

**TECHNOLOGICAL PROGRESS AND
COMMERCIALIZATION OF BIODIESEL
IN MALAYSIA**

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**MINISTRY OF PLANTATION INDUSTRIES & COMMODITIES
(MPIC)
MALAYSIA**

AVAILABILITY OF PALM OIL FEEDSTOCK FOR BIODIESEL, MALAYSIA (2006)

- **World's largest palm oil producer and exporter**
- **Production 15.88 million tonnes**
- **Exports 14.42 million tonnes**
- **Export value of oil palm products: RM31.85 billion**

OIL YIELD

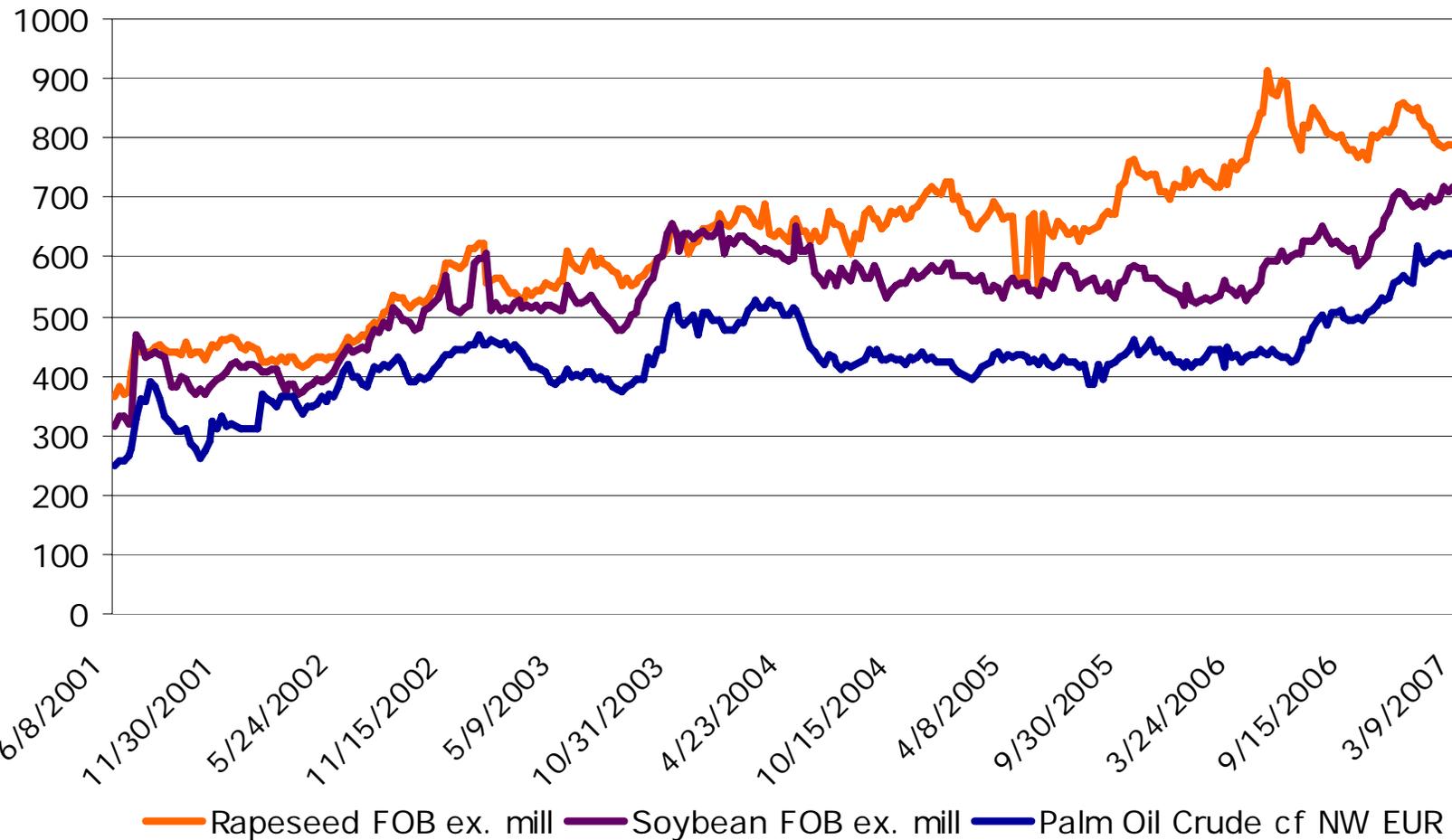
	Yield (tonne / ha / yr)
Palm Oil (Malaysia)	3.80*
Rapeseed (EU)	1.33**
Soyabean (USA)	0.46**
Sunflower (Argentina)	0.66**
Jatropha	3.00***

