Editorial

We take this opportunity to wish our readers a very Happy and Prosperous 2007.

We would like to start the year by saying a big thank you to all those in the palm oil industry for your continuous support of MPOB to achieve its vision and mission. We will strive to be the best R&D institute for palm oil and oil palm in the world.

We are also delighted to say that 2006 has been a very busy and successful year for MPOB and the palm oil industry in particular. The palm oil industry has never been in a better position to compete in the global oils and fats market. The crude palm oil (CPO) price started at about RM 1400 \( t^{-1} \) at the beginning of 2006 and has exceeded RM 2000 \( t^{-1} \) in December, the highest close since January 1999.

Palm oil products contributed some RM 28.6 billion in Malaysia’s export earnings in 2005. The contribution in 2006 was even more impressive amounting to a spectacular RM 31.8 billion, an increase of 11.2%, due to the increase in CPO price. The demand for CPO in 2007 is expected to be bullish due to the increased demand for palm oil in China, EU countries, Pakistan, India and even USA. The demand for biodiesel in the global market also is increasing with palm oil being the cheapest feedstock for biodiesel. We also need to increase our global market share for oleochemical products, palm kernel oil and palm kernel cake.
However, Malaysia may soon lose its position as the largest producer of palm oil in the world to Indonesia. According to forecast, in 2007 Malaysia will produce about 16.4 million tonnes of CPO and Indonesia, 17.5 million tonnes. In addition, Indonesia still has a very large land bank suitable for oil palm cultivation whereas, Malaysian land bank is on verge of exhaustion. In this respect, Malaysia will never be able to regain its leadership position in the production of CPO. Nevertheless, Malaysia should strive to maintain its pride by being the most efficient producer of the highest quality palm oil products in the world. In order to realize this, we have to improve the yields; both fresh fruit bunches (FFB), oil to bunch ratio in the estates and the oil extraction rate (OER) in the palm oil mills. The FFB yield and OER for 2006 were 19.6 t ha\(^{-1}\) yr\(^{-1}\) and 20.04\% respectively. Obviously, there is much room for improvement and this will require full cooperation of all sectors in the palm oil industry.

There are some in the industry who like to believe that there is very little chance for the national OER to make significant inroads in terms of improvement. This type of feeling is damaging to the industry as there are many ways to boost the national OER. A typical case is the removal of the formidable volume of trash accompanying the FFB consignment to the mill. If the trash contributed to 10\% of the FFB, the very removal of this could bolster up the OER by at least 2\%.

If we add to this, full recovery of all loose fruits from the field, can we not claim another boost of 2\% to our OER without much effort? The possibility to boost an additional 4\% of the OER is within our reach but we are doing very little to tap this. This is not magic but a simple logical approach, which no one can dismiss as nonsense.

It is sad to start 2007 by mourning the demise of MPOB’s former Chairman, Tan Sri Dato’ Seri Haji Basir Ismail, who passed away on 19 January 2007 morning.

Milestones of his illustrious career are given in another article in this issue. On a lighter note, we are happy to welcome our new Chairman, Dato’ Haji Sabri Ahmad. We hope that under his stewardship, MPOB would continue to cater to the needs of the industry more efficiently.

We hope that you will continue to enjoy reading this *Palm Oil Engineering Bulletin* and keep abreast of the latest developments in the oil palm industry. You are always most welcome to send your views on any palm oil milling activities so that others in the industry can enhance their knowledge.
Recent Events

Contributed by: Noor Asmawati Abd Samad*

Launching of Supervised Fertilizer Cluster Scheme, Beluran

A few Supervised Fertilizer Cluster Schemes [or Kelompok Baja Terselia (KBT)] were launched on 11 January 2007 at Beluran, Sandakan, Sabah by Datuk Ronald Kiandee, Member of Parliament of Beluran. The Minister of Plantation Industries and Commodities was scheduled to officiate this function but unfortunately his airplane could not land at Sandakan due to poor weather.

During this event, a total of four schemes were launched namely KBT Malsa, KBT Segaliud, KBT Tenom and KBT Langkon. With this, a total of six schemes were launched in Sabah including the KBT Kinabatangan and KBT Asiatic Sabahpalm launched last year. The Supervised Fertilizer Cluster Scheme initiated in August 2003 has been a well-received concept to improve the field productivity amongst the plantation companies and smallholders. To date, 30 Supervised Fertilizer Clusters have been launched.

A number of smallholders received their coupons from Datuk Ronald Kiandee under the scheme to supply of good quality oil palm seedlings to poor smallholders in Sabah and Sarawak.

Launching of Supervised Fertilizer Cluster Scheme, Central Region

The Director-General of MPOB, Dato' Dr Mohd Basri Wahid launched the Supervised Fertilizer Cluster Scheme for the Central Region in MPOB Head Office at Bangi on 6 February 2007. For the Central Region,

* Malaysian Palm Oil Board, P. O. Box 10620, 50720 Kuala Lumpur, Malaysia.
eight schemes were launched during the event namely KBT Jempol, KBT Dengkil, KBT Sungai Pelek, KBT Jugra, KBT Sungai Buaya, KBT Morib, KBT Alor Gajah and KBT Jenjarom involving eight palm oil mills, 19 dealers and more than 350 smallholders.

During the event, the Director-General of MPOB also gave away a Special Award to KBT Air Kuning as pioneer for the KBT programme. The Minister of Plantation Industries and Commodities launched KBT Air Kuning in August 2003. To date, a total of nine schemes were launched for the Central Region.

