

PILOT PLANT SERVICE FOR REFINING OF OILS AND FATS

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727

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Refining produces edible oils and fats with characteristics that consumers desire such as bland flavour and odour, clear appearance, light colour, stability to oxidation, suitability for frying and functionality. During refining, impurities such as moisture, insoluble solids, gums, free fatty acid (FFA), waxes, metals compounds, colour, odour and taste are removed. However, refining should preserve valuable components such as vitamin E and phytonutrients, and prevent chemical changes in the triacylglycerols of the oils and fats (Leong, 1992).

There are two types of technology available to process crude or low quality edible oils into refined oils, namely, chemical/alkali refining and physical refining. The difference between these two types is basically based on the method of removing the FFA. Chemical refining utilises an alkali to neutralise most of the fatty acids which are removed as soap. The alkaline neutralisation process has major drawbacks: oil yield is relatively low; oil losses due to emulsification and saponification of neutral oils; and some loss of tocopherols and sterols during alkaline neutralisation (Johansson and Hoffmann, 1979). Physical refining involves subjecting the oil to steam distillation under high temperature and vacuum for removal of FFA. The advantages of the physical refining method over the chemical method in palm oil refinery are better yields, high quality fatty acids as by-products, good oil stability, simultaneous distillation of FFA and deodorisation, lower cost of equipment, and the simplicity of operation (Yusoff and Thiagarajan, 1993; Yusoff, 1994).

REFINING PROCESS

The processing routes for chemical and physical refining of crude palm oil into refined palm oil are illustrated in Figure 1 (Rohani, 2006). Degumming removes hydratable and non-hydratable gums. Hydratable gums are removed by treating the oil with water to separate the gums. Non-hydratable gums are removed by treating the oil with acids to separate the gums. Neutralisation (in chemical/alkali refining) removes FFA by treating the oil with caustic soda (NaOH). Bleaching removes colour pigments from the oil by treating it with bleaching clays that adsorb the colour pigments, as well as trace metal complexes such as iron and copper, phosphatides and oxidation products. Deodorisation removes FFA, carotenoid pigments, primary and secondary oxidation products and other odouriferous

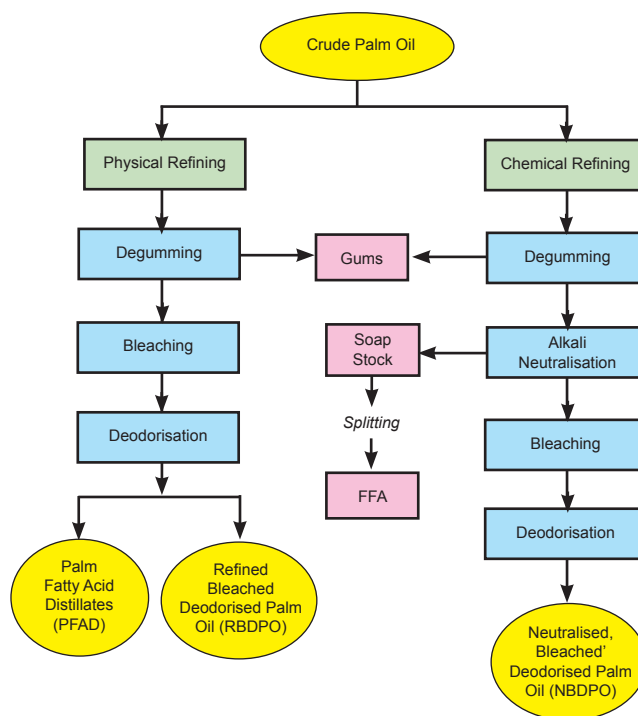


Figure 1. Chemical and physical refining routes.

substances, which may contribute to off-flavours. The resulting deodorised oil is almost bland and tasteless.

DESCRIPTION OF REFINING PILOT PLANT

Refining Pilot Plant at the Malaysian Palm Oil Board (MPOB) is shown in Figure 2. The schematic diagram of the pilot plant is depicted in Figure 3. Example of



Figure 2. Oils and Fats Refining Pilot Plant at MPOB.

