

MEDCO BIOETHANOL PLANT IN KOTABUMI LAMPUNG AND ITS PRODUCTION IMPACTS TO THE SURROUNDING PEOPLE

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ABSTRACT

Government of Indonesia (GOI) has stated its intention to support the development of alternative energy sources including biofuel. As the basis for such a development, GOI through Ministry of Energy and Mineral Resources (MEMR) has discussed it in many energy forums in order to shape a national blueprint for bioethanol and biodiesel. In 2004, total consumption of fossil fuel: gasoline, diesel, kerosene, pertamax and pertamax plus, were 60.06 million kilo Liters (kL), while total production from the existing refineries in Indonesia is only 44.9 million kL in 2005, leaving a deficit that should be imported.

Responding this situation, Medco Energi is committed to invest and initiate its entry by developing Indonesia's first multi-feedstock bioethanol production plant that able to produce ethanol from cassava-derived starch and sugarcane molasses. Biogas produced by the waste treatment facility will be used to optimize the overall energy efficiency. By mid of 2007, it is planned to produce 180 kL industrial-grade ethanol daily and a fuel-grade ethanol will be produced as the market grow. The paper is also described the socio economics and macroeconomic impact of this activities that representing a case study in developing countries that giving subsidize for fossil fuel to their people.

Keywords: Bioethanol, Biodiesel, Cassava, Ethanol grade, Indonesia, Medco, Molasses, Transportation

ABSTRAK

Pemerintah Indonesia menyatakan akan mendukung pengembangan energi terbarukan termasuk biofuel. Sebagai dasar pengembangan, Pemerintah melalui Departemen Energi dan Sumber Daya Mineral (ESDM) telah mendiskusikannya di berbagai forum dalam upaya menyusun peta jalan untuk pengembangan bioetanol dan biodiesel. Pada tahun 2004, konsumsi total bahan bakar minyak: premium, disel, minyak tanah, pertamax and pertamax plus mencapai 60,06 juta kilo Liter (kL), sedang total produksi dari kilang yang ada di Indonesia hanya 44,9 juta kL per tahun 2005, sehingga ada defisit yang harus diimpor.

Merespon situasi ini, Medco Energi menetapkan untuk berinvestasi dan mengawali kegiatannya dengan membangun sistim produksi bioetanol multi-feedstock pertama di Indonesia yang mampu menghasilkan etanol murni dari singkong dan tebu. Biogas yang dihasilkan fasilitas pemroses limbah akan digunakan untuk mengoptimalkan efisiensi sistem keseluruhan. Pada pertengahan tahun 2007 akan diproduksi 180 kL etanol industri per hari dan kemudian akan diproduksi etanol murni menyesuaikan pertumbuhan pasar. Makalah juga menguraikan impak sosial ekonomi dan makro ekonomi dari kegiatan ini yang menampilkan studi kasus disuatu negara berkembang yang memberikan subsidi energi fosil untuk rakyatnya.

Kata kunci: Bioetanol, Biodiesel, Singkong, *Grade* etanol, Indonesia, Medco, Molasses, Transportasi

1. INTRODUCTION

The current Government hot issue is to reduce the imported oil, which need a huge subsidy when its price sky rocketing since 2004.

In January 2005, the CEO of Medco Energi has submitted a road map of oil and gas to the Government via Indonesia Chamber of Commerce and Trade (KADIN) and to elaborate an alternative to oil, that is gas and renewable energy resources [2].

When international crude petroleum price was about US\$60, the subsidy for oil and gas in 2005 was IDR134 trillion or about US\$13 billion. In the second week of April 2006 the price raised to US\$67-68 per barrel, while the set price in the country's income and expenditure (APBN) 2006 is only US\$57 [3]

In 2004, total domestic consumption of fossil fuel (gasoline, diesel, kerosene) were 59.4 million kL and the need of pertamax and pertamax plus in total was 0.66 million kL. In 2005 the total consumption reached 65.7 million kL (7% higher than that in 2004). On the other hand, total production of the existing refineries is limited to only 44.9 million kL in 2005, leaving the deficit to be purchased from international market.

In 2005, the need for gasoline (or premium) is 15.2 million kL and for diesel oil is 26.3 million kL [4]. This fact reflects a large potency of bioethanol as blending component for gasoline.

