

Palm kernel expeller (PKE) is a nutritious product generated from kernel crushing plants. In 2003, Malaysia produced about 1.90 million tonnes of PKE and most of the production was exported to countries in the European Union (EU) whereby about 20% of the dairy rations in those countries use PKE as one of the common ingredients. The crude fibre content of PKE which currently ranges from 16% - 18% is acceptable to most ruminants. However, the use of PKE for poultry feed is still unacceptable due to high content of fibrous material in the expeller as a result of the high content of shell and dirt in palm kernel which currently exceeds 6%. This high shell content also affects the feeding value for poultry in terms of low protein content and energy availability.

The inconsistency in the quality of the raw material (palm kernel) sold and delivered to the crushing plants has been identified as the main factor that resulted in the low quality of PKE. A survey conducted by MPOB indicated that the content of shell and dirt in kernel delivered to crushing plants ranged from 6% to as high as 11%.



Figure 1. Hammer mill and water cooled screw press.

This has contributed to the high percentage of dirt content (12% - 15%) in PKE produced by crushing plants. Realizing that the quality of palm kernel has to be improved, MPOB undertook a project to design and develop a system that can produce consistently good quality palm kernel and palm kernel products both at the mill and kernel crushing plant.

TECHNOLOGY

Rolek nut cracker is invented by MPOB to improve the method of cracking palm nut at the mill and is able to achieve cracking efficiency up to 99%. The machine is also capable of cracking palm nuts of all sizes, particularly the *tenera* and *dura* nuts. It is able to produce cracked mixture with low percentages of broken kernel (<10%), uncracked nuts (<1.5%) and half cracked nuts (<2%). The machine enhances the process of separating shell from kernel by incorporating a winnowing system that enables the mill to produce shell-free kernel with shell content as low as 3%.

Subsequently, MPOB has successfully developed a new version of screw press to crush low shell content kernel. The technology known as *water cooled screw press* is designed to cater for a maximum capacity of 3 t hr⁻¹ of kernel with various percentages of shell content (Figure 1). It is integrated with a 5 t hr⁻¹ hammer mill to reduce the size of kernel prior to oil extraction. This pre-treatment will enlarge the surface area, thus maximizing oil extraction rate.

These integrated systems enable the oil extraction process to be carried out through a single stage pressing compared to double stage pressing that is currently being adopted by kernel crushing plants. The crude palm kernel oil (CPKO)

recovery will be increased as high as 48% due to crushing of low shell content kernel, and thereby reducing the percentage of remaining oil in PKE to 5% or less.

SPECIAL FEATURES

The robust mono screw press has a gradual tapering and variable pitch worm screw incorporating a circulating water-jacketed press body to prevent excessive heat build-up during the pressing. This feature ensures that the rapid dissipation of heat resulted not only in an efficient oil extraction but also the production of good quality CPKO (lighter color) as well as the production of PKE with good feed quality. The technology and process flow diagram for the production of high feed quality PKE is illustrated in *Figure 2*.

THE PRODUCT

Crushing of shell-free kernel using a *water cooled screw press* produces feed quality expeller which can be utilized as an ingredient up to 30% in the poultry feed formulation (*Figure 3*). The reduction of shell content in PKE to less than 7.5% will significantly reduce the crude fibre content to 15%. It also increases protein content up to 18% and thus reduces dependence on imported protein-based material such as soyabean and corn. The nutritive value of PKE was further enhanced by utilizing enzymes from microbes through biotechnological fermentation. The specific microbes have the ability to degrade PKE fibres especially hemicellulose to release digestible sugar which can be fully absorbed and metabolized by monogastric animals.

