

Use of the Deterioration Of Bleachability Index (DOBI) to Characterise the Quality of Crude Palm Oil

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Keck Seng are a producer of high-quality refined palm oil products. They achieve high quality by ensuring that they start with a high-quality crude palm oil(CPO). This paper illustrates the use of the DOBI to characterise the quality of CPO and covers the following topics:

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2. [The causes of a low DOBI](#)
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1. Definition of the DOBI and its relation to the quality of CPO

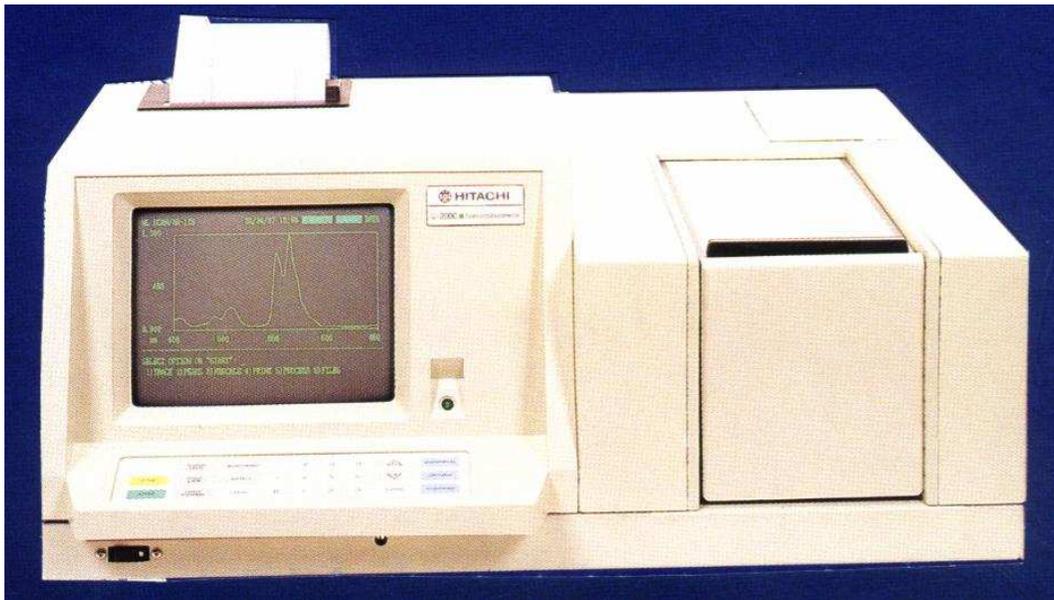
Crude palm oil is traded with quality specifications on free fatty acid (FFA) and moisture & impurities (M&I). In trade contracts, the quality of CPO must also meet the description of "good merchantable quality" (GMQ). However, the term GMQ is not defined.

The Deterioration Of Bleachability Index (DOBI) is not included in quality specifications. However, most of the buyers refine the CPO into refined, bleached and deodorised products. Good bleachability is then an indicator of "fitness for use" and hence should be covered under GMQ.

Analysis of FFA and M&I alone is not sufficient to indicate the quality of CPO. Including DOBI in the analysis can provide a good indication of the oxidative status of CPO as well as its ease in processing.

The DOBI is the numeric ratio of the spectrophotometric absorbance at 446nm to that at 269nm. The method was developed by Dr. P. A. T. Swoboda of the Palm Oil Research Institute of Malaysia (now known as the Malaysian Palm Oil Board).

Measurements are made by dissolving the palm oil in hexane and then determining the absorbance in a spectrophotometer. At Keck Seng we use an Hitachi U-2000 UV-VIS spectrophotometer as shown in the following picture.



Picture: Keck Seng's Spectrophotometer

The PORIM workers found the following relationship between DOBI and refinability:

DOBI	Grade
< 1.68	Sludge palm oil or its equivalent
1.78 - 2.30	Poor
2.36 - 2.92	Fair
2.99 - 3.24	Good
> 3.24	Excellent

To avoid missing gaps, Keck Seng (M) Berhad adopted the following guidelines:

DOBI	Grade
< 1.68	Sludge palm oil or its equivalent
1.68 - 2.30	Poor
2.31 - 2.92	Fair
2.93 - 3.24	Good
> 3.24	Excellent

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2. The causes of a low DOBI

The main causes of a low(poor) DOBI are:

- High percentage of black (unripe) fruit bunches
- Delay in processing, especially during rainy season
- Contamination of CPO with steriliser condensate
- Contamination of CPO with badly oxidised sludge oil
- Prolonged sterilisation of fruit bunches
- Over heating (> 55C) of CPO in the storage tank

There are other causes, but these are less significant compared with the above causes. These include splashing/aeration of hot oil, delay in processing due to temporary machinery breakdown, high-temperature crude oil clarification and high-temperature processing at other stages.

Examples of fresh fruit bunches are given in the following picture.



Picture: Fresh fruit bunches showing three categories of ripeness.

The black bunch on the left has oil with the lowest DOBI.

The bunch in the centre has oil with the highest DOBI.

The oil extracted from black bunches can have $DOBI < 1.5$ whereas that from fruit bunches with optimum ripeness can have $DOBI > 3.5$. In practice, $DOBI > 3.0$ can be achieved with a little effort in harvesting and processing.