Assuming the growth rate is 3% per year, the gasoline demand in 2006 will be 16 million kL, and in 2007 will be 17.5 million kL. The use of full-grade bioethanol (C₂H₅OH) as blending component with gasoline up to 5% v/v will require 900 thousands kL. Popular code of this mixture is E5. Current production capacity of bioethanol in Indonesia is only 20% of this demand. Octane value of E10 is 91, while gasoline is only 87. This makes E10 similar to Pertamax, which is more expensive than gasoline. Target for substituting gasoline until 2025 is given in Table 1 [5]. There is a huge gap which must be filled by the bioethanol production plants.

Table 1. Target to substitute gasoline until the year 2025

Consumption rate is predicted 7% per year [5]

	Unit	2005	2006	2007	2008	2009	2010	2025
Predictied gasoline consumption	thousand KL	16 050	17 170	19 370	19 660	21 036	22 500	62 110
Percentage of gasoline substitution	%		1	4	7	10	10	50
Volume of bioethanol needed	thousand KL		172	735	1 376	2 100	2 261	30 000
Raw Material (Cassava) needed	thousand tones		1 200	4 800	8 900	13 650	14 600	

KL is kilo Liters, in the text is written as kL, tones in the text written as tons

Socio-economy in Indonesia is given below [1]:

Population (million)	216.42
Life expectation (years)	66.18
Poor population (%)	16.66
Poverty line (IDR/cap/month)	122,775
Labor force (million)	102.75
Unemployment rate (%)	9.86
Per capita GDP US\$	1000

Unemployment, huge population, poverty alleviation, legal aspect and the use of alternative energy is important parameters that should be tackled in development.

It is easy to plant cassava, sugarcane, palm tree, corn, potatoes, sweet potatoes, rice especially for a country where majority are farmer. These are the raw material to derive ethanol. Indonesia is the 5th biggest sugarcane producer in the world, the 5th biggest cassava producer and the 2nd biggest palm oil producer, but the growth of ethanol industry in Indonesia is slow. The existing ethanol factories produce 200 million liters ethanol /year.

This is small compared to Brazil, the biggest ethanol producer in the world that produces 18 billion liters per year. Brazils ethanol made from molasses is the cheapest price in the world. Sugarcane plantation in Brazil is about 5.5 million hectare and will grow to 10 million hectare by the year 2015. Their gasohol uses ethanol as blending component until 25%. More than 4 million vehicles use gasohol in 2004.

In the USA, the bio-ethanol utilization began with the sign of Energy Policy Act on August 2005 including Renewable Fuel Standard. This policy made the USA become the biggest producer and consumer of bio-fuel in the world, with 90% of ethanol is made from corn and 10% is made from wheat. Japan recently begins to use E3 and E5 of gasohol and will increase to E10 in 2010 [6]. The price of ethanol/m³ FOB in Brazil, Thailand, China, USA, Indonesia, France and Germany are US\$250, 295, 315, 375, 380, 540 and 620 respectively.

2. MEDCO BIOETHANOL PLANT

Medco Energi Internasional is a public company in Indonesia, which owns blocks of oil and gas in 4 countries and its production is over 67,000 barrel oil equivalents per day.

Medco Energi intends to initiate its entry into the renewable energy sector by developing Indonesia's first multi-feedstock bio-ethanol production plant that able to produce ethanol from non-edible cassava derived starch and from sugarcane molasses as a buffer feedstock.

