

Palm Oil Waste Management: Value-Added Products from Effluent Pond Solids



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Ir. Wan Wai Thong graduated with a Bachelor in Engineering Hons. Agriculture in 1993 and he managed to complete the 3 years of Reserve Officer Training Unit in 1992 before graduated as an engineer. At present, he works as a technical adviser in palm oil mills in Malaysia and Indonesia.

Conventionally, palm oil mill effluent is treated via a series of ponds such as Acidification, Anaerobic, Aerobic and Algae ponds. Due to natural bacteria process in the effluent, solids normally form in an aerobic ponds as the effluent passes through it and eventually settles at the bottom of the pond.

In current mill practice, the effluent solids are pumped out or excavated every six months or yearly; these are then dried naturally in the drying bed. Alternatively, with matured engineering and technology innovations, the effluent solids are extracted out daily and further processed and turned into value-added products which can be sold. This product is normally called bio-fertiliser or organic fertiliser.

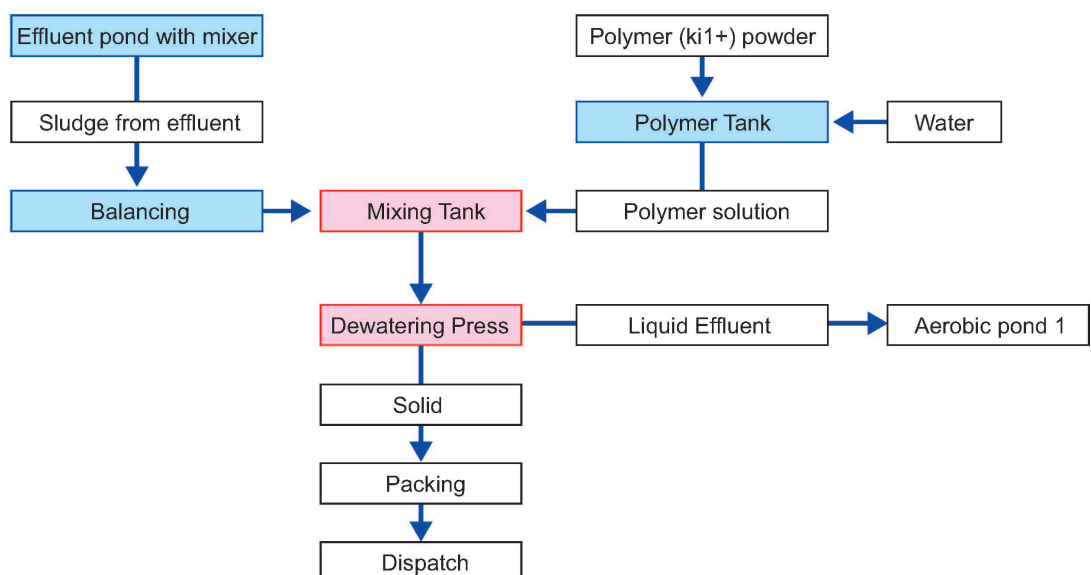
Here, we will briefly elaborate, with a clearer scope, about the product and the process which has improved the management of solids in the ponds and resulted in a by-product that is marketable.

INTRODUCTION

Dewatering is the removal of water from solid material or soil by wet classification, centrifugation, filtration or similar solid-liquid separation process, such as removal of residual liquid from a filter cake by a filter press as part of various industrial processes.

The bio-fertiliser plant is used to produce organic fertilisers which have a lot of nutrients. Natural and organic fertilisers are quite different from chemical fertilisers. Soil with organic material will remain loose and airy to hold more moisture and nutrients that will promote faster growth of soil organisms. This results in healthy plant root development.

Flow chart - The solid dewatering process flow is shown below:



THE PROCESS FLOW:

The Palm Oil Mill Effluent (POME) is initially stirred at the Effluent to homogenise the mixture. After this, it is pumped to the balancing tank at 25m³/hour as shown in Photo 1.



Photo 1: Balancing tank – Inlet and overflow

The powdered polymer (K11 cation) is diluted by mixing it with water. This process is done in the mixing tank as shown in Photo 2. Next, the polymer solution and the sludge from effluent are mixed together using a stirrer. This is done so that the solid particles will coagulate together during the chemical reaction. The whole system is automated, making it very efficient and reliable. The control panel is attached to the machine itself (Photo 2).



Photo 2: Mixing Tank

Following this, the mixture (sludge + polymer) is fed into a dewatering press with three motors attached as shown in Photo 3. The machine removes moisture and thickens the solid clusters. The filtered water from this machine is sent back to the Aerobic Pond No.1.

At the end of dewatering press, there is an adjustable press plate to determine the dryness of solid. This is done to ensure the efficiency is up to 90-95%. The press is controlled by an inverter which regulates the speed of the screw, depending on the dryness of the solid. If there is too much



Photo 3: Multi disc screw dewatering press

moisture, it will automatically decrease the speed of the screw, ensuring the moisture has enough time to be separated. The solid is then conveyed via a stainless steel shaftless conveyor for solid disposal into a solid storage bunker as shown in Photo 4.

The solid cake can be packed for sale as shown in Photo 5.



Photo 4: Solid storage bunker



Photo 5: Solid cake packed into bags for sale

A sample of the solid cake was tested to check the components contained and the following results were obtained:

Table 1: Sample contents

N	3.59%
P	1.43%
K	1.03%
Mg	1.22%
Organic Matter	42.88%
CN Ratio	15.5%
Moisture	77.18%

SUMMARY

This waste product, produced daily by palm oil mills, has immense potential. Right education, promotion and marketing strategies will improve demand for the product.

As seen from Table 1, the product sample has a high content of organic matter which will help enhance the soil nutrients for agriculture. The production process requires very low power consumption and will not add much to the cost of running the mill, only about <10KW in total for an entire plant.

It is not only a good organic fertiliser but it also helps to maintain effluent ponds retention time as the daily effluent desludging process takes away most of the solid continuously.

This solid can also be used as base material for a chemical fertiliser known as hybrid fertiliser, which can be tailor-made to suit customer requirements by adding other fertiliser components to it. ■

IEM DIARY OF EVENTS

Title: 2-Day Course On ‘Adjudication – Procedure and Problems’

13 - 14 June 2016

Organised by : Project Management Technical Division

Time : 8.45 a.m. – 5.30 p.m.

CPD/PDP : 14

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