



The use of traditional petroleum-based grease raises environmental and food safety concerns. On the other hand, there is a scarcity of local grease manufacturers in Malaysia, highlighting the necessity to transfer grease processing technology and reduce dependence on imported greases. According to a market study (Markets and Markets, 2022), the global grease market is growing at a 2.9% CAGR and is expected to reach USD6.1 billion by 2025. About 90% of grease consumption is accounted for by mineral greases, while the remainder (130 kT) is for bio-based grease (Panchal *et al.*, 2015; Sharma and Phadke, 2014). Based on a recent report (Mordor Intelligence, 2023), the overall grease consumption in Malaysia is at least 15 kT, of which about 1.5 kT is bio-based grease. The overall grease consumption of the Malaysian palm oil industry is estimated to be about 2 kT, considering the size of the industry relative to other industries.

One of the driving factors for the bio-based grease market growth is the list of restrictions imposed by environmental regulatory bodies such as the Vessel General Permit for Discharges Incidental to the Normal Operation of Vessels (U.S. EPA, 2010). The regulations encourage the development of

environmentally friendly products, such as bio-based grease, so that no chemical treatments are required when grease residues are released into the environment. On the other hand, the significance of lubricant discharges (non-accidental spills) to the aquatic ecosystem is substantial. Most ocean-going ships operate with oil-lubricated stern tubes and use lubricating oils for various applications in machinery on deck and underwater (submerged).

Therefore, MPOB has developed a palm-based grease formulation and processing technology specifically designed for food-grade applications such as the milling and processing sectors of the oil palm industry and biodegradable applications such as marine wire-rope grease.

THE TECHNOLOGY

Palm-based food-grade biodegradable grease (Figure 1) is made from high bio-based palm-based esters and NSF HX1, and FDA-approved ingredients for food-grade and biodegradable applications.

The characteristics and properties of this grease product are listed in Table 1.

TABLE 1. GREASE PRODUCT CHARACTERISTICS

Characteristics	Methods	Properties
NLGI grade	ASTM D217	2
Colour	Visual	Orange
Appearance	Handfeel	Tacky
Operating temperature	/	-20°C to 120°C
Penetration at 25°C	ASTM D217	282 x10 ⁻¹ mm
Four-ball weld load	ASTM D2596	200 kg
Anti-rust performance	ASTM D4048	1b
Dropping point	ASTM D2265	>150°C
Oil separation	ASTM D6184	0.12%

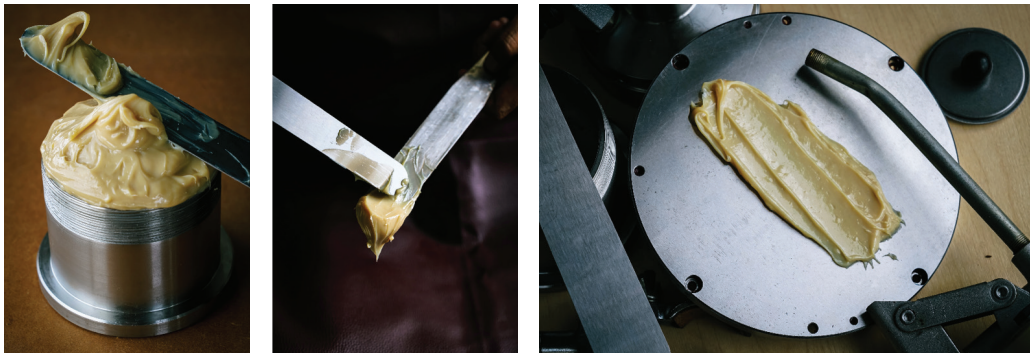


Figure 1. Palm-based food-grade biodegradable grease.

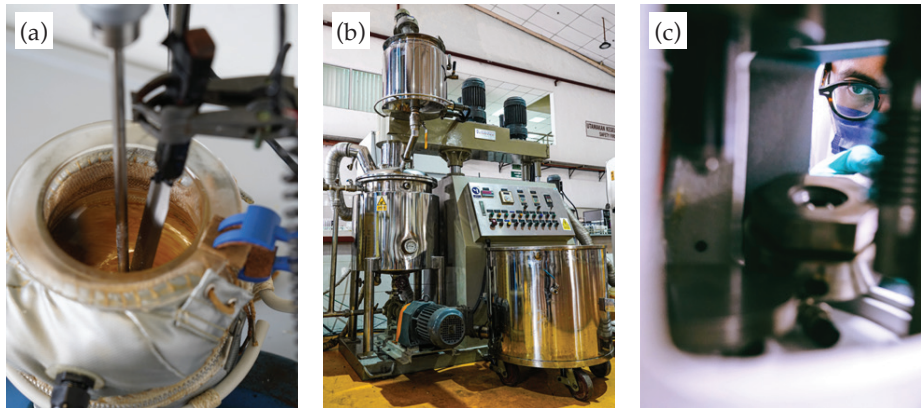


Figure 2. (a) Selected photos of lab scale grease kettle; (b) grease pilot plant and (c) grease tribology Four-ball testing.

In addition to the grease product formulation, MPOB has developed grease processing technology, incorporating comprehensive know-how, encompasses methods from lab-scale experimentation to pilot testing (Figure 2), optimising formulations, and scaling up production. Grease testing facilities based on ASTM methods (Table 1) are also available in MPOB.

NOVELTY OF THE TECHNOLOGY

This product is crafted from locally sourced ingredients, meeting stringent standards for both food-grade quality and biodegradability. Developed in-house, the manufacturing technology ensures not only exceptional consistency in operation performance but also scalability to meet growing demand.

BENEFITS AND ADVANTAGES

This product holds significant market potential as a food-grade and environmentally acceptable lubricant (EAL). Offering a compelling alternative to imported grease products, its competitive pricing becomes even more

advantageous when manufactured locally. With increasing demand for greases meeting both food-grade and biodegradability criteria, particularly in Western markets, this product presents lucrative opportunities for export expansion.

ECONOMIC ANALYSIS AND COMMERCIAL BENEFITS

The estimated economic analysis for palm-based food-grade biodegradable grease is shown in Table 2. This evaluation is based on a product selling price of RM30.00 per kg, a production capacity of 1 tonne per day, 270 operational days per year.

The economic analysis in Table 2 is predicated on a scenario where a technology taker enters the grease manufacturing business anew. For existing grease manufacturers or company who do grease blending and repacking, this technology presents an opportunity to diversify their product offerings if they currently lack food-grade and biodegradable grease. Given that a significant portion of food-grade and biodegradable greases are imported from

TABLE 2. ECONOMIC ANALYSIS

Cost of raw materials	RM19.50 per kg
Selling price	RM30.00 per kg
Capital expenditure	RM2 000 000.00
Net present value (NPV)	RM4 488 661.00
Internal rate of return (IRR)	43%
Discounted payback period	3 years
Discounted benefit: Cost ratio (B:C)	1.11

Note: Calculated based on a discounted rate of 10%.

REFERENCES

overseas, adopting this technology allows the technology taker to produce such greases locally, resulting in substantially lower raw material costs and consequently, improved profit margins.

IMPACT

The commercialisation of this product not only reduces dependency on imports of grease products but also drives value addition within the domestic economy and boosts export values.

IP STATUS

Protected as a trade secret.

CONCLUSION

This grease technology represents a transformative opportunity for local industries to embrace, given its substantial demand for food-grade and biodegradable (EAL) greases, both domestically and internationally, particularly in Western markets.

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