

# NEWSLETTER

PTT Research and Technology Institute (PTT RTI)

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## Technical feasibility study project for the production of hydrogen from natural gas of PTT for use in fuel cells

At the present, **hydrogen** is used as fuel in the production of electricity from electrochemical reactions called fuel cells by eliminating the combustion process. Therefore, the quantity of the pollution released is lower than that emitted from internal combustion engines.

Thailand has natural gas sites. Therefore, the production of hydrogen from natural gas to be used as fuel cells for automotive industries is a way of adding value, which is useful for the country in reducing the import of crude oil, the problems of air pollution and the greenhouse effects behind global warming. Today, companies in many countries in the world are interested in fuel cells. Especially, car manufacturers in several countries can produce and develop fuel cells cars. In addition, some companies and industries are developing fuel cells to produce electricity for households and industries.



Therefore, **PTT Research and Technology Institute** has cooperated with The Joint Graduate School of Energy and Environment (JGSEE) of the King Mongkut's University of Technology, Thonburi to launch **the technical feasibility study project for the production of hydrogen from natural gas of PTT to be used in fuel cells**. The aim of the project is to develop and construct a hydrogen production process (Reformer Process) from PTT's natural gas in order to efficiently supply high-temperature fuel cells in a suitable manner for Thailand. The hydrogen production process from natural gas was designed and constructed as a prototype, to be a model of the hydrogen production unit. Also, a feasibility study of the use of fuel cell co-generation system for Thailand will be conducted.



## PTT RTI Researcher's presentation in the International Pipeline Conference and Expo 2008

On October 1, 2008, **Miss Patchareeporn Sintoorahat**, a researcher from the **Geo-science and Petroleum Engineering Research Department**, PTT Research and Technology Institute (PTT RTI), presented her research on the **"Performance of Corrosion Inhibitors at High CO<sub>2</sub> Pressures"** in the agenda of Pipeline Integrity Management, under the topic of Corrosion Prevention, Management & Mitigation at the International Pipeline Conference and Expo 2008 during September 29-October 3, 2008 at the Hyatt Regency Hotel & the TELUS Convention Centre in Calgary, Alberta, Canada, organized by the American Society of Mechanical Engineers (ASME). Her presentation was very interesting for the seminar participants. In addition, she had the opportunity to exchange knowledge about Pipeline Technology and Pipeline Integrity Management, including interesting case studies which can be applied in the future research and development of PTT RTI.



## RTI Portal Community Booth in the PTT Knowledge Management Event 2008



During October 14-16, 2008 **PTT RTI organized PTT RTI Portal Community Booth** under the concept of **"Technology-Based, Innovative Product and Process Development"** in the **PTT knowledge Management Event 2008** at the first floor of the PTT Head Office Building. The aim was to show knowledge management regarding PTT RTI research and development from the very beginning to the building of knowledge passed on and developed from generation to generation up to the present time. As a result, the RTI Portal Community is set up to create a community of practice in PTT RTI.

In the seminar session, **Dr. Songkiert Tansamrit, Executive Vice President, PTT Research and Technology Institute** gave a presentation on **"Green Energy Options and Opportunities"**, which deals with three types sustainable developments: environmental sufficiency, economic sufficiency and socio-political sufficiency which will shape a new and exciting area of future business. This presentation was very interesting to the seminar participants.

Furthermore, **Miss Imsub Subkaew and Miss Pornsawan Prommart, Data Management Officers from Analytical Technology & Knowledge Management Division, Research Planning and Management Department** received the **PTT Group KM Facilitator Team Certificates**, as they were part of a team which greatly helped facilitate the PTT RTI knowledge management in becoming a success. Also, **Miss Prissana Prakanwiwat, a researcher from Petroleum Products and Alternative Fuels Research Department** received the **PTT Group KM Best Contributor Certificate**, for being a role model of exchanging and giving knowledge in the RTI community.



## A researcher took part in the “Workshop on Microalgal Mass Cultivation”



The School of Bioresources and Technology together with the Pilot Plant Development and Training Institute of the King Mongkut's University of Technology, Thonburi, Bang Khun Tein Campus organized the “**Workshop on Microalgal Mass Cultivation**” on November 3-5, 2008 at the Pilot Plant Development and Training Institute of the King Mongkut's University of Technology, Thonburi, in which **Dr. Kunn Kangvansaichol, researcher, the Petroleum Products and Alternative Fuels Research Department** participated.



In this workshop, Prof. Dr. Avigad Vonshak from The Jacob Blaustein Institute for Desert Research, Ben Gurion University of the Negev, Israel and Asst. Prof. Dr. Marasri Ruengjitchatchawalya from the School of Bioresources and Technology of the King Mongkut's University of Technology, Thonburi presented about Introduction to Microalgae, Outdoor production of Microalgae, High Value Chemicals from Microalgae, Laboratory for Indoor and Outdoor works, Growth and Nutrient analysis, Outdoor Pond Experiment, Photobioreactors, Productivity and photosynthesis, Demonstration and setting up of material and equipment for photosynthesis measurement, Summary of lab work, and Trouble shooting discussion. The knowledge gained from the seminar is very useful for research on alternative energy in Thailand.