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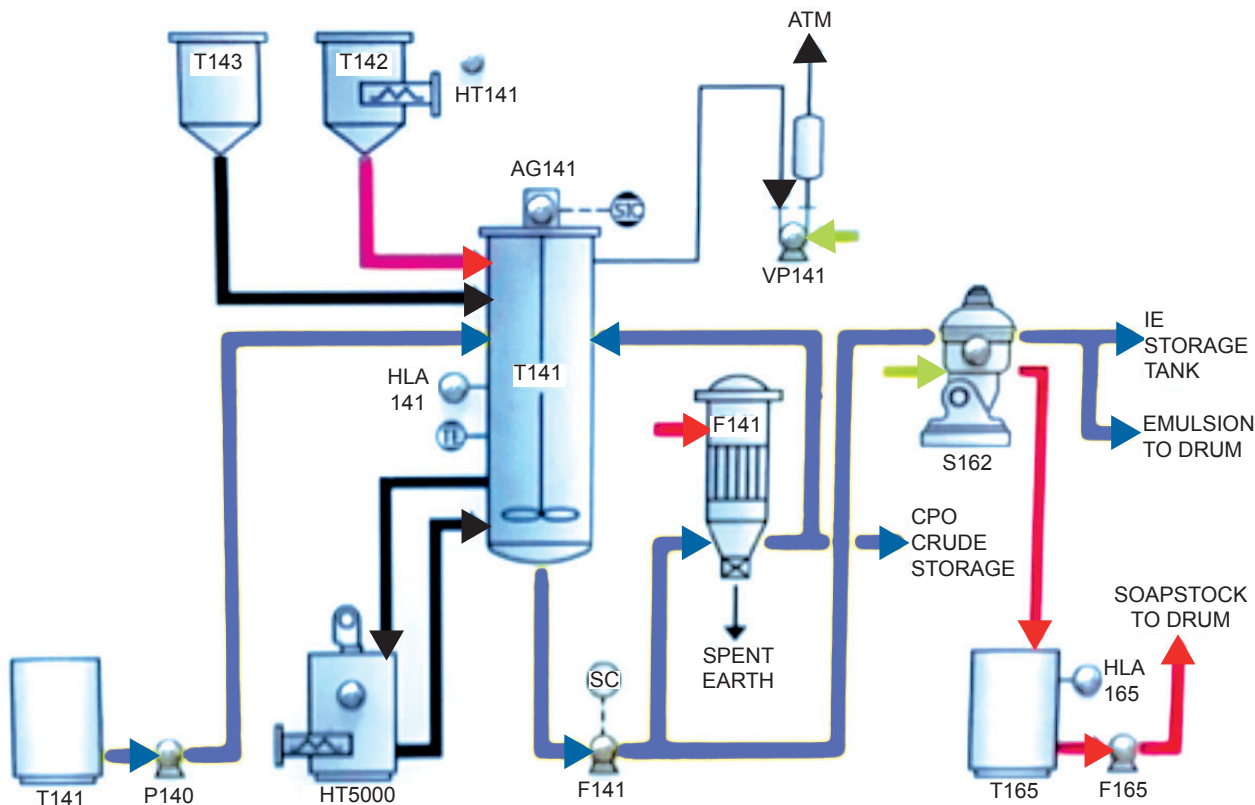


Figure 3. Schematic diagram of the MPOB Oils and Fats Refining Pilot Plant.

oil before and after refining is shown in Figure 4. The plant consists of a multipurpose tank for degumming, neutralisation (for alkali refining) and bleaching of the oil, a deodoriser tank (high temperature, low vacuum) and a scrubber to trap distilled fatty acid distillate (FAD). It is a batch-wise pilot plant with a flexible production capacity of 50 to 100 kg refined oil per batch.

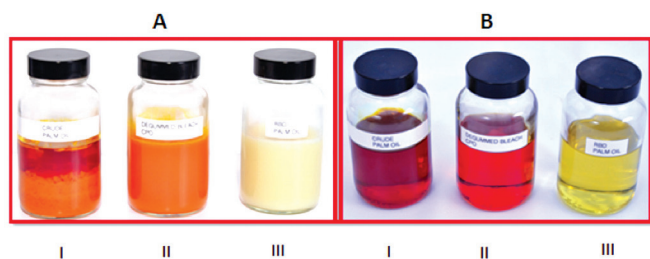


Figure 4. Crude (I) degummed and bleached (II) refined, bleached and deodorised (III) palm oil at room temperature (A) and 60°C (B).

SERVICE OFFERED

MPOB offers a service of refining of oils and fats at the Refining Pilot Plant. The service is offered at a minimal fee, depending on the type of method used and the processes involved. The service fee includes the refining process, sample analyses before and after refining (FFA value, peroxide value and moisture content), and consultation.

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