MPOB Director-General Appointed as Council Member of IIPM

The Director-General of MPOB, Dato’ Dr Mohd Basri Wahid was appointed as a council member of International Institute of Plantation Management (IIPM) on 6 March 2007 at MPOB Head Office, Bangi. The Executive Director of IIPM, who is also the Vice Chancellor of Universiti Teknologi MARA (UiTM), Prof Dr Nasuddin Othman gave the letter of appointment to Dato’ Dr Mohd Basri Wahid.

Prof Dr Nasuddin Othman said, the present Director-General MPOB is the second person from MPOB appointed as the IIPM’s council member, the earlier one being Dato’ Haji Sabri Ahmad, who was appointed before he became the Chairman of MPOB.

The main objective for the establishment of IIPM is to enhance the professional development in the plantation and agricultural sector.
## Forthcoming Events

### 2007 MPOB Training Programme Schedule

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<thead>
<tr>
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<th>TITLE</th>
<th>DATE</th>
<th>VENUE</th>
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<tbody>
<tr>
<td>A</td>
<td>COURSES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Oil Palm</td>
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<tr>
<td>A1.1</td>
<td>Kursus Kemahiran Menggred Buah Sawit</td>
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<tr>
<td></td>
<td>Bil. 1: Sabah</td>
<td>20 – 22 Mac</td>
<td>Tawau, Sabah</td>
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<tr>
<td></td>
<td>Bil. 2: Semenanjung</td>
<td>19 – 21 Jun</td>
<td>Melaka</td>
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<td></td>
<td>Bil. 3: Sarawak</td>
<td>*Ogos</td>
<td>Miri, Sarawak</td>
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<td></td>
<td>Peperiksaan Kemahiran Menggred Buah Sawit</td>
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<td></td>
<td>Peperiksaan Bil. 8</td>
<td>17 Mei</td>
<td>Tawau, Sabah*</td>
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<tr>
<td></td>
<td>Peperiksaan Bil. 9</td>
<td>16 Ogos</td>
<td>Kuantan, Pahang</td>
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<td>A1.2</td>
<td>8th Intensive Diploma in Oil Palm Management and Technology Course</td>
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<tr>
<td></td>
<td>Semester I</td>
<td>11 June – 4 July</td>
<td>MPOB HQ</td>
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<td>Estate Attachment</td>
<td>5 – 14 July</td>
<td>MPOB HQ</td>
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<td></td>
<td>Semester II</td>
<td>16 July – 9 Aug.</td>
<td>MPOB HQ</td>
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<td>Estate Attachment</td>
<td>13 – 24 Aug.</td>
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<td></td>
<td>Semester III</td>
<td>27 Aug. – 18 Sept.</td>
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<td>A1.3</td>
<td>Kursus Pengurusan dan Penyelenggaraan Tapak Semaian Sawit</td>
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<td></td>
<td>3 – 4 April</td>
<td>Tawau, Sabah</td>
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<tr>
<td>A1.4</td>
<td>Kursus Operator Mekanisasi Ladang</td>
<td>Februari Ogos</td>
<td>MPOB/UKM</td>
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<td>A1.5</td>
<td>16th Oil Palm Plantations Management Course</td>
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<td></td>
<td></td>
<td>5 – 19 Nov.</td>
<td>Kuala Lumpur</td>
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<tr>
<td>A1.6</td>
<td>Kursus Pegawai Pengembangan dan Pengurusan Kilang</td>
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<td></td>
<td></td>
<td>22 – 26 Nov.</td>
<td>Trolak, Perak</td>
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### 2007 MPOB CONFERENCES/SEMINARS

<table>
<thead>
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<tr>
<td>1.</td>
<td>Programme Advisory Committee (PAC) Seminar</td>
<td>12 Apr.</td>
<td>MPOB HQ</td>
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<tr>
<td>2.</td>
<td>7th National Seminar on Oil Palm Tree Utilization</td>
<td>13 – 14 Nov.</td>
<td>*Hotel</td>
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<td>3.</td>
<td>MPOB Transfer of Technology (TOT) Seminar 2007</td>
<td>18 June</td>
<td>MPOB HQ</td>
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<td>4.</td>
<td>GSAS Seminar</td>
<td>19 June</td>
<td>MPOB HQ</td>
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<td>5.</td>
<td><strong>MPOB Technology Demonstration Month 2007</strong></td>
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<td></td>
<td>Quality &amp; Product Development Research Seminar</td>
<td>12 July</td>
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<td>Oleochemical Research Seminar</td>
<td>19 July</td>
<td>MPOB HQ</td>
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<td></td>
<td>Engineering &amp; Processing Research Seminar</td>
<td>26 July</td>
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<td></td>
<td>Biological Research Seminar</td>
<td>2 Aug.</td>
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### Forthcoming Events