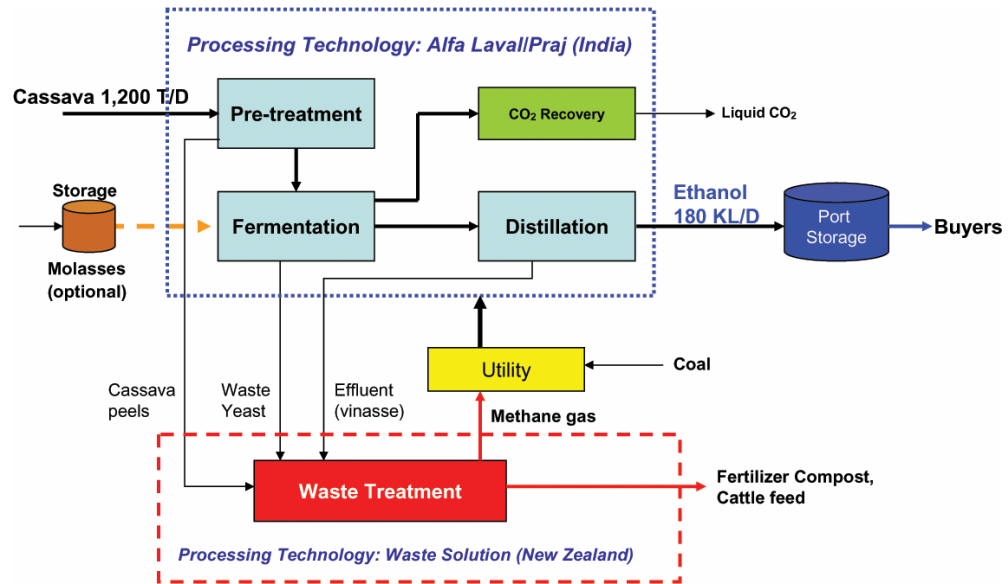
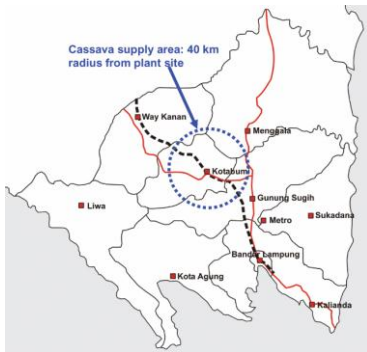


Fig. 1. Lay-out of Indonesia’s first multi-feedstock bio ethanol production plant. It is able to produce ethanol from cassava derived starch and from sugarcane molasses [7].

It operates in low pressure of 3.5 bars and low temperature of 90°C. All components are manufactured locally. In order to optimize the overall energy efficiency, biogas produced by its waste treatment facility will be used in the production process. The remaining sludge can be processed into compost. Two feeding schemes are applied:

- 396000 tons/year cassava only
- Combined feedstock of 258000 tons/year cassava and 64350 tons/year molasses.

At the first stage, an industrial-grade ethanol (96.5% purity) of 180 kL per day will be produced by May 2007. The capital cost is US\$31.5 million.



On the left is the site location in Lampung province, southern end of Sumatera Island at Kotabumi. This ethanol project shall become the largest independent ethanol plant in Indonesia, see Table 2. When the market demand grows, Medco Energi will scale up this facility and produce full-grade ethanol (99.999%) [7].

Photo on the right shows high-yielding cassava variety taken on January 6, 2004 in Lampung. One tree gives 27 kilogram non-edible cassava after 12 months grown. Therefore, harvest of 80-100 tons/ha can be expected [8]



As a business entity in oil and gas, Medco Energi has program named as a Community Social Responsibility (CSR) for community development, through a Micro Financing Services. It is merely a sincere dedication to build a strong and sustainable partnership between Medco Energi and local communities to achieve a common goal of prosperous coexistence. Recently, the Micro Financing Service program has enrolled 238 small entrepreneurs including groceries, vegetable seller, carpenters, tailors, traditional bakers and barbers. One of the programs is to integrate them into 28 groups in order to empower the economic of each member of the group. The total funding to support this program is IDR238.4 million. This program is further supported by Local Government and Private Sector; creating synergies to provide maximum benefits in social and economic development, including relief the victims of natural disaster, improve education, health and public utilities.



Fig. 2. Micro Financing Services

3. MARKETING STRATEGY

140 kL /day is sold under long term contract. Negotiation with the buyer is on progress and ready to proceed into sales purchase agreement. There will be 3 road tankers of 32 kL that run 2 trips per day to the storage. For 45 days inventory, storage capacity of 8100 kL is needed (3100 kL on site and 5000 kL at the port). Ship-tanker of 2000 kL capacity sails per 12 days. The rest of 40 kL is sold on spot basis.

The price of rectified industrial grade ethanol per March-May 2005 was US\$ 0.4 /liter (FOB Lampung). Production cost is US\$ 0.2 /L. It shows a positive balance. The price of full grade ethanol without tax is IDR4350/Liter, gasoline with partly subsidy IDR4500/L, made the price of E10 is $\text{IDR}4485 \{=(0.9 \times \text{IDR}4500) + (0.1 \times \text{IDR}4350)\}$ [5]. It is cheaper than gasoline alone.

