

National Biodiesel Implementation in Malaysia: An Update

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Biodiesel is considered as one of the most promising alternative fuels for the transportation sector, replacing conventional diesel fuels. The use of biodiesel is aimed at addressing concerns over dependency on fossil fuel linked to global warming/climate change caused by greenhouse gas (GHG) emissions by the transportation sector.

Malaysia is blessed with a golden crop, *viz.*, oil palm which is a well-known and versatile commodity in the world's oil and fats market. Palm biodiesel or palm methyl esters has been found to be a promising renewable fuel comparable to petroleum diesel. Scientifically, almost an equal amount of palm oil is converted into palm biodiesel (a 1:1 ratio). The palm biodiesel produced is mainly used locally despite a huge export market challenged by sustainability issues.

The total biodiesel export for 2016 was 83 581 t with export value of RM 247.71 million. From the economic point of view, the domestic use of palm biodiesel in Malaysia helps to stabilise the fluctuating market price of crude palm oil (CPO). As oil palm is one of the highest yielding crops, a considerable quantity of the oil can be spared for biodiesel production, without jeopardising its use as a food source. At the same time, it also mitigates about 1.0 million t CO₂ eq of the total GHG emitted (28.3 million t CO₂ eq) by the road transportation sector.

RESEARCH AND DEVELOPMENT OF PALM BIODIESEL IN MALAYSIA

Much effort has been put forward by the Malaysian Palm Oil Board (MPOB) to look for an alternative fuel to petroleum-based

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fossil fuels. MPOB first embarked on the research and development (R&D) of palm biodiesel in the 1980s, with ideas conceived to convert palm oil into fatty acids methyl ester (FAME) via a process called transesterification. The resulting FAME has been thoroughly examined, tested and proven to be a superior diesel substitute. The first palm biodiesel pilot plant (3000 tpa) using MPOB palm biodiesel technology was built in 1985 at the MPOB's premises in Bangi, Malaysia. Subsequently, MPOB has also developed the winter-grade palm biodiesel for export market. In 2006, the first state-of-the-art integrated palm biodiesel commercial plant was set up by Carotino Sdn Bhd. This successful commercialisation has spurred tremendous private investment and subsequently induced the growth of the Malaysian biodiesel industry to what it is today. To-date, MPOB has successfully built nine normal grade and three winter-grade palm biodiesel plants in Malaysia. The MPOB biodiesel technology has also been commercialised overseas with two biodiesel plants in Thailand and one each in Colombia and South Korea.



Figure 1. MPOB Palm Biodiesel Pilot Plant (3000 TPA).

IMPLEMENTATION OF B5 AND B7 PROGRAMME FOR TRANSPORTATION AND FISHERIES SECTORS

In preparation for the national biodiesel implementation in Malaysia, MPOB has initiated field trials using B5 (blends of 5%

palm biodiesel with 95% petroleum diesel) with two government agencies *i.e.* the Kuala Lumpur City Hall (DBKL) and the Armed Forces, all in involving 3900 vehicles. The trial period (February 2009 - December 2011) utilised 1100 t of palm biodiesel. The B5 was prepared using the splash blending facilities available at the Klang Valley Distribution Terminal (KVDT). With no technical problems reported in these trials, the government decided to introduce the B5 programme in stages starting in June 2011. This programme was fully implemented in Peninsular Malaysia in March 2014 involving the transportation (in all retail stations) and fisheries sectors. Following a globally accepted B7 diesel blend, the government announced the upgrading of B5 to B7 (7% palm biodiesel with 93% petroleum diesel) in October 2014. The B7 programme was successfully mandated in Peninsular Malaysia in November 2014 while the East Malaysia in stages by December 2014.



Figure 2. Launching of B7 programme at Bintulu, Sarawak in February 2015.

The Government has invested in setting up the biodiesel in-line blending facilities in cooperation with five petroleum companies at some 35 petroleum depots throughout Malaysia to ensure all the diesel fuels sold in Malaysia meet the desired blending accuracy. These depots are owned by Petronas Dagangan Berhad, Shell Malaysia Trading, Petron Malaysia Berhad, Boustead Petroleum Marketing Sdn Bhd and Chevron Malaysia Limited.



Figure 3. Installation of in-line blending facilities and two units of palm biodiesel storage tanks at a petroleum depot.

PREPARATION FOR THE IMPLEMENTATION OF B10 FOR TRANSPORTATION AND B7 FOR INDUSTRIAL SECTORS

Since the mandatory implementation of B5 and B7 programmes for about three to five years, no technical issues have been reported to-date. With this success, the government has planned to implement a higher blend *i.e.* B10 programme for the transportation sector and B7 programme for the industrial sector in the 4th quarter of 2016. In this regard, the Ministry of Plantation Industries and Commodities (MPIC) together with MPOB has put in place several strategies and action plans to address any unforeseen problems and hiccups which may arise. In addition, extensive consultations with automotive companies, petroleum companies and other relevant stakeholders have been carried out. However, after a thorough study, taking into consideration the price difference between CPO and petroleum diesel at current volatile market, the government has decided to defer this until further notice.