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<tr>
<td>A2.1</td>
<td>Diploma in Palm Oil Milling Technology and Management**</td>
<td>26 – 31 Mar.</td>
<td>PLASMA, MPOB, Lahad Datu, Sabah</td>
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<tr>
<td></td>
<td>Semester I</td>
<td>17 – 14 May</td>
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<td>Semester II</td>
<td>9 – 16 July</td>
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<td>Exam. Semester III</td>
<td>3 – 4 Sept.</td>
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<tr>
<td>A2.2</td>
<td>The 21st MPOB Oil Palm Products Surveying Course</td>
<td>25 – 29 June</td>
<td>Johor Bahru, Johor</td>
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<td></td>
<td>The 20th MPOB Oil Palm Products Surveying Examination</td>
<td>27 – 29 August</td>
<td>Johor Bahru, Johor</td>
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<tr>
<td>A2.3</td>
<td>Kursus Penyelia Kilang Kelapa Sawit Peperiksaan**</td>
<td>7 – 14 Mei, 11 Julai</td>
<td>PLASMA MPOB, Lahad Datu, Sabah</td>
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<tr>
<td>A2.4</td>
<td>Kursus Pengendali Makmal Kilang Minyak Sawit</td>
<td>9 – 14 April</td>
<td>Bintulu, Sarawak</td>
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<td>A2.6</td>
<td>Welder Certification in Palm Oil Industry 3G SMAW</td>
<td>May, July, Aug., Dec.</td>
<td>Shah Alam, Selangor</td>
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<td>A2.7</td>
<td>Colour Cosmetic Course</td>
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<td>MPOB HQ</td>
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<td>A2.8</td>
<td>Diploma in Marketing and Tracing</td>
<td>*15 Oct. – 13 Dec.</td>
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<tr>
<td>5.</td>
<td>Minggu Komoditi 2007</td>
<td>3 – 7 July</td>
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<td>6.</td>
<td>International Biofuel Conference</td>
<td>5 – 6 July</td>
<td>PWTC, Kuala Lumpur</td>
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<td>7.</td>
<td>MPOB International Palm Oil Congress (PiPOC)</td>
<td>26 – 30 Aug.</td>
<td>KL Convention Centre, Kuala Lumpur</td>
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</table>

Notes:  
* To be confirmed.  
* By invitation.  
** Course approved under PROLUS scheme of Pembangunan Sumber Manusia Berhad.

For enquiry or further information, please contact:  

HRD & Conference Management Unit  
Tel. No. : 03-87694400 ext. 4865, 4860, 4867  
Fax No. : 03-89259446  
E-mail : azizah@mpob.gov.my  
MPOB’s website : http://www.mpob.gov.my
Pre-cleaner System – Operation and Performance in the Palm Oil Mill

Liew Seng Fook*

The pre-cleaner or sometimes better known as the de-sander is one of the most under-rated equipment in the palm oil mill. Sadly, it has always been overlooked and not enough attention is paid to ensure that it is functioning properly. Unlike many other critical equipment that can stop or reduce the throughput of the mill, the failure of the de-sander does not have an immediate impact on its daily operation.

During harvesting, fruit bunches dropping to the ground pick-up sand particles of varying quantity and sizes. This is the main source of the sand and there is a lack of concerted effort to minimize the sand and dirt brought from the field. During the rainy season, the problem becomes more acute when there is a high tendency for mud to stick onto the fruit bunches.

There were instances when some mills initiated measures to wash fruits but this did not become popular because of the high volume of water usage and the fear that some free oil may be lost.

In the mill, the initial stage of dirt and sand removal takes place at the vibrating screen. Normally, double deck mesh screens are used, but this is not an equipment designed to remove sand. Fine sands can easily escape through the mesh and continue its journey through the process line.

The main purpose of the de-sander is to remove sand and other abrasive material from the process medium after the vibrating screen. There is no fixed location for the installation of the de-sander but various configurations have been tried. The most common location is after the clarification tank, where it is used to remove sand from the underflow prior to oil recovery in separators or decanters. It is also not possible for us to determine the performance of the various combinations unless we take steps to measure and quantify it.

This article attempts to provide an analysis of the efficiency of Alfa Laval’s de-sander system and the mapping of the particle size distribution after undergoing each stage of the de-sanding processes. It will also provide some guidelines of good practical practice and understanding on how to operate an effective de-sanding system.

PARTICLES IN MOTION

If we look at the de-sander, the most important component is the de-sanding cyclone. This is the heart of the complete

* Alfa Laval (Malaysia) Sdn Bhd, Lot 2.23 Jalan SU 7, Perindustrian Subang Utama, 40000 Shah Alam, Selangor Darul Ehsan, Malaysia.
de-sanding system. The cyclones come in various types of material and vary according to the application. The materials for its construction are steel, ceramic, porcelain and polyurethane. In the palm oil mills, it is typically made either with ceramic or plastics like reinforced nylon material.

The cyclone is a hollow chamber with a cylindrical section on top of a cone. The device has an inlet into the cylindrical section, rectangular at the point of entry to the chamber and with a contraction serving to accelerate the liquid towards the point of entry.

The centrifugal forces created within the cyclone body causes the process of separation. There are two outlets, one axial outlet at the apex of the inverted cone and one at the cylindrical top acting as a vortex finder with the help of a tube extending down into the chamber. Feed liquid under pressure enters the de-sander tangentially. Because of the centrifugal force, the coarser particles migrate into a primary vortex adjacent to the wall and move downwards to a receiver tank commonly called the dirt receiver. Particles finer than the size at ‘cut point’ migrate into a secondary upward moving vortex, along the axis of the cyclone, and will leave the de-sander together with the liquid via the outlet vortex finder. This is a cylindrical tube, which protrudes some distance into the cyclone body. The collected particles in the dirt receiver intermittently discharge with the help of hot water from a flushing line.

