

NEWSLETTER

PTT Research and Technology Institute (PTT RTI)

PTT Public Company Limited

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Study of the Potential of Napier Grass for Sustainable Ethanol Production

The Ministry of Energy has continuously promoted the use of gasohol through encouraging motorists to use gasohol and assuring them of its supply and its safety. In addition, the government has also strictly controlled the standard of the gasohol sold at every gas station. With such measures, the demand for gasohol has increased dramatically, resulting in a concern about the lack of such raw materials as cassava and molasses for producing ethanol in the near future. Cassava and molasses are mostly used in Thailand to produce ethanol while other countries use corn, millet, rice, wheat, barley, sweet millet, potato, sweet potato and beetroot. At present, there are many institutes finding ways to extract ethanol from non-food crops such as Lignocellulosic materials commonly found is agricultural crop residues, forests and grasses.

Petroleum Products and Alternative Fuels Research Department, PTT Research and Technology Institute, in collaboration with **the Department of Agronomy, Agriculture Faculty, Kasetsart University**, conducted applied research, **“The Study of the Potential of Napier Grass for Sustainable Ethanol Production”**, whose purposes were to study the chemical components of Napier grass and a suitable production of Napier grass for ethanol production. The research was conducted by selecting the proper species of Napier grass, studying the cutting frequency and the proper height of the Napier grass to be harvested and the effects of nitrogen in a fertilizer on the production and the content of the cellulose of the grass.

It is found primarily that in theory a good species of Napier grass and a proper harvesting period will yield more than 2,200 liters of ethanol/rai/year equivalent. Five species of Napier grass are found to yield the highest amount of ethanol. Additionally, the appropriate harvesting frequency, the grass can yield even more ethanol a year. Through a biochemical process, if both cellulose and hemicellulose are used to produce ethanol, they can theoretically produce approximately 2,251 L/rai/year of ethanol with 50% efficiency.



Researcher and Napier at Rai Suwan, Pak Chong, Nakhon Ratchasima (August 21, 2008)

NGV Team of PTT RTI Trains Mechanics Installing NGV Equipment for Heavy Duty Vehicles



A team of specialists, researchers and technicians from the Vehicle Technology Group, the Energy Application Technique and Engine Lab Department joined a workshop, "Strengthening Knowledge for Mechanics Installing NGV Equipment for Heavy Duty Vehicles Project" (Course 2) as speakers at PTT Research and Technology Institute. This was a collaborative project between PTT Public Company Limited (NGV Service Stations and Vehicles Engineering Standard Division, NGV Strategy and Business Development Department), Faculty of Engineering at Kasetsart University, the Department of Energy Business, the Department of Land Transport, the Department of Royal Thai Naval Dockyard and the Department of Skill Development. The purpose of this project was to provide knowledge to entrepreneurs and mechanics, from both the central and other regions, who install NGV equipment for heavy duty vehicles with standard method. If they passed the test, they were received a certificate. The project started from May to September, 2008. The Vehicle Technology Group had trained almost 300 entrepreneurs from the Central, the Eastern, the Northern, the Western and the Northeastern Regions. Training for those from the Southern Region was conducted from 14-17 October, 2008.

Researcher Lectures on Alternative Energy to Military Officers



The Royal Thai Army has adopted the cabinet's measures about using alternative energy by requiring that all military vehicles use gasohol 95 and requesting the Quartermaster Department, the Royal Thai Army to detail the maintenance and distribution of gasohol for completing the logistic cycle.

As a result, the Quartermaster Department, the Royal Thai Army organized a training session for military officers in charge of fuel nationwide on August 4, 2008 at Ayothaya Room, 3rd floor of PTT Research and Technology Institute. The title of the session was "Trends in Using Alternative Energy as the Country's Main Energy in the Future: From Theory to Practice." At this session, Dr. Kunn Kangvansaichol, researcher, the Petroleum Products and Alternative Fuels Research Department, was invited to lecture on "Alternative Fuel and Energy for Thailand", which was of great interest to the participants.



In addition, the issues related to the solution of Thailand's renewable energy in the future was discussed in this session. Besides, the participants also visited fuels and lubricants laboratory and engine test facility with a warm welcome by PTT RTI's researchers.

PTT Organizes The Demonstrating Test of PTT Gasohol E85 Plus



On August 13, 2008, PTT organized **The Demonstrating Test of PTT Gasohol E85 Plus** at PTT Research and Technology Institute with the concept of **"PTT Gasohol E 85 Plus, The Future Energy You Can Trust"**. The test was presided over by Lieutenant General Poonpirom Liptapanlop, Minister of Energy. She also visited the testing lab. Mr. Prasert Bunsumpun, Chief Executive Officer and President, PTT Public Company Limited was granted a certificate to be the first trader of the country that use an additive in gasohol E85 by the Department of Energy Business. In addition, Dr. Songkiert Tansamrit, Executive Vice President, PTT Research and Technology Institute, summarized the tasks carried out by the PTT RTI, and the testing procedure of PTT gasohol E85 Plus to ensure that it is the alternative energy of the future.