Despite the postponement of this higher biodiesel blends implementation, MPOB has continued aggressively, several B10 and B20 trials and at the same time worked on strengthening the communication plan to create public awareness. A series of engagement is actively being pursued with stakeholders *e.g.* government agencies (Malaysian

Automotive Institute, Department of Road Transport, Department of Environment, *etc.*), automotive associations (Japanese Automobile Manufacturers Association, Malaysian Automotive Association, *etc.*), original equipment manufacturers through the Malaysian diesel vehicle dealers, fuel injector equipment manufacturers, Malaysian Biodiesel Association (MBA) and petroleum companies.

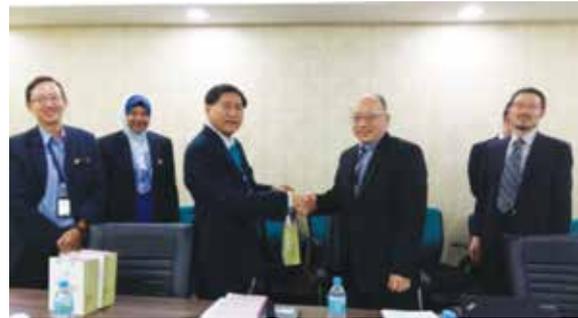


Figure 4. Meeting with the Japanese Automobile Manufacturers Association (JAMA).



Figure 5. Meeting with the Department of Road Transport Malaysia (JPJ).



Figure 6. Meeting with the Malaysian Automotive Institute (MAI).



Figure 7. Consultation session with the Malaysian Automotive Association (MAA).

i. Field Trials on B10/B20

MPOB has started using B10 and B20 since January 2013 for its 25 vehicles. Fuelling these vehicles with B10 and B20 was done at the MPOB fuel station located at its headquarters in Bangi. Normal services to the vehicles have been carried out at the recommended interval implying no specific technical issues. Those vehicles that had travelled >100 000 km using B10 show no signs of drop in their engine performance.



Figure 8. Fueling of B10 at MPOB fuel station.

On top of this, the B10 trial with DBKL commenced in April 2014 with 50 vehicles and some machineries including lorries and shoveled tractors. So far, all the tested vehicles are in normal condition without any technical problems. The injector of one unit of vehicle was tested via diagnostic test and found to be in normal working condition after running 60 000 km using B10. Besides, the exhaust and smoke emissions test of two units of vehicles was found to be in full

compliance with the maximum opacity limit set by the DOE.



Figure 9. Exhaust emission test by the Department of Environment (DOE) Malaysian.

Alam Flora has started using B10 for a unit of its armroll lorry since February 2014. So far, the lorry that has consumed about 20 000 litres of B10 and covered 57 700 km showed satisfactory results without negative feedbacks on fuel filter plugging and engine oil dilution or degradation. Besides, there is no difference in fuel consumption between B10 and normal diesel.



Figure 10. Fueling the Alam Flora's armroll lorry with B10 at MPOB fuel station.

ii. B10 communication plan

For educational and awareness programme, MPOB has been channeling the facts and addressing the skeptical view of using palm biodiesel continuously *via* social media platforms *e.g.* conducting technical briefing with the editors and the online automotive opinion leaders in December 2016.



Figure 11. Discussion with NST group.

Two expeditions using B10 have been organised by MPOB to expose the public to B10. The first expedition was held in January 2017 in collaboration with the Malaysian Recreational Off-Roaders Society (MyRoff) and participated by 12 different 4x4 driving club members in Peninsular Malaysia. The three days and two nights 4x4 expedition began from Teluk Intan, Perak through Sungai Koyan, Pahang, Gunung Stong, Pos Tohoi, Gua Musang, Jeli, Kuala Kangsar and ended in Kuala Lumpur, covering 1220 km. The second one, the Trans-Borneo expedition was held in March 2017, participated by media groups from the West and East Malaysia.

It started the journey from Belaga to Miri across Brunei, to Lawas, Keningau, Ranau and ended in Kundasang, Sabah. A total of 15 4x4 vehicles of various models and four tankers participated in this five days and four nights expedition which covered 1000 km.



Figure 12. The flag off of the 4x4 expedition using B10 at the Leaning Tower (Menara Chongdong), Teluk Intan, Perak in January 2017.

CONCLUSION

The palm biodiesel offers not only significant and impactful environmental benefits *i.e.* notably mitigating GHG emissions in pursuing a greener automotive footprint, but also yields tremendous socio-economic benefits for the country as a whole. The introduction of B10 and B7 for the transportation and industrial sectors, respectively is estimated to reduce emissions equivalent to removing 120 000 cars off the road. This, indirectly also contributes to an increased demand *vis-à-vis* decreased stocks for palm oil.