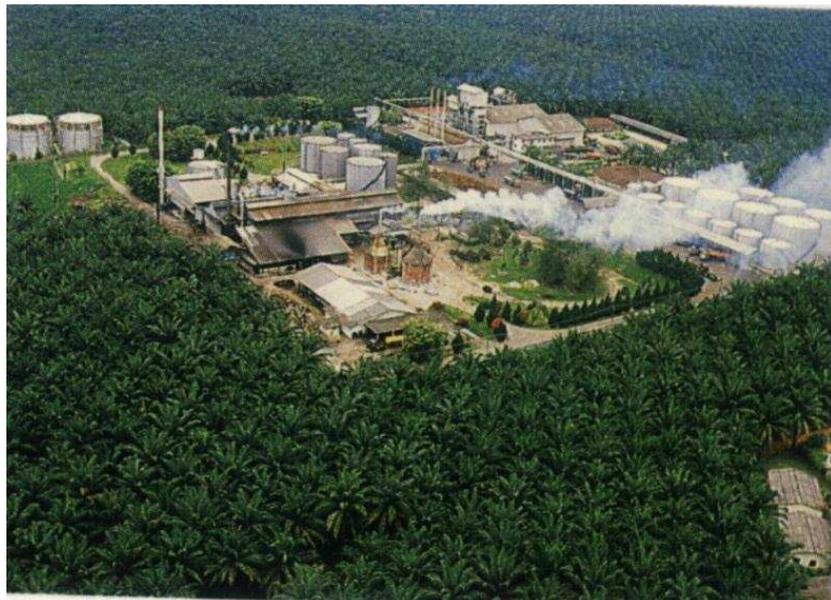
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3. Actions taken at Keck Seng to ensure a high-quality CPO

Keck Seng (M) Berhad operate an integrated oil-palm plantation, palm fruit processing mill and palm oil refinery. This integration ensures minimum transport of raw materials which

saves costs and energy but, more importantly, ensures that the highest quality CPO is processed by the refinery.

The picture shows the refinery and mill located in the middle of the plantation.



Picture: Keck Seng (M) Berhad at Masai, Johore, Malaysia

Within Keck Seng, the following actions are taken to produce consistently high-DOBI CPO:

- Advise the plantation to harvest fruit bunches at optimum ripeness.
- Steriliser condensate and badly oxidised sludge oil are not permitted to have contact with CPO. Steriliser condensate and sludge oil contain high levels of iron and copper. These pro-oxidants are detrimental to oil quality and pose bleachability problems during refining. In many other palm oil mills, such positive segregation is often neglected.
- Keck Seng use mild sterilisation conditions. In order to minimise bunches with undetached fruitlets after stripping, double stripping with an intermediate bunch crusher is used.
- Keck Seng use low-pressure steam for gently warming up CPO, if need arises, to a temperature below 50C.

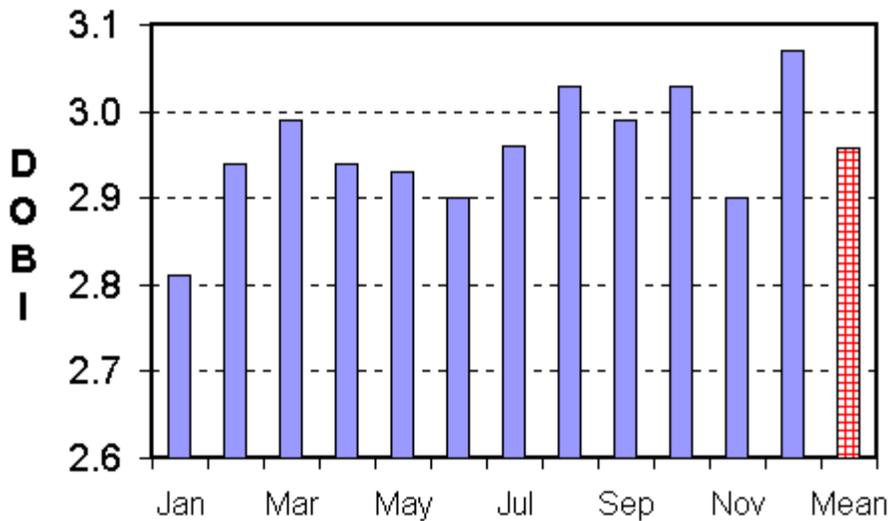
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4. Variation of DOBI over a season

The chart shows the mean monthly DOBI for CPO received at Keck Seng refinery during 1999. The low value in January is attributable to the delay in harvesting and processing the fresh fruit bunches because of a major public holiday. The figure for July is estimated after eliminating low values due to experimental work on the sterilisation of the fruit bunches.

The mean for the year is 2.96, putting the CPO into the 'good' category.

DOBI of CPO produced by Keck Seng during 1999



5. Conclusion

The DOBI is one of the key indicators for CPO quality. Good quality CPO is a pre-requisite for production of high-quality final products. A high DOBI is essential as this enables milder processing conditions to be used for refining. Mild processing conditions minimise the formation of trans fatty acids during deodorisation and enable more of the natural antioxidants (tocopherols and tocotrienols) to be preserved in the final refined oil.

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