The motion of the fluid within the cyclone body has a circular symmetry as shown in Figure 1.

The centrifugal force and the particle settling velocity are highly dependent on the particle size. Obviously, larger particles separate more easily than smaller particles and the performance of the de-sander is strongly influenced by the particle size.

**FACTORS INFLUENCING THE PERFORMANCE OF THE DE-SANDER**

**Pressure Drop**

The pressure drop in the de-sander is the difference between the static pressure drop measured between the inlet and overflow outlet.

We have always advocated that the higher the pressure drop the better the separation efficiency. Increase in pressure drop leads to higher flow rate, thus generating greater tangential velocities and higher separation efficiency. This means that the grade efficiency curve moves to the left and we achieve a finer cut size. The overflow will
be cleaner and more particles will separate from the underflow.

Increasing the pressure drop can lead to:
- higher throughput;
- finer cut size;
- increase in total efficiency;
- more concentrated underflow; and
- cleaner overflow.

Although the above statement is true, we must take note that increase in pressure drop is not directly proportional to the separation efficiency. We should not expect to double the quantity of sand recovery by doubling the pressure drop.

The relationship between pressure drop and cut sizes follows the quadratic equation stated below:

$$X_{50} \sim \frac{1}{\Delta P}$$

where $X_{50}$ is the equiprobable size. This is the particle size, which has a 50% chance of being separated. $\Delta P$ is the pressure drop.

This clearly illustrates the law of diminishing returns in terms of the pressure drop. It indicates that even if we double the pressure drop it will bring about only a 16% reduction in cut size. There is little benefit increasing the pressure drop beyond 5 or 6 bar. Moreover, increasing the pressure drop will also require a bigger pump causing higher velocity leading to greater wear and tear of the pump and cyclone.

For de-sanding palm oil sludge, it is desirable to have a pressure drop of 2.0 bar-g with a typical inlet pressure of 3.5 bar-g and an outlet pressure of 1.5 bar-g.

A practical approach to decide on the inlet pressure is to look at the height or back pressure from the static distance between the outlet of the cyclone to the delivery point above it. Knowing this, we can then calculate the minimum pressure required to overcome the pressure generated from the static height and pipe losses. We then need to add in an additional 2 bar-g to have the total inlet pressure requirement.

**Continuous Operation**

In most installations, the de-sanding pumps will be drawing the sludge from a small feed tank, normally about 1 - 2 t in capacity with a float switch installed in this tank to stop the motor when the liquid level drops to prevent the pump from running dry. However, frequent start/stop of the pump has a detrimental effect on the performance of the cyclone. The dynamic flow pattern of the fluid in the cyclone will be constantly disturbed and the operation will not be able to reach equilibrium for prolonged periods.

To maintain continuous operation, there must be a re-cycle line at the outlet pipe of the cyclone where the sludge will return to the de-sanding feed tank when the liquid level drops. It is possible to achieve this by installing a float valve opening the sludge to the return line.

**Diameter of Cyclone**

It is a fact that smaller cyclone diameter give lower cut sizes and higher recovery of the particles for the same pressure drop. The smaller diameter creates higher velocity flow in the cone. This means better separation as the cut size of a particle is highly dependent on the separation process.

That is also the reason why we sometimes see a series of small diameter cyclones arranged in the manifold. However, there is a trade-off between having an efficient cyclones system and a higher capital outlay.

**De-sanding Pump**

In order to achieve the required pressure, most centrifugal pumps operate at high speeds, normally 2900 rpm. It is not desirable to subject the process medium to excessive agitation as this could unnecessarily promote the formation of emulsion and make oil separation difficult. The pump
should ideally operate at low speeds, possibly at the motor rated speed of 1450 rpm and the pressure raised by providing pumps with bigger impellers. Operating at low speed also reduces the wear and tear on the pump.

The impeller for the de-sanding pump must also be of the closed-type so that the process medium does not puncture the casing easily. It is important to select the correct pump as constant stoppages for maintenance makes operating the de-sander a burden.

**ALFA LAVAL DE-SANDING SYSTEM**

The Alfa Laval de-sanding system consists primarily of a single cyclone with bigger internal diameter and a twin cyclone with a smaller diameter. The single cyclone (Super Single Cyclone) has a diameter of 150 mm and the twin cyclone (Super Single Cyclone) diameter is 100 mm. Owing to the small diameter of the cyclone, we will require two small cyclones say for a 60 t FFB hr⁻¹ capacity mill to match the throughput of one big unit.

The design of the single cyclone is to serve as the first stage followed by the twin cyclone serving as the second stage (Figures 2 and 3).

**Special Features of the De-sander**

- The de-sander has a modular form design mounted on a skid for quick and easy installation. It does not have to suspend high up in the building where it is difficult to monitor its performance or carry out maintenance work;

- The electrical cabinet conceals the solenoid valves and coils for the actuators. There is no possibility for the water contacting components;

- The de-sanding cyclone uses a special high resistant polymeric material with very smooth surface for its fabrication; and

- The complete operational cycle is fully automatic with the discharge intervals easily adjusted by timers.

**Analysis of the Performance of the Double Stage De-sanding System**

In order to test the performance of the double stage de-sanding system, we
have selected a privately-owned palm oil mill processing mostly outside FFB. The locations of the SSC were immediately after the crude oil tank and that of the STC at the underflow from the clarification tank before going into the decanter.

The objective of the test was to determine the particle size distribution at the various points before and after the two de-sander systems.