Highest Yield
& Most
Economical
Oil

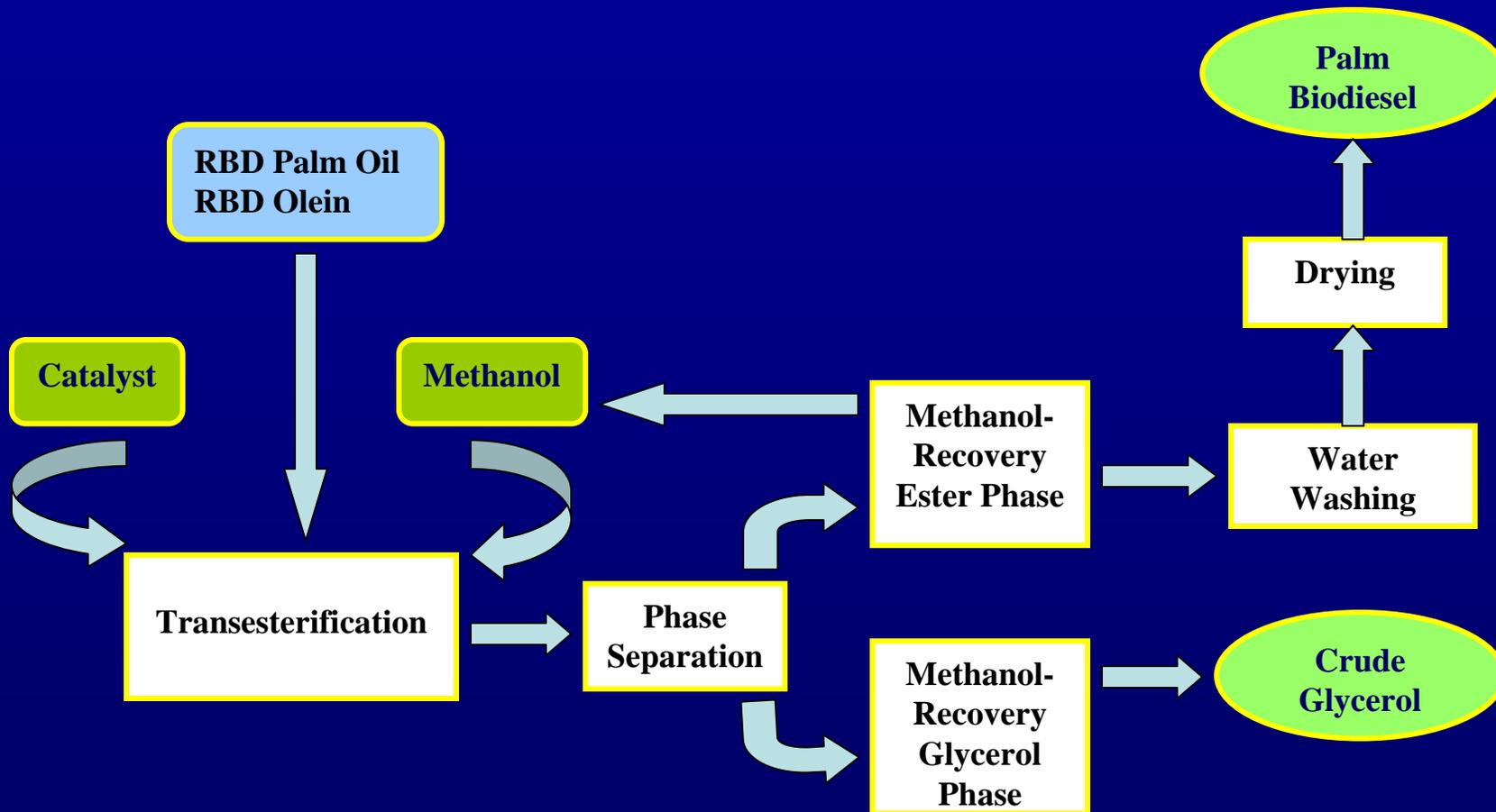
Source: * MPOB (2005) ** Khoo (2001) *** Khoo H.A. (2007)