PTT RTI and the Royal Thai Naval Dockyard Department Collaborative R&D and Test Bio-diesel B100



On September 23, 2008, **Vice Admiral Worapot Wanintanon, Commander, Naval Engineering Command**, and **Dr. Songkiert Tansamrit, Executive Vice President, PTT Research and Technology Institute** signed a Memorandum of Understanding on research and development of **"The Stability of Bio-diesel and Test of Bio-diesel B100 in Vessels"**. The research was conducted in **"Angsana"** a naval vessel *to determine whether this fuel can be used in place of fossil fuels in a warship or patrol ship.*

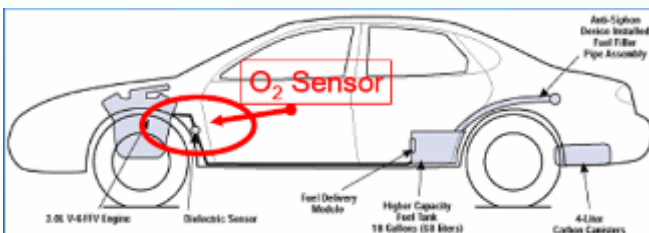
PTT will be in charge of giving advice, planning, collecting the data obtained from the experiment, studying the effects of bio-diesel on engine oil and assessing the quality of the bio-diesel and the engine oil used in the experiment. The bio-diesel B100 used in this experiment is produced by **Thai Oleochemical Limited Company (TOL)**, Thailand's biggest manufacturer of high quality bio-diesel. The Royal Thai Naval Dockyard Department who specializes in designing and working with metals is responsible for designing and making a tank containing the B100. After that, the tank will be installed in the vessel to study the stability and long-term storage of the bio-diesel while the ship is in the sea over a long period and the effects of bio-diesel on the engine of the vessel. The study results will determine the possibility of using bio-diesel B100 in a warship or other ships operating at sea for long periods of time. PTT hopes that this collaboration will lead to a new type of alternative energy for ships, which will be useful for the Royal Thai Navy as it has the potential to save a lot of money in fuel expenses. In addition, bio-diesel B100 will be more widely used, allowing the country to make substantial savings by cutting expenditure on imported fossil fuels.

What is FFV

FFV or **Flex Fuel Vehicle** is a vehicle which can be driven by fuel with a high content of ethanol. Besides, using regular gasoline, gasohol E10, gasohol E20, it can use gasohol E85 or any other gasohol.

The main part of FFV engine which enables its engine to use various fuels is the Electronic Control Unit (ECU) within the engine management system. Its software and sensor will measure the content of ethanol mixed in the oil for adjust the rate of fuel injection according to the type of fuel used each time.

A vehicle which can use a fuel with a high content of ethanol has to undergo some engineering modifications. For example,



1. Some parts in the fuel system which are made of either metal, rubber or plastic so that they can resist corrosion. Some rubber, magnesium and aluminum parts which are used to make the gas tank, the pump, the tubes for distributing oil, and the injector nozzle have also to be replaced with other materials.

2. The width of the injector nozzle has to be expanded to meet the higher circulation of fuel and the valve, the piston, the piston ring and the spark plug have to be modified.

Make of FFV

Nissan

- Nissan Armada (2007-2009)
- Nissan Titan (2005-2009)



- <http://th.wikipedia.org/wiki/E85>
- http://www.e85fuel.com/news/2008/2009_ffv_release.htm
- <http://www.e85fuel.com/e85101/flexfuelvehicles.php>
- http://www.tlcthai.com/webboard/view_topic.php?table_id=1&cate_id=121&post_id=29214
- http://www.volvocars.com/th/Documents/local_uploaded_doc/Volvo_E85_Fact_Sheet_TH-EN.pdf

Chrysler

- Chrysler Aspen (2007-2009)
- Chrysler Sebring Sedan (2003-2009)
- Chrysler Town & Country (2002-2009)
- Chrysler/Plymouth Voyager (2004-2009)
- Dodge Avenger/ Dakota(2008-2009)
- Dodge Caravan (2002-2009)
- Dodge Durango/ Stratus(2006-2009)
- Dodge Grand Caravan (2000-2009)
- Jeep Commander/ Grand Cherokee (2007-2009)



Ford/ Lincoln/ Mercury

- Lincoln Town Car (2007-2009)
- Lincoln Navigator / Navigator L (2009)
- Ford Crown Victoria (including taxi/police units) (2006-2009)
- Ford Explorer (4 doors)/ Ford F-150 (2006-2009)
- Ford Ranger pickup 4WD & 2WD (2008-2009)
- Ford Supercab Ranger pickup 2WD (2007-2009)
- Ford Taurus (sedan & wagon) (2006-2009)
- Mercury Grand Marquis/ Mercury Sable (2007-2009)
- Mercury Montaineer (2006-2009)



