



C rude palm oil (CPO) is produced in palm oil mills by mechanically extracting it from the sterilised and digested fruitlets. However, mechanical methods have their limitations as to how efficient they can extract the oil from the fruitlets. Thus, some oil is lost in the residues such as the empty fruit bunches (EFB), mesocarp fibres, steriliser condensate, separator sludge and decanter cake.

According to the *Environmental Management Guideline for Palm Oil Industry* (1997), about 56% of the oil losses are in the solid residues, while the other 44% is discharged along with the liquid residues (mainly oil-room effluent).

This new technology uses an ionic aqueous wetting agent to enhance the oil extraction rate and oil quality.

OBJECTIVES

D3 Solution Technology focuses on the following during the milling process:

- facilitation of oil extraction from palm oil fruitlets which results in higher yield;
- suppression of build-up of free fatty acids (FFA) in the CPO during the milling process;
- improvement in separation of oil at condensate and sludge pit; and
- lesser emulsification in the clarifier for better oil recovery.

TECHNOLOGY

D3 APOLLO 59 Solution is an ionic aqueous wetting agent that affects the interfacial surface tension between two liquids or between a liquid and a solid. The solution is highly alkaline and yet is environmentally safe and non-toxic.

Other key characteristics:

- inherently negatively charged – has no affinity for all non-polar hydrocarbon, oil and gas;

- separating and settling ability;
- corrosion inhibitor;
- water softening ability;
- antioxidant characteristics; and
- minimises and suppresses hydrolysis activity.

APPLICATION METHODOLOGY

D3 Solution Technology complements the existing mechanical milling process of the palm oil mills. It promotes surface contact and enhances the penetration of steam into the fruitlets and its bunches. By improving the steam's ability to penetrate, the sterilisation process is then more efficient and ultimately resulting in improving the extraction of CPO.

- The solution is packaged together with a chemical injection skid which consists of pumps, heater and atomiser. It is injected directly into the steam line to the steriliser.
- It is stored in individual intermediate bulk containers (IBC), each with a capacity of storing 1 t.
- Dosage is based on the estimated steam flow rate to the steriliser.
- It is heated prior to injection into the steam line to ensure there is no condensation due to temperature difference.
- *Figure 1* shows the D3 solution application in a generic palm oil mill process.

PERFORMANCE

Case Study No.1 (60 t hr⁻¹)

Type of steriliser: horizontal

During the D3 Solution's proof of concept (POC) application in the palm oil mill, substantial improvement was observed in oil extraction rate. During D3 injection, the oil extraction rate achieved was 21.29% compared to 20.56% before injection (*Figure 2*). Therefore, the oil extraction rate increment is 0.73% (*Figure 3*).



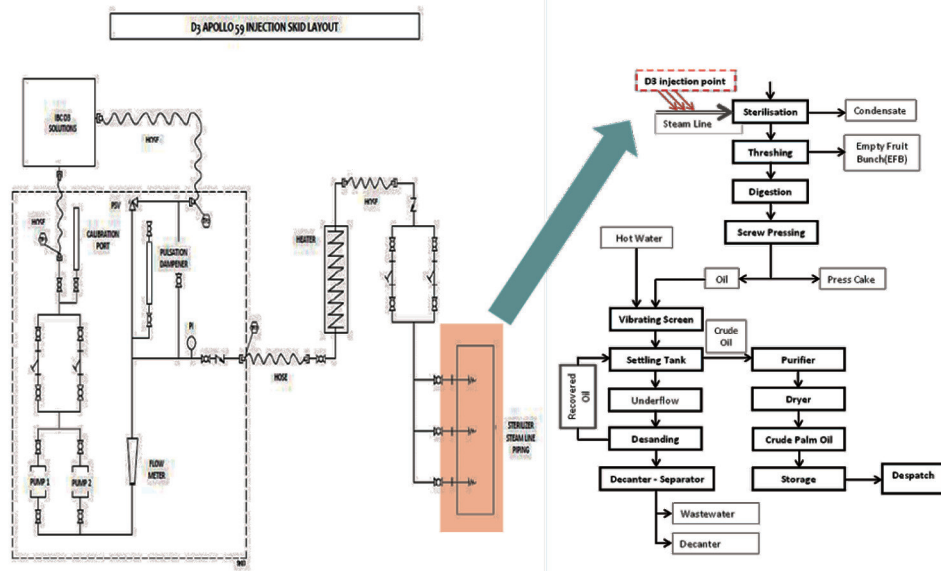


Figure 1. D3 Solution injection to the steam line entering steriliser in palm oil mill.



Figure 2. D3 Solution's skid and injection points at the steriliser.

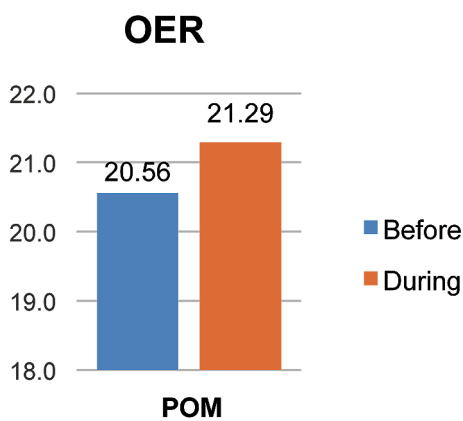


Figure 3. D3 application to the steriliser and improvement in oil extraction rate.