We took samples from the following locations:
- before the vibrating screen (BS1);
- immediately after the first stage de-sander (AS1);
- underflow before the second stage de-sander (BS1); and
- after the second stage de-sander (AS2).

A laser granulometer (Malvern 2000-S Mastersizer, UK) analysed the particle sizes distribution. Appendices 1 and 2 show an example of the detailed analysis.

Figure 4 shows the plots of the compiled results of four samples for easy comparison.

From Figure 4, we can make the following deductions:
- the particle sizes in the sludge typically show binomial distribution with the biggest particles not exceeding 1000 micron. Most probably vibrating screens have separated particles bigger than that size or they had settled down in the clarification tank. It can also indicate that generally the sand particles were not 1000 microns in diameter;
- the lines for AS1 and BS2 are very close because there is actually no de-sanding done between these two points. After the first de-sander (AS1), the crude oil settled in the clarification tank and we took the sample from underflow (BS2) before pumping it to the second de-sander. Therefore, in reality it is the same except that some sand might have settled at the clarification tank;
- we also observed that the grade efficiency curve for AS2 shifted towards the left, indicating a finer

![Graph showing the % distribution of various particle sizes for the four samples taken.](image)
cut size. This means more of the smaller size particles separated out after the second stage of de-sanding; and

- we note from calculations that more than 75% of the particles fell into the size range of 30 - 209 micron for crude palm oil before the vibrating screen.

- Table 1 shows that the volume weighted mean diameter of the particles gradually decreases in size. As larger particles separate out in each de-sanding stage, the remaining particles become smaller and smaller. The mean diameter for AS1 and BS2 does not differ much for the reason given above.

The primary duty of the first stage de-sander is to remove the bigger particles and the second stage is to perform the polishing function. If we only install the second stage de-sander in the mill, most of the big size particles will still separate out but it may compromise the effectiveness of removing the fine particles (Figure 5).

**Figure 5. Sand removed from the second stage de-sander.**

**CONCLUSION**

The de-sander is a simple equipment, but if operated correctly can bring enormous benefit and saving in the mill maintenance cost.

It is an effective equipment for sand removal with low operating cost. A double stage system is the best trade-off between having an effective sand removal system and a high capital investment based on multiple series of de-sanders.

It has a limitation on the cut-off size and we should not expect it to remove all the sand.

**TABLE 1. VOLUME WEIGHTED MEAN DIAMETER OF PARTICLES FOR THE SAMPLES**

<table>
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<tr>
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<th>BS1</th>
<th>AS1</th>
<th>BS2</th>
<th>AS2</th>
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<tr>
<td>Wt. mean (micron)</td>
<td>111.01</td>
<td>105.55</td>
<td>103.32</td>
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### Appendix 1

#### Feature Article

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tr>
<td>Particle RI</td>
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<td>Dispersant RI</td>
<td>1.330</td>
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<tr>
<td>Concentration</td>
<td>0.0365 %Vol</td>
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<tr>
<td>Specific Surface Area</td>
<td>0.131 m²/g</td>
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<tr>
<td>Surface Weighted Mean D(0.2)</td>
<td>43.846 um</td>
</tr>
<tr>
<td>Vol. Weighted Mean D(0.4)</td>
<td>111.014 um</td>
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<tr>
<td>d(0.1)</td>
<td>27.199 um</td>
</tr>
<tr>
<td>d(0.5)</td>
<td>70.212 um</td>
</tr>
<tr>
<td>d(0.9)</td>
<td>257.804 um</td>
</tr>
</tbody>
</table>

**Particle Size Distribution**

BS1 - Average, Friday, October 14, 2005 9:09:22 AM

---

*see page 24*
Appendix 2

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**Operator notes:**

---

**Measurement...**

---

**Start**

---

**Hydro 20005**

---

**Mastersizer 2000 - [MF]**

---

**File** **Edit** **View** **Measure** **Configure** **Tools** **Security** **Window** **Help**

---

**Sieve ASTM E11 61 (M)**

---

**Result Analysis (M)ty**

---

**Result Analysis (M)ty2**

---

**Data (M)**

---

**Fit (M)**

---

**Sieve BS 410 1996 - ISO565 1990 (M)**

---

**BS1 - Average, Friday, October 14, 2006 9:09:22 AM**

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**Feature Article**
When people talk about palm oil mills, the product that gets most highlighted is undoubtedly the palm oil and surprisingly the second one anyone would discuss mostly happens to be biomass and not kernel. It is about time that we started giving more attention to kernel, which is an important product of palm oil processing. Moreover, palm kernel oil commands a higher price than palm oil and it is an important raw material for the oleochemical industry.

If we trace back the development of palm kernel recovery over the past 50 years, there is hardly any milestones in the evolution of its process techniques. On the contrary, palm kernel quality on the other hand could have deteriorated over the same period due to the adoption of process technologies that probably did not deliver the guaranteed benefits. Apparently, the changes made were more for the sake of a change than for enhancing kernel quality.

Let us examine the impact of new technology for palm kernel recovery. The conspicuous change was the introduction of the ripple mill, consequent dismantling of the nut silos and the re-introduction of the clay bath. I use the word re-introduction because in the beginning of the industry in Malaysia, cracked mixture separation was done using clay bath before hydrocyclones made their presence for wet kernel separation. Previously, centrifugal crackers cracked nuts in almost all mills in Malaysia. The question posing us is whether its replacement with ripple mills was a bright choice. The cracking principle is dissimilar in the two systems. Does ripple mill out-perform centrifugal nut crackers considering the mass appeal it enjoyed in the early 1990s?

