

# **Development of Ethanol as a transportation fuel in Thailand**

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Thailand imports more than 90% of the transportation fuel as crude oil, gasoline, and diesel. The Royal Chitralada Project (RCP) under HRH King Bhumipol original thinking was the first alternative fuel project in Thailand. RCP ethanol plant was built 20 years ago with the capacity of 900 liter per batch making ethanol from molasses. The second ethanol plant was established in the Thailand Institute of Scientific and Technological Research (TISTR) supported by the Japanese Government producing ethanol from cassava with the capacity of 1,500 liter per day. The use of ethanol as alternative fuel gained strong momentum in the year 2001 under the promotion of MP Alongkorn Polaboot and a group of Thai researchers. The National Ethanol Committee (NEC) consists of representatives from various government agencies and private sectors were established in the Ministry of Science and Technology to look after the promotion of ethanol fuel. MTEC coordinated the research and development project on gasohol, diesohol, and other biofuels. The cabinet set up the deadline to substitute ethanol for all MTBE in the year 2007. There are several oil companies selling gasohol (E10) with about 800 filling stations throughout the country.

## **Introduction**

From the report on the world energy outlook 2004 of the International Energy Agency (IEA), fossil fuels will continue to dominate the global energy mix, while oil remains the leading fuel. The global demand for transport increases very closely in line with GDP. Most of the increase in oil demand comes from the transport sector, especially in the OECD countries. It is forecasted that the transport oil demand in Non-OECD countries will increase three times more than in the OECD's. [1] The volatile situation in the middle east couple with the surging of the demand for energy in the People Republic of China and India in the second half of the year 2003 resulted in the highly fluctuation toward upward trend of oil price. The situation getting worst with the destruction of oil rigs in the western parts of USA due to the hurricane Katarina. Thailand imports about 90% of crude oil or 870,000 barrel/day or about \$10,000 million/year. Although the crude oil import in the first quarter of the year 2004 reduced by 3.5% and the refined oil import reduced by 41.8% compared with 2003, the import value increased \$ 600 million during January-March 2005 which affected the balance of trade and GDP. The retail price of diesel and gasoline also increased nearly 50% for the past 12 months. Various countermeasures are seriously and urgently needed to alleviate this situation.

## **Government Strategy**

The Royal Government of Thailand, on December 9, 2003, established three strategies to solve the oil problem. These are

1. Increase renewable fuel and utilization efficiency.
2. Secure alternative oil sources.
3. Increase value added for energy sources.

The target of new renewable energy in the year 2011 was set at 8% of the total energy consumption of 6,540 ktoe. The ratio will be 16% in electricity generation, 24% in liquid biofuel, and 60% in

heating source. In term of transportation, 1,570 ktoe of liquid biofuel will be used for transportation and agriculture. Ethanol and biodiesel are two major biofuel under promotion. It is envisaged that, in the transportation sector, ethanol will be used at 1 million liters/day as a replacement for MTBE in 96-octane gasoline in 2006 and 3 million liters/day in 2011 as a replacement for both MTBE in 95-octane gasoline and blending components of 91-octane gasoline. [2] The ratio of 10% blended or gasohol as E10 will be promoted throughout the country. In case of biodiesel, the target will be 172 million liters/day in 2006 and 720 million liters/day in 2011.

### **Alternative fuel in transportation sector**

As the transportation sector consumes about 34% of the total energy in the country, the RTG aims to reduce the oil consumption by 15% in 2008. The filling station will be increased from 730 to 4,000 in December 2005. The country-wide usage of gasohol 95 will be started in January 1<sup>st</sup>, 2007 and gasohol 91 will be added country-wide in 2008. The preliminary ethanol promotion measures such as giving an exemption of excise taxes for ethanol and lowering gasohol contribution rate to the oil fund and the energy conservation promotion fund is imposed. A joint committee that include the Energy Ministry, Industry Ministry and Agriculture and Cooperatives Ministry and various private sectors is formed to set up the measures for promoting the establishment of ethanol production plants, a raw material procurement plan, and related measures.

As of present, there are 23 ethanol plants permitted with total capacity of 3 million liters/day. There are two plants in operation with the total capacity of 225,000 liters/day with one more plant will start production with the capacity of 150,000 liters/day.

The demand for gasohol increased rapidly due to the surge in oil price and the attractive price gap of about 40c/liter between gasohol 95 and ordinary gasoline. Sell of gasohol increases from 5

million liters/month in August 2004 to nearly 50 million liters/day in August 2005. The Ministry of Energy is planning to import 7 million liters of ethanol from India in September 2005 to solve the problem of lack of ethanol supply from domestic producers.