MARKET PRICE TREND OF WORLD MAJOR VEGETABLE OIL

- Traditional price discount of palm oil eroded in recent months



CURRENT MPOB PALM BIODIESEL PROCESS



DEVELOPMENT OF MPOB PALM BIODIESEL TECHNOLOGY

- Idea conceived – 1981
- Lab scale R&D – 1982
- Continuous Pilot plant (3,000 TPA) built and commissioned – 1985



MPOB Palm Biodiesel Pilot Plant

EXHAUSTIVE FIELD TRIALS USING PALM BIODIESEL

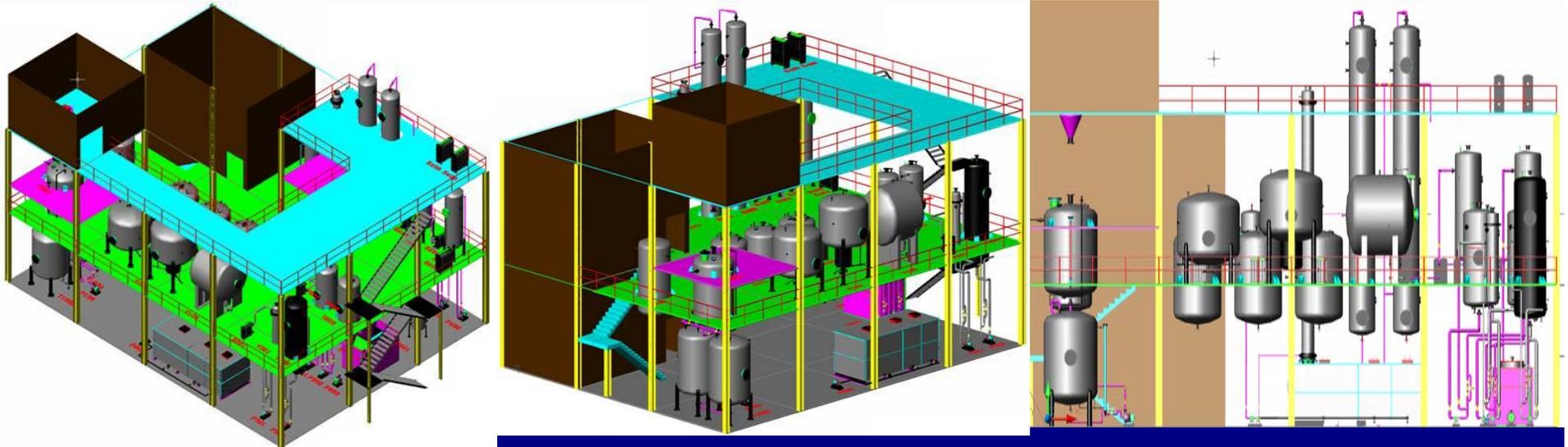
- Produces palm biodiesel for stationary engine testing and field trial (1985-1995)
- Most exhaustive field trial was conducted with Mercedes Benz (1990-1994)
- Palm biodiesel (B100) tested as fuel for passenger trains in Europe





- Each bus covered 300,000km
- Fuel Tested:
 B100 & B50
 100% Petroleum Diesel (Control)
- Cleaner emissions, no technical problems

MPOB COMMERCIAL PALM BIODIESEL PLANTS

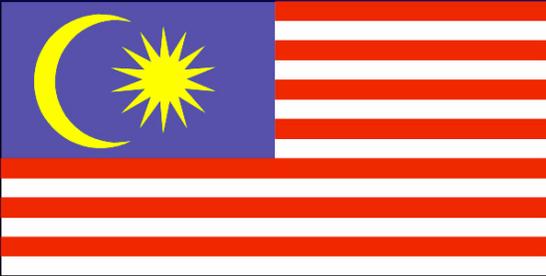


Three (3) demonstration plants were built using MPOB Technologies
Each plant consists of a 60,000 TPA normal biodiesel plant and a
30,000 TPA winter fuel plant.

