANIA engine modifications, whereby the following major engine modifications are conducted:

1. Increasing fuel injection volume to match that of diesel which is higher than ethanol's
2. Adjusting compression ratio to be higher than that of diesel from 18:1 to 28:1
3. Improving Engine Control Unit
4. Improving gasket and seal quality for better wear resistance




PTT RTI Latest

PTT RTI's Research Received an NRCT Award 2011

02/02/2011-**Mr.Nirod Akarapanjavit**, Vice President, Energy Application Technique and Engine Test Department, PTT Research and Technology Institute, led his research team comprising Mr.Somchai Siangsanorh, Dr.Krisada Wannatong, and the two project partners namely King Mongkut's University of Technology Thonburi, and Kasetsart University, consisting of Assoc.Prof.Dr.Somchai Chanchaona, Dr.Tanet Aroonsrisopon, and Dr.Withit Chatlatanagulchai, to receive a good level of NRCT (Research Achievement) Award for their collaborative research work entitled "**The development of Diesel Dual Fuel Conversion Kit for Diesel Common Rail**" from His Excellency **Mr.Abhisit Vejjajiva**, Prime Minister of Thailand, at the Inventors' Day Expo 2011, organized by the Office of the National Research Council of Thailand (NRCT), at Impact Arena, Muang Thongthani Convention Center.


A Lecture on Fuels Given by PTT RTI's Researcher

20/01/2011- **Mr.Supap Silapakampeerapap**, researcher, Petroleum Products and Alternative Fuels Research Department, PTT Research and Technology Institute, was invited by the Department of Alternative Energy Development and Efficiency, to give a lecture on " **Knowledge on Gasohol E85**" together with his co-lecturers from the Excise Department, the Customs Department, ethanol producer companies and General Motors (Thailand) Limited, at the event of Flex Fuel Vehicle 2, S.D Avenue Hotel, where related knowledge and discussions were given.

22/01/2011- Mr.Supap Silapakampeerapap was also invited to lecture on "**Bio-jet & Biodiesel Products**" to the Technical Department, the Royal Thai Air Force, at Imperial Lake View Hotel and Golf Club, Petchburi Province.


PTT-TOYOTA Technical Information Exchange Meeting 2011

23-25/02/2011- Executives and key project team members from PTT Research and Technology Institute and Toyota Motor Corporation, Japan (TMC), led by **Mr.Chaicharearn Atibaedya**, PTT RTI's Executive Vice President, together with **Mr.Shigeki Suzuki**, TMC's Managing Officer, convened in Krabi Province for "PTT-TOYOTA Technical Information Exchange Meeting 2011" relating the research work of "the Collaborative Research and Development Project On Palm Trunk Ethanol". The technological information exchange regarding hybrid & electric cars, biodiesel, ethanol and other alternative fuels including the technical site-visit for ethanol production from palm oil at Kaset Sithi Co.,Ltd., were included in this meeting agenda. In addition, both management teams had a chance to exchange their mutual R&D experiences contributing to the integrated R&D collaboration as well as strengthening relationship between R&D strategic alliance partners.

Miscellaneous

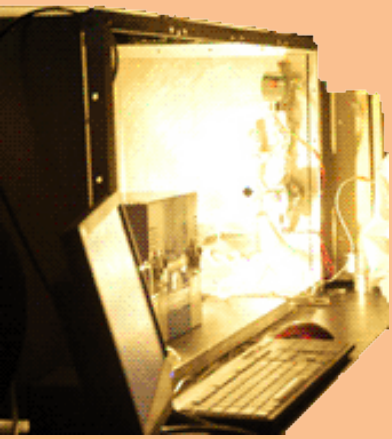
Fuel Produced from Sunlight, Water, and Carbon Dioxide

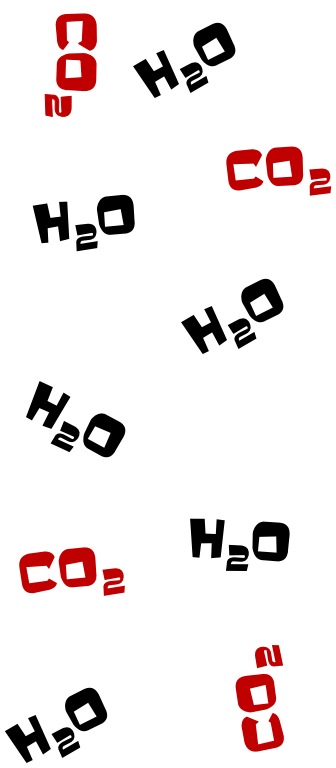
Is this a workable solution to the energy challenge if we can we store and transport solar energy from the sunny and uninhabited areas to the populated and energy intensive ones?