## **History of ethanol and gasohol production in Thailand**

In the year 1985, HRH King Bhumipol requested the study of the cost of producing alcohol from sugar cane for alternative fuel. The facility for the research and development of ethanol fuel and ethanol production from sugar cane was opened in the Royal Chitrlada Palace in 1986, but the cost was still too high compared with gasoline at that time.

In 1994, the Royal Chitrlada project (RCP) studied the ethanol production from sugar cane with the capacity of 900 liters/batch and test run with 15 automobiles with various makes and models. The Petroleum Authority of Thailand or PTT who responsible for the testing submitted the report that gasohol with 10% blended or E 10 can be used without problem or adjustment needed.

In 1996, HRH Princess Mahajakree Sirindhorn opened the filling station in the palace as the first gasohol filling station in Thailand.

In December 1999, Dr.Dennis Shuetzel, Director of Ford Motor Corporation, USA, visited HE Dr.Arthit Urairat, then the Minister of Science and Technology (MOST), to discuss the collaboration in the research and development of ethanol as an alternative fuel for transportation. The National Metal and Materials Technology Center (MTEC) was requested to collaborate with Ford Motor for this project with the aim to test the viability of gasohol for passenger car and diesohol (10% blended) for light truck.

In the year 2000, Mr.Alongkorn Polaboot, the then MP under the government party, began the campaign to promote ethanol and gasohol as an alternative transportation fuel. The promotion team

consists of Dr.Ong-art Pongluck who used to work as the Director of the Alcohol Authority of Thailand, Dr.Samai Jai-in of the Royal Navy, Dr.Paritud Bhandhubanyong of MTEC, Mr.Sawang Boonyasuwat of PTT, Dr.Anusorn Saengnimnual of Bangchak Plc., and others. The team participated in the International Symposium on Alcohol Fuel (ISAF) in Sweden and organized the next one in Phuket in 2003. The team also visited Brazil and set up the Ethanol-Biodiesel Foundation in the year 2003 to further promotion of ethanol and biodiesel to the public.

The National Ethanol Committee was established, at first under MOST in the year 2001, and then transferred to the Ministry of Industry (MOI) in 2003. This committee was transformed into the National Biofuel Committee under the Ministry of Energy (MOE) chaired by the Deputy Prime Minister in the year 2004.

After the long and serious discussions, the specification for gasohol for commercialization was established in the year 2002, one year after Bangchak Plc. Began the production of gasohol and did the market testing of gasohol 95 (E 10) at Bangchak filling station.

In June 2004, Cabinet jointly filling Bangchak gasohol before the cabinet meeting at the Royal Air force Command Headquarter.

In September 2005, gasohol filling station increased to nearly 1,000 with 6 oil companies. PTT, Shell, and Bangchak are leading the group with several hundred filling stations in each company.

### **Problems and obstacles in production and distribution of gasohol in Thailand**

After several months of distribution, PTT and Bangchak Plc. did the survey on customer's opinion about gasohol usage. Price gap and trial and following the trend are two main reasons that customers use gasohol in their cars.

There are still several problems for the country-wide distribution of gasohol. These are

1. *Customer's confident in the quality of gasohol.* Although the government requested for the full cooperation from automobile manufacturers in Thailand, there is still no full guarantee issued from the company.
2. *Price differentiation.* The price gap was set at 0.0125 c/l in the initial stage, then it was increased to 0.40 c/l in the beginning of 2005. The price gap can be wider with the secure supply of raw materials such as cassava and sugar cane.
3. *Instability in ethanol supply.* The ethanol price is still varied due to the raw materials price fluctuation. The RTG set the ceiling price for ethanol at 30c/l which is enough for the initial stage. But as sugar cane, molasses, and cassava price increased due to the lack of supply, the ethanol producers are requested for the upward adjustment of the ceiling price to 40c/l.
4. *Blending and distribution equipment are not ready for general gasoline distributors.* This problem will be solved with the ban of MTBE in the year 2007.

## **Conclusions**

The demand for gasohol 95 and 91 are rapidly increased with the surging of oil price in the world market and the increased in retail gasoline price in Thailand. Diesel is the other transportation fuel with the strong demand in the market. With the amount of diesel usage over 50 million liters/day, RTG is promoting the biodiesel as an alternative for diesel with low blended of 5-10%. In order to promote country-wide distribution of alternative fuel, the collaboration from stakeholders is the crucial factor. So, the commitment of the policy maker is a key in the successful promotion. It can be clearly seen that, the tax exemption and price gap are strong motivators especially in the initial stage of promotion.

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## **Reference**

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