Case Study No. 2 (40 t hr⁻¹)

Type of steriliser: vertical

During the D3 Solution's POC application in the palm oil mills, substantial improvement was ob-

served in oil extraction rate. During D3 injection, the oil extraction rate achieved was 20.09% compared to 19.61% before injection. Therefore, the oil extraction rate increment was 0.48% (Figure 4).

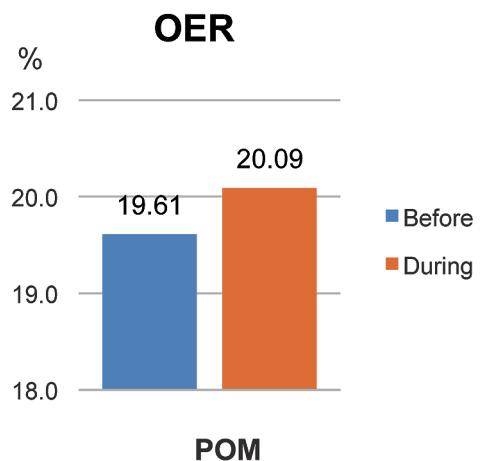


Figure 4. D3 application to the steriliser and improvement in oil extraction rate.

GENERAL FEEDBACK FROM FIELD OBSERVATION

- Improved oil quality with more reddish colour observed in the CPO.
- Increased oil separation and level at vertical clarifier tank.
- Increased oil separation and recovery from sludge pit.
- Increased rate of detachment of fruitlets from its bunches.
- Improved fruitlets conditioning.

BENEFITS

- Enhanced oil extraction rate.
- Reduce oil loss in unstripped bunches (USB) (Figure 5).
- Improved CPO quality (Figure 6).

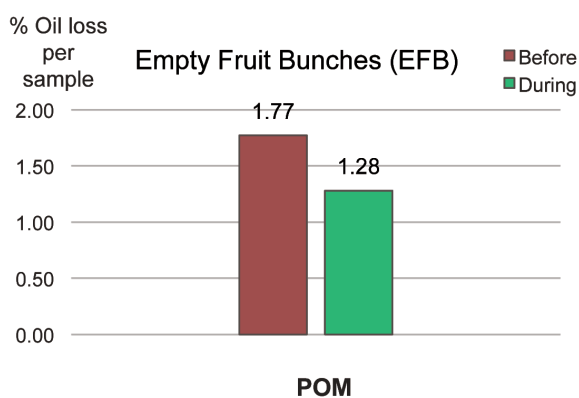


Figure 5. Oil losses at empty fruit bunches.

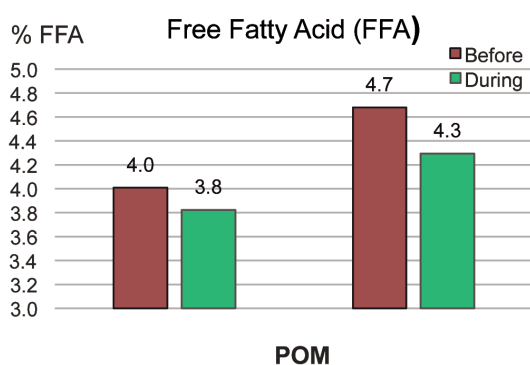
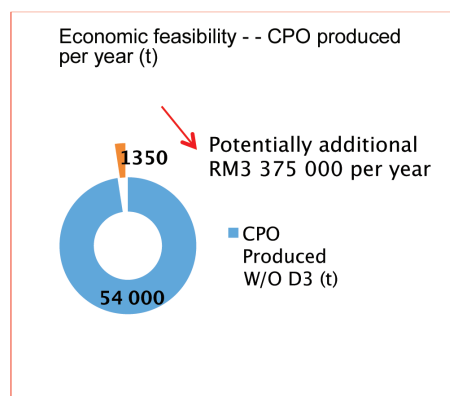


Figure 6. FFA improvement at two different mills.

ECONOMIC EVALUATION



Revenue	Per month	Per Year
FFB processed per hour	45 t	45
Mill FFB Processed	22 500 t	270 000
Estimated D3 required	12.4 t	148.5
Average improvement in OER by D3	0.50%	0.50%
Additional CPO produced with D3	112.50 t	1 350
CPO Price	2 500 MYR	2 500
Total additional mill's revenue increase	281 250 MYR	3 375 000
Cost of D3	(185 625) MYR	(2 227 500)
Additional potential profit for mill	95 625 MYR	1 147 500

Assuming a total of 270 000 t FFB per year for a typical 45 t hr⁻¹ palm oil mill, at an average CPO price of RM 2500 t⁻¹, an increment of 0.5% oil extraction rate will bring an additional revenue of approximately RM 3.38 million a year and an additional profit of RM 1.15 million per year.

Estimated D3 usage ranges between 0.04% to 0.06% of FFB input per annum. The profit calculation above is based on an estimated usage of 10 t of D3.

REFERENCE

ENVIRONMENTAL MANAGEMENT GUIDELINE FOR PALM OIL INDUSTRY (1997).

For more information, kindly contact:

Director-General
MPOB
6, Persiaran Institusi,
Bandar Baru Bangi,
43000 Kajang, Selangor,
Malaysia
Tel: 03-8769 4400
Fax: 03-8925 9446
www.mpob.gov.my