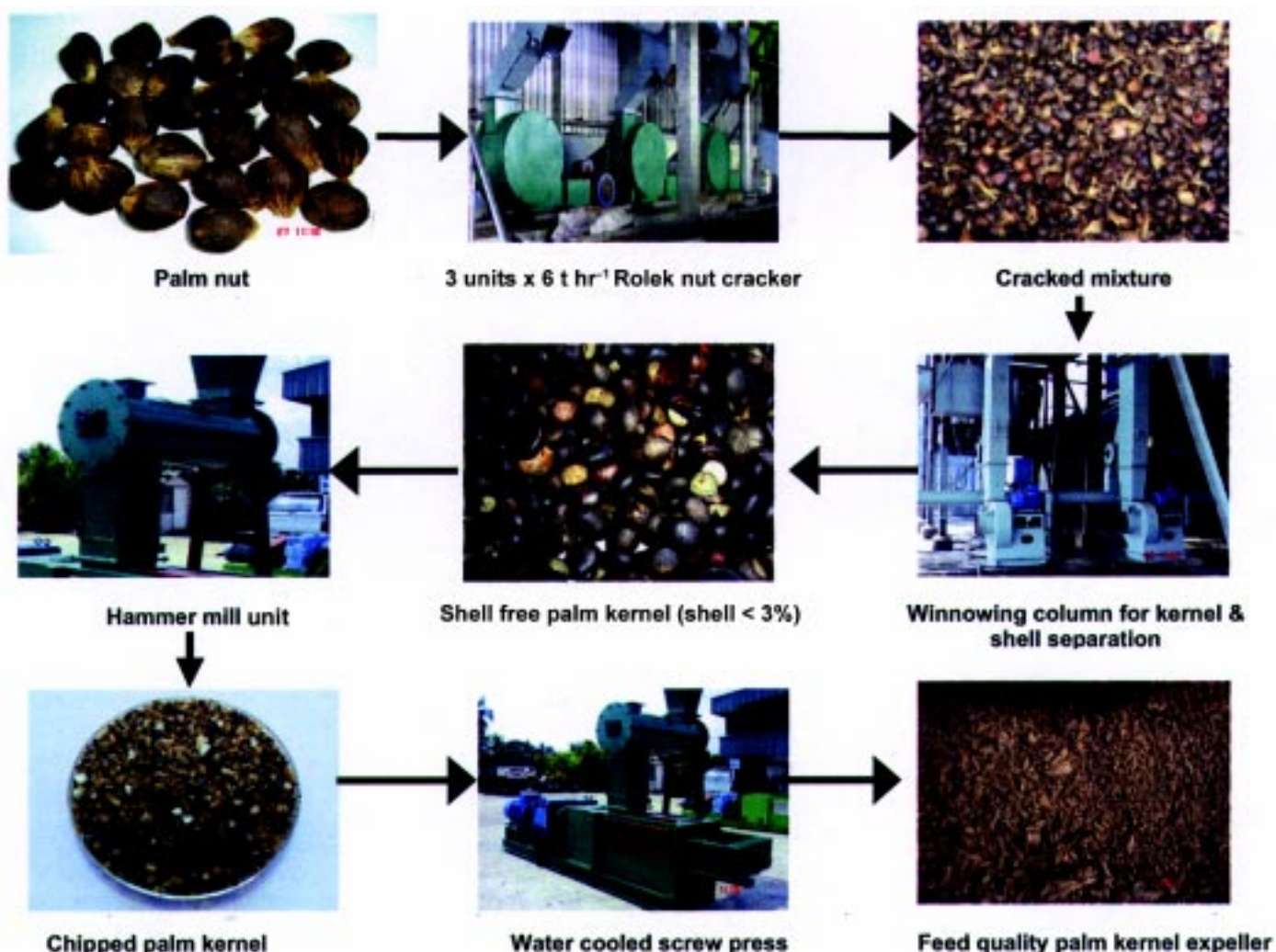


Figure 2.



Feed quality palm kernel expeller



Commercial palm kernel expeller

Figure 3.

The comparison between commercial and feed quality PKE in terms of nutritive value and their compositions via fermentation process are tabulated in *Table 1*.

COMMERCIAL BENEFITS AND ECONOMIC FEASIBILITY

- Single stage pressing – better CPKO quality, low operational and investment costs;

- Additional increment of CPKO recovery of at least 1% - additional revenue to kernel crushing plants;
- Improvement in the nutritive value of PKE – improve marketability for poultry feed and gaining a premium price for PKE; and
- Significantly reduce wear and tear of the screw press due to crushing of low shell content kernel – reduces metal contamination in CPKO and PKE.

TABLE 1.

Parameter, %	Commercial PKE	Treated commercial PKE (fermentation)	Feed quality PKE	Expected feed quality PKE (fermentation)
Shell	< 15	-	< 7.5	-
Crude fibre	18.8	15.0	15.0	< 11.0
Oil	10.0	< 10.0	6.0	< 6.0
Protein	14.0	21.2	18.0	26.0

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