MPOB BIODIESEL TECHNOLOGY COMMERCIALISATION

- **Engineering Design Drawings for Scaling Up Completed in 2005**
- **Scaling design for both normal biodiesel and winter grade biodiesel completed**
- **Technology licensed to two Malaysian Companies, Lipochem Sdn. Bhd. and Oiltek Sdn. Bhd.**

OTHER PLANTS USING MPOB TECHNOLOGY

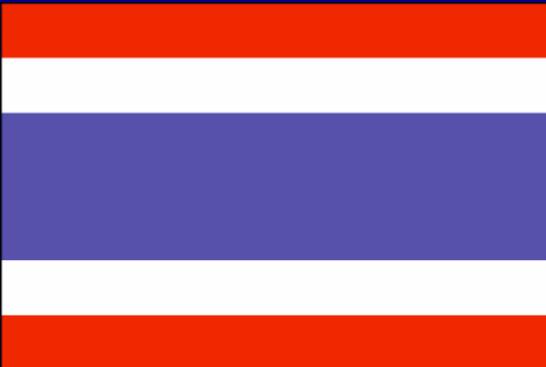


Pulau Indah, Klang, Selangor Darul Ehsan

Capacity : 120,000 tonnes/year

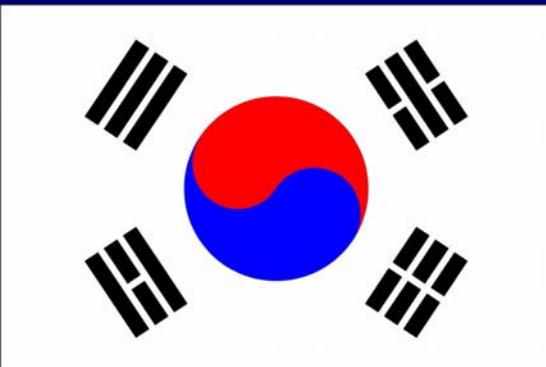
Pasir Gudang, Johor Darul Takzim

Capacity : 120,000 tonnes/year



Surat Tani, Thailand

Capacity: 60,000 tonnes/year



ENERTECH Co. Ltd.

Pyeongtaek, SOUTH KOREA

Capacity: 60,000 tonnes/year

Status : Commissioned



WINTER GRADE PALM BIODIESEL PLANT (Capacity: 30,000 mt per year)

Three Plants built
CFPP UP TO -21°C





- **MPOB-Carotino Winter Grade Plant is in commercial production.**
- **Winter grade palm biodiesel has been sold to temperate countries.**

MPOB PALM BIODIESEL PLANT : OVERALL PLANT PERFORMANCE

- **Overall Yield (Biodiesel) : 98%
(promised 96.5%)**
- **Products meeting full EN 14214 and
ASTM D6751 specifications**
- **Commissioning time : Full EN and
ASTM specs. may be achieved in less
that 24 hours of feeding in RBD palm oil**

FUEL PROPERTIES OF PALM BIODIESEL vis-à-vis EN14214 & ASTM D6751

Properties	Unit	EN 14214		ASTM D6751		Palm Biodiesel
		Min	Max	Min	Max	
Ester Content	% mass	96.5	-	-	-	98.5
Density at 15°C	g/cm ³	0.860	0.900	-	-	0.8783
Viscosity at 40 °C	cSt	3.5	5.0	1.9	6.0	4.415
Flash Point	°C	120	-	130	-	182
Sulphur Content	% mass	-	0.001	-	0.0015	<0.001
Carbon Residue (on 10% distillation residue)	% mass	-	0.3	-	0.05	0.02
Cetane Number	-	51.0	-	47.0	-	58.3
Oxidative Stability, 110°C	hours	6.0	-	-	-	>6
Copper Strip Corrosion (3h at 50 °C)	rating	1	-	-	3	1a