All the millers know too well that centrifugal cracking requires dried nuts and drying take place for a period of about 14 hr before cracking them. Heating silos are important machinery process because they help to dry products in a convenient way, like in this case drying of kernel with 22% moisture level to say 14%, while the kernel is still residing within nuts. Moisture evaporates from the kernel while they are still within the shell, something that does not happen any more after the introduction of the ripple mill. Strangely, one of the supporting features to promote the ripple mill was that it does not require nut drying.

Almost all mills fell for this and as they already had the silos, there was obviously no saving for them on the cost of silos other than the extra space when silos were pensioned off. The ripple mill does its job of nut cracking without going through the drying stage. After performing for a period of one week, the maintenance crew would

* Malaysian Palm Oil Board, P. O. Box 10620, 50720 Kuala Lumpur, Malaysia.
build back the ripple surface every week to maintain its initial cracking efficiency, which progressively dropped every day the ripple was on its cracking mission. There was a significant drop in the cracking efficiency by weekend. The millers as well as the machinery suppliers were happy and contended. Even the high broken kernel content in production kernel failed to encourage them to compare the performance of the new cracker with the old one. Then broken kernels and dirt in kernel were high but such setbacks were easily over looked and tolerated under the name of technology progress.

The Australian wheat industry used ripple mills for de-husking wheat by using the principle of the grinding action of the rotor rods on a ripple surface. That is fair enough. It did its job well but nuts are extremely dissimilar to grains in many ways. For one thing, they are larger and their shells are considerably thicker than the soft wheat husk. How this de-husking equipment made an impact on Malaysian millers is still a question mark.

THE PRINCIPLE OF CENTRIFUGAL CRACKING

As mentioned earlier, nut drying take place via nut silo (Figure 1) for a period of 14 hr. This is the precursor of nut cracking. When heated the shells become elastic, but subsequent cooling of nuts in the last stage of the silo allow kernels to detach from the shell a very thoughtful processing step that will considerably aid the subsequent cracking operation.

Figure 1. Nut drying silo.

Heater banks

Cold air

HEATER BLOWER FAN

CENTRIFUGAL NUT CRACKER
The principle involved is that the cooled nuts on cracking allow the free ejection of whole kernel from nuts. Inside the centrifugal cracker, the rotor driven by the motor throws the conditioned nuts onto the wearing strip attached to the cracking housing. The rotor speed can vary by changing the drive pulley size to suit different types of nuts. The basis of speed optimization is the best cracking efficiency and the least percentage of broken kernels. By using this cracker, it was possible to produce kernel with practically the least percentage of broken kernel.

The ripple mills often give a very high percentage of powdered kernels that escapes detection and as a result, this loss is neither measured nor recorded. The easiest way to quantify this loss is sieving the cracked mixture and isolating the powdered kernel. Most of the powdered kernel does not seem to be flowing along with the LTDS shell based on the high percentage of kernel dust found in the sieved tailings. Nonetheless, the presence of powdered kernel in the cracked mixture fed into the clay bath can cause rapid quality deterioration of the clay bath. This will lead to the high operating cost for the clay bath.

One way to address this problem is the introduction of a pre-cleaning system (Figure 2) for the cracked mixture prior to clay bath separator. One sensible approach is to let the cracked mixture flow through the first stage of a hydro-cyclone, which, in addition to scrubbing the cracked mixture of any dust particles including the powdered kernel, will also remove most of the shell. The kernel faction together with some shell discharges through the vortex to the clay bath where the entire kernel separates out for recovery. By using this combination of first stage hydro-cyclone and clay bath, the clay bath operation cost would be minimal.

Figure 2. Hydro-cyclone stage 1 in combination with clay bath - a good system that can reduce calcium carbonate consumption.
The year 2007 started with a sad note, the demise of Tan Sri Dato’ Seri Haji Basir Ismail, a prominent leader, who was at the helm of PORIM/MPOB for more than a decade after holding a number of distinguished posts in many important organizations.

It is interesting to note that he was awarded the special Maal Hijrah award by Raja Dr Nazrin Shah, the Raja Muda of Perak last year and he passed away on the eve of Maal Hijrah this year. Tan Sri Dato’ Seri Haji Basir passed away at the age of 80 on 19 January 2007, at the University of Malaya Medical Centre after suffering an attack of lung fibrosis. He leaves behind his 65-year-old wife, Toh Puan Datin Seri Hamidah Abdul Rahman, four children and 10 grandchildren. It was his wish to be buried at the Muslim burial ground in Simpang, Taiping, Perak his hometown according to his eldest son.

Some of the distinguished dignitaries who paid their last respects to him were: the former finance minister, Tun Daim Zainuddin and Datin Seri Kamariah Mokri representing her husband, Datuk Seri Tajol Rosli.
Ghazali, the *Menteri Besar* of Perak; Datuk Mat Isa Ismail Perak, State Assembly Speaker of Perak and Datuk Jamaluddin Al Amini, State Financial Officer.


As adviser to the Ministry of Transport, he helped to form Malaysia Airports Holdings Bhd and built the Sepang International Circuit.