Table 2. Ethanol Production in Indonesia

Name of Factory	Percentage
Medco Ethanol Lampung	25.4 %
Indo Acidatama	19.8 %
Molindo Raya	17.0 %
Indo Lampung Distillery	17.0 %
Aneka Kimia Nusantara	6.4 %
PG Rajawali	4.5 %
PTPN XI	3.0 %
Several small factories	6.9 %
Total	100 %

Table 3. Bioethanol Standard [5]

Note: Min. is minimum, Max. is maximum

Min.alcohol content, at 20C, % v/v	99.5
Max.water content, % v/v	0.4
Max.asetaldehyd in 100% ethanol, g/L	0.2
Max.fusel oils in 100% ethanol, g/L	0.2
Max.methanol content, % v/v	0.1
Max.acid acetate in 100% ethanol, g/L	0.03
Max.ethil acetate in 100% ethanol, g/L	0.2
Max.dry particulate in 100% ethanol, g/L	0.02
Max.copper content, mg/kg	0.1
Max.clorine content, mg/kg	40

In the second week of April 2006 the oil price raised to US\$67-68 per barrel. This situation has made E10 become an appropriate alternative. Discussion on the national standard grade of bioethanol is on progress. The proposed standard is given in Table 3.

National policy for E5 or E10 is not decided yet. It is expected to be published soon to courage trading and its implementation in transportation sector.

National policy for diesel oil has been published by Directorate General for Oil and Gas at the Ministry Office of Energy and Mining, Indonesia. It is allowed for diesel oil to have fatty acids methyl ester (FAME) until 10% volume. Popular code is B10.

The International World Wide Fuel Charter dated December 2002 stated only 5% [9].

4. ECONOMY IMPACT OF ETHANOL PRODUCTION

Cassava plantation in Sumatera is 352,403 hectares that gives 5742 thousand tons/year. In Java island is 665,357 hectares and gives 10,682 thousand tons/year [5].

Molasses is the side product from sugarcane mill factory, but it available in 5 months per year only. Molasses product is about 4% of factory's crushing capacity. Molasses in Sumatra is lower in grade than that from Java

In 2003, the price of cassava in Lampung fluctuated between IDR150 - 225/ kg. Cassave production fluctuated between 12.5 - 35 tons/ha depending on the variety, farming practice, cultivation management and distribution channel. Small farmer produces less than corporate farmers. Production classifications are: traditional (12.5 tons/ha), semi intensive (20 tons/ha), intensive (30 tons/ha) and highly intensive (35 tons/ha).

Medco Energi will buy cassava and molasses from the surrounding farmers in radius of 40 km to feed their ethanol plant. Farmers will get assistance from factory to improve productivity and to increase starch content. CSR program covers knowledge sharing on cultivation technique to plant high-yielding cassava variety (80-100 tons/ha), planting schedule, logistic support and working capital. This assistance program had been started in July 2005 for one year period. Contractual supply agreement will be commenced in July 2006.

The next harvest of the second year will be the first round of feedstock to the ethanol plant. This socio economics approach might representing a case study in developing countries that give subsidize for oil and gas provision to their people.

5. CONCLUDING REMARKS

The problems with Renewable Energy (RE) application in Indonesia are:

- RE technology as the alternative energy is not in the prime mind yet.
- limited knowledge on production of RE technologies to harness RE resources.
- difficulties in getting international cooperation.
- limited incentive from the government
- difficulties in getting financial support from the banks.

To overcome these problems, the government exerted consecutive campaigns for alternative energy in order to make Indonesian people change the paradigm of alternative energy and to courage a new business of energy alternative in Indonesia.

Promote the regulation to courage RE implementation and incentive as reward is a must to leverage the will and the spirit to face the energy problems.

Nowadays is considered as an appropriate time to do some business on RE.

Energy alternative to oil is the major concern of the Indonesian Government. Medco Energi will do more pioneering action in this field and courage their networks to do the same. Developing bioethanol production plant is selected as the answer to contribute a solution to overcome the fast growing need of fuel in transportation sector. Consumers will also have a better fuel.

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