General Motors

- Buick Lucerne/ Terraza (2009)
- Cadillac Escalade, Escalade ESV, Escalade EXT (2009)
- Chevrolet Avalanche (2005-2009)
- Chevrolet Express/ S-10 pickup 2WD (2007-2009)
- Chevrolet Impala (2006-2009)
- Chevrolet Monte Carlo/ Uplander(2008-2009)
- Chevrolet Silverado pickup 2WD & 4WD (2003-2009)
- Chevrolet Suburban/ Tahoe(2002-2009)
- GMC Savana /Sonoma pickup 2WD (2007-2009)
- GMC Sierra pickup 2WD & 4WD/ Yukon(2002-2009)
- Hummer H2 (2009)
- Pontiac Montana (2008-2009)
- Saturn Relay (2009)



Volvo, Mercedes Benz, Toyota, Isuzu, Mazda

- Volvo S40, S60, S80 Flexifuel/ Volvo V50, V70 Flexifuel
- Volvo C30 Flexifuel (2008)
- C300 Luxury & Sport (2008-2009)
- C230 Sedan/ C240 Luxury Sedan & Wagon (2009)
- C320 Sedan, Sport Sedan & Wagon (2007-2009)
- Toyota Sequoia/ Tundra(2009)
- Isuzu Hombre pickup 2WD (2008-2009)
- Mazda B3000 pickup (2006-2009)

At present, PTT gas stations offer a wide range of fuels from regular gasoline, regular diesel and alternative fuels such as PTT gasohol Plus 91, PTT gasohol Plus 95, PTT E20 Plus and PTT gasohol E85 Plus, which was launched in August, 2008. So, let's know more about gasohol E85.

? What is gasohol E85?

E85Plus According to the specification by the Department of Energy Business, gasohol E85 in Thailand is gasoline mixed with 75-85% of ethanol (whose purity is 99.5%). It has an octane number more than 100 due to contain high oxygen. As a result, combustion is complete. Besides, it helps to improve the performance of engine in terms of torque and power which suitable for a Flex Fuel Vehicle (FFV).

? Is gasohol E85 used in any foreign country?

E85Plus It is widely used in Brazil, Sweden and some states of the U.S.A. such as Minnesota. However, the proportion of ethanol and that of gasoline vary according to the climate of each country.

? Why do we have to use gasohol E85?

E85Plus The main reason is that using ethanol means energy security. We can depend less on petroleum, reduce global warming and help farmers have greater income.

? What are the advantages of gasohol E85?

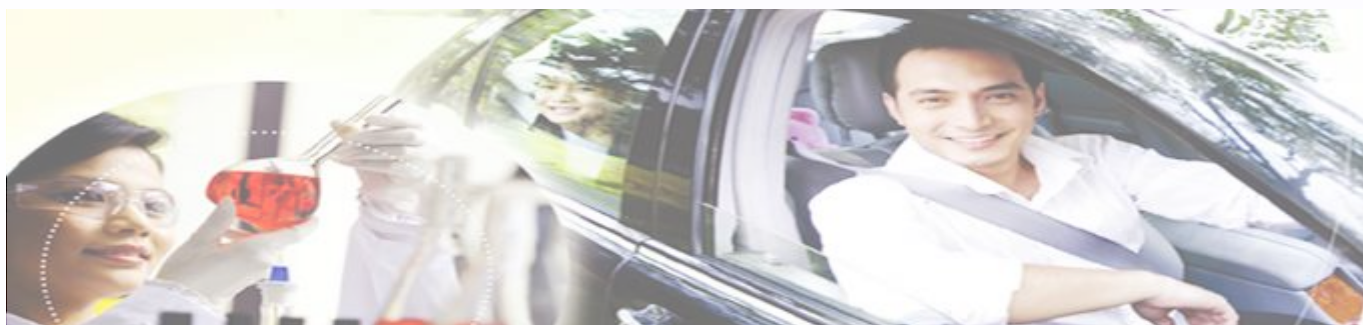
E85Plus It is an environmentally friendly fuel that helps reduce greenhouse gases such as CO and CO₂ which are the main cause of global warming. In addition, it helps the country import less petroleum since 1 liter of E85 means a reduction in 0.85 liters of gasoline.

? PTT gasohol E85

E85Plus It is generally accepted that ethanol is a clean fuel since its combustion is complete and it is made from agricultural products. However, contamination may occur during its manufacturing process and transportation. In addition, some properties of ethanol may cause deposit and corrosion in the fuel system. As a result, PTT Research and Technology Institute conducted a study to select the appropriate components and additives to mix with ethanol at the proportion of more than 75% so that gasohol E85 Plus will be suitable for FFV. Gasohol E85 Plus also reduces deposit at the nozzle and the fuel mixture valve and the corrosion in the fuel system and the engine.

? Gas stations distributing PTT gasohol E85 Plus

E85Plus The first PTT gas station to distribute gasohol E85 Plus in Thailand was that at the Office of the Secretary General of the Ministry of Defense (Bangna Outbound Expressway). The second was the PTT gas station on Chalermmahanakorn Expressway (Inbound Bangna - Port). PTT plans to establish altogether 15 PTT gas stations distributing gasohol E85 Plus in Bangkok and vicinity by the end 2008.



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