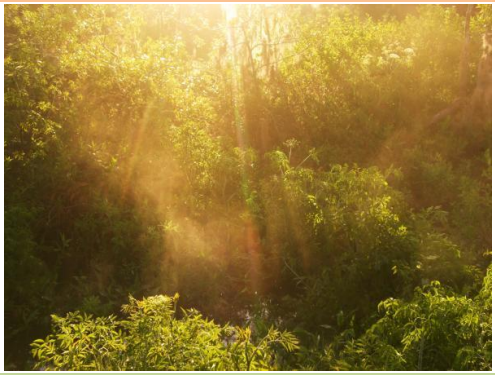
Such a question has motivated solar energy researchers to conduct research and development on liquid fuel production process, such as gasoline and jet fuel from sunlight as an energy source to convert water and carbon dioxide into synthetic gas or syngas.

Synthetic gas or syngas is a gas mixture that contains varying amount of carbon monoxide and hydrogen. It can be used as an intermediate in generating liquid hydrocarbon fuels. Syngas production from water and carbon dioxide can be achieved by reactor technology development . The new technology uses a common metal most famously embedded in the walls of self-cleaning ovens. It is cerium oxide or ceria which can catalyze reactions that decompose food and other thick gooey substance s stuck on the walls. The concept of syngas production is based on 2-step solar-driven thermochemical process using cerium oxide redox reactions.

The designed reactor has a solar concentrator, a quartz window, and a cavity absorbing concentrated sunlight. At the heart of reactor is a porous ceria cylinder

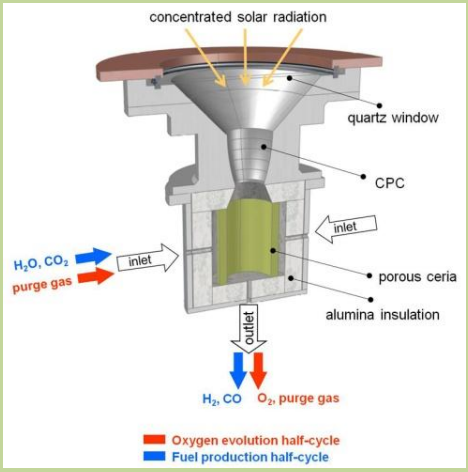


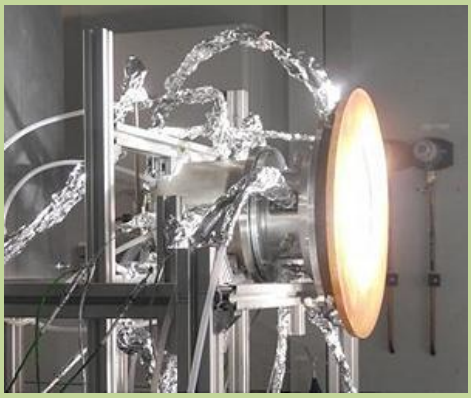




placed inside the cavity. The ceria's special ability is to "exhale" oxygen from its crystalline framework at very high temperature and then "inhale" oxygen back at lower temperature. What is special about this material is that it doesn't release all oxygen from its framework that helps to leave the framework of intact material. When the material is cooled down, it will pull oxygen back into the structure.

Ceria can attract and hold water gas molecules (H_2O) from the surrounding environment and also absorbs a small amount of carbon dioxide (CO_2).





Miscellaneous

As the sunlight heats ceria, it breaks down the water and carbon dioxide molecules pumped into the reactor to produce carbon monoxide (CO) and hydrogen (H_2). The produced hydrogen can be used to fuel hydrogen fuel cell and the carbon monoxide-hydrogen mixture can be used to produce syngas which is the precursor to liquid fuels. In addition, adding other catalysts to the gas mixture can produce methane. Once the ceria is oxygenated to full capacity, it can be heated back up again so that the cycle is restarted.

The temperatures in the reactor are different according to the steps of the cycle. The 2-step cycle consists of thermally reducing ceria at above 1,500 ^{O}C and re-oxidizing it with water and carbon dioxide at below 900 ^{O}C to generate hydrogen and carbon monoxide. Such temperatures can be achieved by various methods, for example using electrical furnaces at California Institute of Technology, and photons for a real-world test in the future. At the Paul Scherrer Institute, researchers installed the reactor on a large solar simulator capable of delivering the heat of 1,500 suns.

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