We wish to take this opportunity to convey our deepest condolences to the wife and family of the late Tan Sri Dato’ Seri Haji Basir Ismail.
Dato’ Haji Sabri Ahmad succeeded Tan Sri Dato’ Seri Haji Basir Ismail effective from 1 January 2007. He is the second chairman of MPOB. Dato’ Haji Sabri holds a Master of Science degree in Agricultural Economics from the University of London. He also attended the International Studies at the University of Rhode Island and management programmes at the Oxford University.

Dato’ Haji Sabri was the Group Chief Executive Chairman of Golden Hope Plantation Bhd since 2004. He has held several positions including the Group Director overseas operations and marketing. Prior to joining Golden Hope in 1985, he was attached to the Ministry of Agriculture.

He was also the Chairman of the Malaysian Palm Oil Association (MPOA), a member of MPOB’s Programme Advisory Committee since 1996, the committee that is responsible for the endorsement of research programmes for implementation by MPOB.

He expressed his appreciation to the government, in particular the Minister of Plantation Industries and Commodities, Datuk Peter Chin Fah Kui for the appointment.

“I hope under my stewardship of the MPOB, the governing body of the Malaysian palm oil industry, the organization would be able to cater to the needs of the industry more efficiently, especially in terms of research and development,” he announced.
Useful Conversion Factors

<table>
<thead>
<tr>
<th>Common measures</th>
<th>Equivalent to</th>
<th>Equivalent to</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 U. S. gallon</td>
<td>3.785 litre</td>
<td></td>
</tr>
<tr>
<td>1 imperial gallon</td>
<td>4.546 litre</td>
<td></td>
</tr>
<tr>
<td>1 ounce</td>
<td>28.41 cc</td>
<td></td>
</tr>
<tr>
<td>1 pint</td>
<td>20 ounce</td>
<td></td>
</tr>
<tr>
<td>1 cubic feet</td>
<td>28.32 litre</td>
<td></td>
</tr>
<tr>
<td>1 tablespoon</td>
<td>½ oz</td>
<td>14.22 ml</td>
</tr>
<tr>
<td>1 barrel (liquid)</td>
<td>31.5 gallon</td>
<td>119 litre</td>
</tr>
<tr>
<td>1 barrel (beverage)</td>
<td>31 gallon</td>
<td>117 litre</td>
</tr>
<tr>
<td>1 barrel (petroleum)</td>
<td>42 gallon</td>
<td>159 litre</td>
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<tr>
<td>1 litre (UK)</td>
<td>35 ounce</td>
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</tr>
<tr>
<td>1 drop</td>
<td>0.06 ml</td>
<td></td>
</tr>
<tr>
<td>1 ml</td>
<td>17 drops</td>
<td></td>
</tr>
<tr>
<td>1 cent (land measure)</td>
<td>435.6 square feet</td>
<td></td>
</tr>
<tr>
<td>1 mile</td>
<td>1.625 kilometre</td>
<td></td>
</tr>
<tr>
<td>1 kg/square centimetre</td>
<td>14.22 lbs/square inch</td>
<td>-</td>
</tr>
<tr>
<td>1 acre</td>
<td>4840 square yard</td>
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</tr>
<tr>
<td>1 square kilometre</td>
<td>100 hectare</td>
<td>0.386 square mile</td>
</tr>
<tr>
<td>1 cubic metre</td>
<td>6.29 barrel</td>
<td></td>
</tr>
<tr>
<td>1 kilo calorie</td>
<td>4.2 kilo Joules</td>
<td></td>
</tr>
<tr>
<td>1 poise</td>
<td>0.1 mpas</td>
<td></td>
</tr>
<tr>
<td>1 inch</td>
<td>2.54 x 104 micron</td>
<td></td>
</tr>
<tr>
<td>Wt. of one M.S. Plate 3M x 1 M</td>
<td>245 kg</td>
<td></td>
</tr>
</tbody>
</table>

FFB Yield

Area one person can harvest day⁻¹ (10-day round) 1.5-2.5 t FFB
Approximate FFB yield ha⁻¹ round⁻¹ (24 t yr⁻¹) 0.67 t
Fertilizer application rate palm⁻¹ yr⁻¹ (for good yield) 12 kg
Source: Discussion with planters.
Datasheet

Harvesting Rounds

<table>
<thead>
<tr>
<th>Harvesting rounds</th>
<th>Loose fruits/</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-day rounds</td>
<td>4 kg weight - not practical</td>
</tr>
<tr>
<td>7.5-day rounds</td>
<td>7% - Best Choice</td>
</tr>
<tr>
<td>10-day rounds</td>
<td>13%</td>
</tr>
<tr>
<td>15-day rounds</td>
<td>Any colour change</td>
</tr>
</tbody>
</table>


OIL SEPARATION TIME IN CLARIFICATION TANK

<table>
<thead>
<tr>
<th>Minutes</th>
<th>Separation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>95.9</td>
</tr>
<tr>
<td>40</td>
<td>97.6</td>
</tr>
<tr>
<td>60</td>
<td>98.3</td>
</tr>
<tr>
<td>120</td>
<td>99.3</td>
</tr>
</tbody>
</table>

Source: Stork, Amsterdam.

CALL FOR ARTICLES

The millers are requested to send in articles of relevance to the palm oil industry in Malaysia for publication in Palm Oil Engineering Bulletin. By sharing your expertise you will be helping the industry and the nation as a whole. The topics of interest are:

1. Plant modifications done in your mill that resulted in improvements in milling operation or maintenance.
2. Innovations done in your mill that produced improvements in the operation of the mill and that you are willing to share them with others.
3. Any special work done in your mill that directly resulted in improvements in OER and product quality.