EN14214: European Standard for Biodiesel

ASTMD6751: Standard Specification for Biodiesel Fuel (B100) Blend Stock for Distillate Fuels

FUEL PROPERTIES OF PALM BIODIESEL vis-à-vis EN14214 & ASTM D6751

Properties	Unit	EN 14214		ASTM D6751		Palm Biodiesel
		Min	Max	Min	Max	
Sulphated Ash Content	% mass	-	0.02	-	0.02	<0.01
Basic Sediment and Water	% mass	-	0.05	-	0.05	<0.05
Acid Value	mg KOH/g	-	0.5	-	0.8	0.08
Pour Point	°C	Report		Report		15
Iodine Value	-	-	120	-	-	52
Content of Linolenic Acid Methyl Esters	% (m/m)	-	12	-	-	<0.5
Content of Polyunsaturated Methyl Esters (more than 3 double bonds)	% (m/m)	-	1	-	-	<0.1

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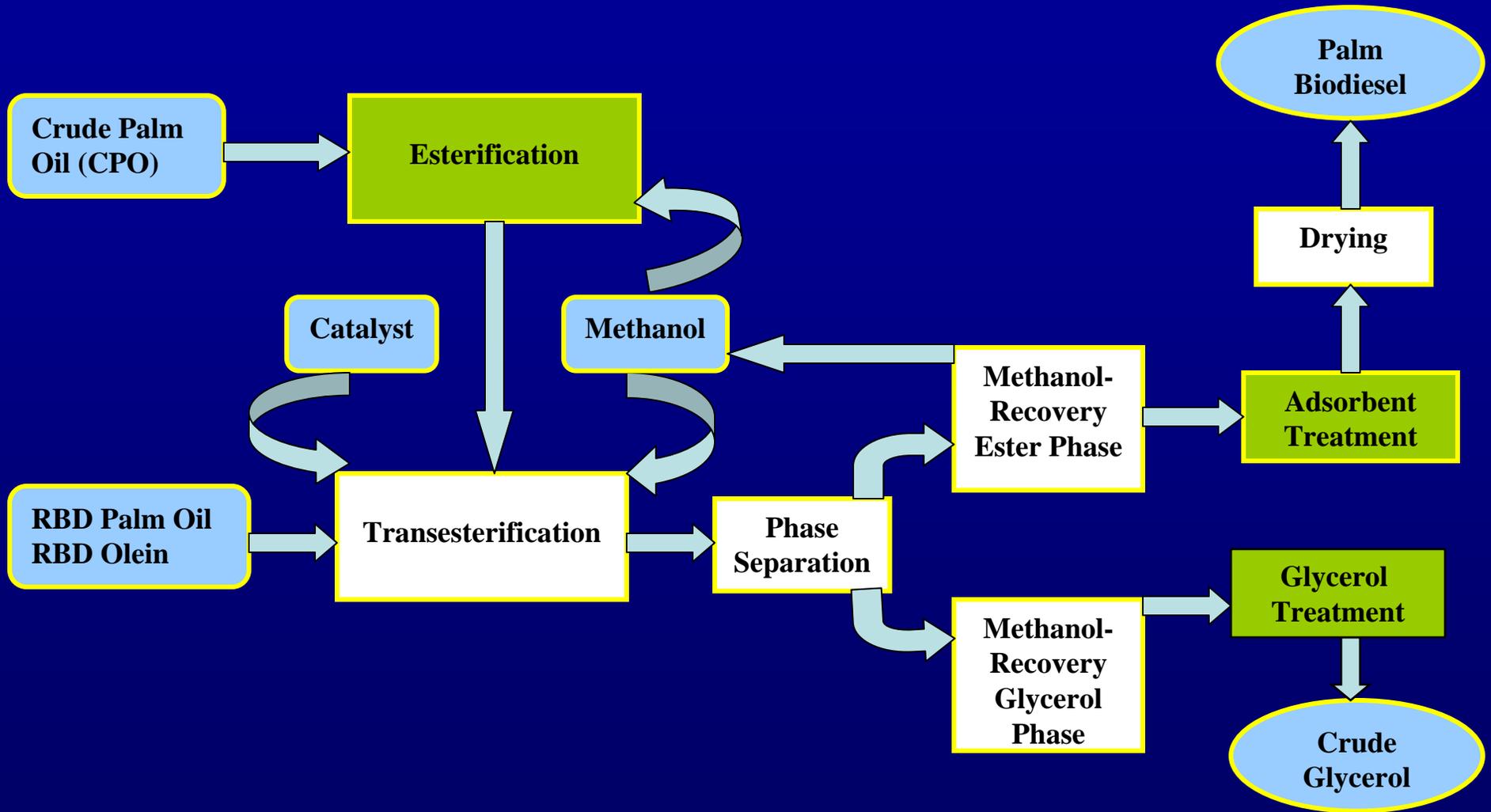
FUEL PROPERTIES OF PALM BIODIESEL vis-à-vis EN14214 & ASTM D6751