## PTT RTI Executives and staff participated in PTT Group Sports Day 2008



The PTT RTI executives and staff led by **Dr. Songkiert Tansamrit, Executive Vice President, PTT Research and Technology Institute**, joined the Blue Team in the “**PTT Group Sports Day**”, which was held for the first time on December 12, 2008 at Gymnasium I, Thammasat University, Rangsit Campus. The PTT RTI executives participated in the parade and cheering songs with PTT RTI and PTT Group staff in a joyous occasion.

In addition, several PTT RTI staff in the Blue Team took part in the Great Fun Games and won third runner-up.

## Ethanol vs Biodiesel

Today Ethanol and Biodiesel clearly play an important role in Thailand. They are mixed in fuels and sold in service stations in order to reduce imports of oil.



Research and development institutes around the world are trying to find materials and resources that can produce ethanol and biodiesel in large quantities to replace the diminishing supplies of petroleum energy in the future. The biggest ethanol producers in the world include the United States and Brazil while the biggest biodiesel producers are Indonesia, Malaysia and Thailand. The following table shows the materials and countries that are capable of producing these two alternative kinds of energy.

### Ethanol

Materials	Capable Countries
Corn	• The United State
Sugarcane	• Brazil

### Biodiesel






Materials	Capable Countries
Palm Oil	• Malaysia • Indonesia
Rapeseed, Sunflower, Soybean, Used Oil	• The United State • European Countries
Coconut	• Philippines
Jatropha	• India

For an agricultural country like Thailand, there are several raw materials that can be used to produce ethanol and biodiesel:

**Ethanol :** Sugarcane, Cassava and Corn

**Biodiesel :** Palm Oil, Coconut and Jatropha

Besides, the information about the yield per unit of the raw materials used in the production of oil is also interesting, as it can be taken into consideration when making decisions about expanding production for commercial purposes in the future. The yields of some raw materials that can be used in the oil production are as follows:

Raw materials		Oil Yield (L/ 10,000 m <sup>2</sup> )
Palm Oil		5,950
Coconut		2,689
Jatropha		1,892
Rapeseed		1,190
Soybean		446
Corn		172

- อนันต์ ดาไลคม "พลังงานทดแทน โอกาสของภาคเกษตรไทย" สัมมนาวิชาการเรื่อง พลังงานทดแทน...นโยบายด้านวัตถุดิบกับปริมาณความต้องการ 28 พ.ย. 51 โรงแรมมิราเคิล แกรนด์
- Christi, Y. (2007) "Biodiesel from Microalgae", *Biotechnology Advances*, 25, p. 294-306.
- Tarik Zebib (2008) "Microalgae Grown in Photobioreactors for Mass Microalgae Grown in Photobioreactors for Mass"

Energy is vital for the human race in the present world and its importance is increasing due to new, ongoing developments. New technologies have been increasingly used in producing energy to allow people to consume energy more effectively. Although there are different sources of energy in Thailand, fossil fuel resources, which are the main source of energy for the country, are small in quantity when compared with other countries and sometimes the world crisis has inevitable consequences on Thailand. Therefore, we would like to provide the definition of different kinds of energy for your information.

## ? How many kinds of energy are there?

There are several kinds of energy, depending on the conditions used in classifying energy. Mostly, energy is divided into two groups: Commercial Energy and Alternative Energy.

## ? What is commercial energy?

Commercial energy is a source of energy that has economic value. It is a large source of petroleum fuels, natural gas or coal. This kind of energy causes high quantities of pollution and the sources are being depleted. Moreover, commercial energy also encompasses processed energy like electricity and petroleum products. Commercial energy includes:

1. Crude Oil
2. Condensate
3. Natural Gas
4. Petroleum Products
  - LPG
  - Gasoline
  - Kerosene
  - Jet Fuel
  - Diesel
  - Fuel Oil
5. Coal/Lignite
6. Electricity (*produced from fossil energy*)

## ? What is alternative energy?

Alternative energy has an ever increasing role. However, today we still need to research and develop it in order to use it widely and effectively. It will help replace commercial energy which is exhaustible and does not meet the needs of national consumption. This includes:

1. Gasohol
2. Biodiesel
3. Renewable Energy
  - Biomass
  - Biogas
  - Energy from Municipal Solid Waste
  - Solar Energy
  - Wind Power
  - Hydro Power
  - Geothermal Energy
4. Nuclear Energy
5. Hydrogen Energy

Moreover, there are also the commonly discussed "alternative energy" and "renewable energy". Sometimes we can use both of them to classify energy in different conditions. They can be defined as follows:

## ? Alternative Energy

**Alternative Energy** is energy generated from natural resources and is unlimited (when compared with the main type of energy used in the present day like petroleum or coal.)

## ? Renewable Energy

**Renewable Energy** is energy generated from a continual source and occurs repeatedly in the environment. The source of the renewable energy is the source that can be renewed indefinitely as shown above.

<http://www.pt.ac.th/ptweb/digital/snet6/envi2/energy/energy.htm>

[http://www.ptit.org/is-energy-preview.php?energy\\_id=4](http://www.ptit.org/is-energy-preview.php?energy_id=4)

<http://th.wikipedia.org/wiki>

<http://www.panyathai.or.th/wiki/index.php>

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