Please submit your article to us and we shall be pleased to publish them in Palm Oil Engineering Bulletin. Feel proud to have your articles published in this Bulletin that is circulated throughout the industry and MPOB offices worldwide.
ADVERTISEMENT

The advertisement cost is RM 600 per issue for an A4 size page of black and white, whereas the cost for colour is RM 800. Advertisers are required to submit to us either their own black and white artwork or colour separation films. Cheque should be made payable to the ‘Malaysian Palm Oil Board’. If you have any queries, please contact the following at MPOB.

Tel: 03-87694400   Fax: 03-89262971

Dr. Lim Weng Soon  ext: 4406  •  N. Ravi Menon  ext: 4467  •  Lim Soo Chin  ext: 4676
E-mail: milleng@mpob.gov.my

Advertising Schedule for MPOB Palm Oil Engineering Bulletin

<table>
<thead>
<tr>
<th>Issue</th>
<th>Quarter</th>
<th>Deadline for Registration</th>
<th>Deadline for Submission of Artwork</th>
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</thead>
<tbody>
<tr>
<td>83</td>
<td>Apr - June 2007</td>
<td>30 Apr 2007</td>
<td>30 May 2007</td>
</tr>
</tbody>
</table>

REPLY-SLIP

Dr. Lim Weng Soon/Ir. N. Ravi Menon
Engineering and Processing Division
Palm Oil Engineering Bulletin
6, Persiaran Institusi
Bandar Baru Bangi
43000 Kajang, Selangor
Malaysia

PALM OIL ENGINEERING BULLETIN ADVERTISEMENT – FULL PAGE ADVT.

1. We confirm our intention to advertise in the MPOB Palm Oil Engineering Bulletin.

Company:

Address:

E-Mail: T
Tel. No.: T
Fax No.: T

Contact Person: T
Issue No.: T

2. The artwork is attached/will be sent on T for your further action.

3. Please find enclosed *crossed cheque no.: T for RM T (T) being payment for the advertisement fee.

4. Thank you.

(Signature) (Date)

* Made payable to MALAYSIAN PALM OIL BOARD.
FOLLOWING a decision by the Editorial Board to further increase the role of Palm Oil Engineering Bulletin to serve the Industry better, a new addition called Palm Oil Mill Vendors has been introduced similar to Telekom Yellow Pages to assist mill engineers to know where to source materials or services pertaining to the industry. In order to make this useful, we need the co-operation of the mill engineers/managers to persuade their vendors to advertise in the Vendors’ List for a nominal fee of RM 100/year (four issues). If you have any queries, please contact the following at MPOB.

Tel: 03-87694400     Fax: 03-89262971

Ir. Ravi Menon ext. 4467 or e-mail: nravi@mpob.gov.my
Ms. Lim Soo Chin ext. 4676 or e-mail: milleng@mpob.gov.my

REPLY SLIP

Dr. Lim Weng Soon/Ir. N. Ravi Menon
Engineering and Processing Division
Palm Oil Engineering Bulletin Advertisement
6, Persiaran Institusi, Bandar Baru Bangi, 43000 Kajang, Selangor, Malaysia.

We wish to advertise in the MPOB Palm Oil Engineering Bulletin

<table>
<thead>
<tr>
<th>Company:</th>
<th>Issue No.:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact Person:</td>
<td>H/P:</td>
</tr>
</tbody>
</table>

Address:

E-Mail:                      Tel:          Fax:          

Please find enclosed a crossed cheque No.:                                          Bank:          

for RM:                              (Ringgit Malaysia)

drawn in favour of MALAYSIAN PALM OIL BOARD

Please select the headings from the list given below (not more than five headings) under which you wish to advertise.

- Air filters/dryers
- Air separators
- Boiler suppliers
- Bearings
- Boiler spares/cleaning
- Bunch crushers
- Belts
- Castings
- Cleaning - general
- Civil engineering
- Condition monitoring
- Control/automation/spares
- Conveyors/elevators
- Consultancy services
- Diesel eng./services/spares
- Fans
- Electric motors
- Expansion joints
- Fabrication works
- Filter cloth/materials
- Fluid control system
- Gaskets/packing materials
- Gear boxes
- Hardware - health & safety products
- Laboratory analysis
- Laboratory equipment
- Lubricants
- Mill machinery spares
- Nut crackers
- Palm oil mill consultants
- Pollution control systems
- Pressure vessels
- Pumps
- Purifiers
- Screw press/parts
- Scrubbers
- Sludge separators/decanters
- Steam turbines
- Sterilizer/parts
- Storage silos
- Vacuum pumps
- Valves
- Water treatment
- Welding equipments
- Waste water treatment
- Weighing machines wheel loaders/spares
- Others (specify headings)

1. ____________
2. ____________
3. ____________
4. ____________
5. ____________

Signature: ____________________________

Name: ________________________________

Date: ________________________________

Company chop
From: ____________________________________________

Address: ____________________________________________

_____________________________________________________

Question/Comment:

_____________________________________________________

Signed: ___________________________ Date: ____________

(We have enclosed this form to assist you in sending to us any questions or comments)
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Malaysian Palm Oil Board
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50720 Kuala Lumpur
Malaysia