Properties	Unit	EN 14214		ASTM D6751		Palm Biodiesel
		Min	Max	Min	Max	
Methanol Content	% (m/m)	-	0.2	-	-	<0.2
Monoglycerides	% (m/m)	-	0.8	-	-	<0.4
Diglycerides	% (m/m)	-	0.2	-	-	<0.2
Triglycerides	% (m/m)	-	0.2	-	-	<0.1
Free Glycerol	% (m/m)	-	0.02	-	0.02	<0.01
Total Glycerol	% (m/m)	-	0.25	-	0.24	<0.01

EN14214: European Standard for Biodiesel

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IMPROVEMENT TO MPOB PALM BIODIESEL PROCESS

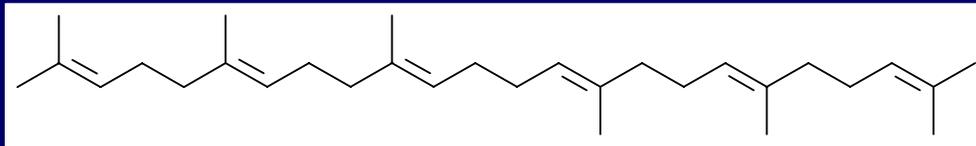
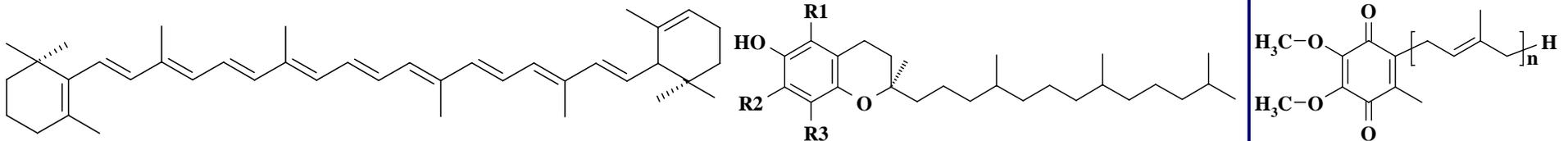


VALUE-ADDED PRODUCTS FROM PALM OIL METHYL ESTERS

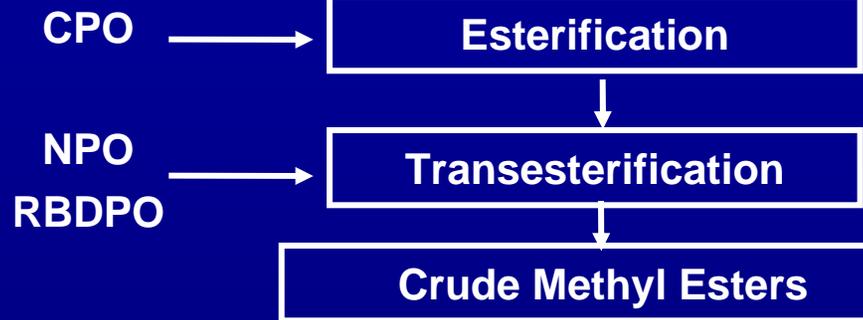
- One (1) tonne of methyl esters contains:

- 0.6 kg Carotenoids
- 0.8 kg Vitamin E
- 0.5 kg Phytosterols
- 0.4 kg Squalene
- 0.05 kg Coenzyme Q
- 0.06 kg Phospholipids

Worth ~ US 970
(RM 3,400)



MPOB PHYTONUTRIENTS TECHNOLOGIES



Fractional distillation

- C16:0 – α -SME
- C18 mixed – low pour point biodiesel
- Vitamin E, sterols and squalene

Integrated Process

- Distilled methyl esters
- High purity phytonutrients
e.g. Carotenes >30%
Vitamin E >70%
Squalene >70%
Sterols >95%
- Fine chemicals



THE NATIONAL BIOFUEL POLICY



MINISTRY OF PLANTATION INDUSTRIES AND COMMODITIES
MALAYSIA

21 March 2006

STRATEGIC THRUSTS

THRUST 1 : USE OF BIOFUEL FOR TRANSPORT

THRUST 2 : USE OF BIOFUEL FOR INDUSTRY

THRUST 3 : DEVELOPMENT OF HOME GROWN
BIOFUEL TECHNOLOGIES

THRUST 4 : PRODUCTION OF BIOFUEL FOR
EXPORT

THRUST 5 : BIOFUEL FOR CLEANER
ENVIRONMENT

- **National Biofuel Policy
released 21 March 2006**

NEW BIODIESEL PLANTS - STATUS

- **92 licences to set up biodiesel plants approved.**
- **Current freeze on new licenses**
- **Currently 4 plants in operation 300,000 tonnes/annum capacity**
- **Another 4 plants under production trials 272,000 tonnes/annum capacity**

BIODIESEL PRODUCTION - CHALLENGES

- **Rise in palm oil prices RM1400 in 2006 to RM2850**
- **Margins have thinned, in fact become negative**

RBD Palm Oil \approx USD750 - 850 per tonne

Palm Biodiesel \approx USD850 per tonne

F.O.B (Malaysia)

Cost of Production \approx USD120 per tonne

LOCAL BIOFUEL USE

- **Local use of biodiesel blended with diesel still not commercially implemented**
- **Government still has not decided on type of biofuel, whether RBD Palm Olein or Methyl Ester**
- **Trials using blend of 5% RBD Olein and 95% diesel still on-going on government vehicles, commercial buses and fishing boats**
- **No technical breakdown on vehicles reported so far**
- **No-Harm Tests with Petroleum Research Institute on-going. Results expected end of 2007**

LEGAL FRAMEWORK

- **Malaysian Biofuel Industry Act 2006 passed by Parliament in 2007**
- **Contains provision to mandate blending of biofuel with diesel through regulations made by Minister**
- **Drafting of regulations under way**
- **No decision yet on implementation. Need to consider type of biofuel, percentage, subsidies required etc.**

ENVIRONMENT

- Environment consideration one of the Thrusts for Malaysia's Biofuel Policy
- GHG reductions for palm oil reportedly relatively good

Palm Oil (Malaysia/Indonesia)	60 - 80%
Corn (USA)	5 - 30%
Sugar Beet (EU)	22 - 50%
Wheat (EU)	22 - 68%
Rapeseed (EU)	43 - 58%
Sugar Cane (Brazil)	85 - 95%

ENVIRONMENTAL CHALLENGES

- **Threats, especially from EU questioning sustainability of palm oil production for biodiesel**
- **Allegations of destruction of orang utans, rainforests and loss of biodiversity**
- **Allegations that development of peat land gives net emission of GHG**

CURRENT ACTIONS ON ENVIRONMENT

- **Awareness campaigns and actions by MPOC on sustainability**
- **Life Cycle Assessment on whole value chain**
- **Establishment of Tropical Peat Research Institute**
- **Establishment of Oil Palm Wild Life Conservation Fund**

NEXT GENERATION OF TECHNOLOGY OIL PALM BIOMASS CONVERSION

- Bioethanol from oil palm biomass
- Oil palm biomass to gas
- Oil palm biomass to liquid

Pursuing R&D

Felled Oil Palm Trunks (OPT)



Pruned Oil Palm Fronds (OPF)



Empty Fruit Bunches (EFB)



Thank You

