

REMOVAL OF TRASH IN STERILIZED FRUITLETS IN PALM OIL MILL

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Trash or impurities in fresh fruit bunch (FFB) consignment supplied to the palm oil mill is one of the major problems for the palm oil millers. It will definitely affect the oil extraction rate (OER) and raise the palm oil mill operation cost. Besides, certain types of trash will affect the quality of end products.

Trash commonly refers to all foreign components in FFB. Trash is picked up during the loose fruit collection and from dirty bunches especially during wet season.

Study by Shawaluddin *et al.* (1998) showed that the trash content in mass passing through digester (MPD) had increased significantly from about 6% in 1990/91 to 11% in 1995/96. Calyx leaves contributed about 33% of the trash received but the remaining 67% are in the form of sand, stones, mud and other plant materials.

Currently, there are a few mills, that try to reduce trash in the early stage of processing. For FFB cleaning, the techniques like spraying system, screening and soaking the whole consignment into hot water tanks have been tried. Even though these techniques have proven promising, they have not gained popularity because of high capital cost, messy operation, and the tendency for oil quality to deteriorate.

THE MACHINE DESCRIPTION AND WORKING PRINCIPLES

The MPD washing system was designed and tested by MPOB to remove trash especially sand and stones in MPD.

The system consists of a hot water tank, a rotary drum, a drive motor, a feeder screw conveyor and hot water sprayer system. The rotary drum is 2.44 m long with a diameter of 0.76 m and is made of three sections with three different sizes of wire mesh. The intake water for sprayer also has a screen to prevent trash from entering the system. The sprayer has a valve at the end to remove trash and to avoid blockages to spray holes if it accidentally enters the sprayer.



Figure 1. Dirty bunches and loose fruits at loading ramp.

The MPD is tapped from the bottom of thresher and fed into a rotary drum by screw conveyor. It is sprayed with hot water normally around 70 °C to remove the trash. The washed MPD is then discharged through perforated holes at the end of rotary drum. The oil losses to the sprayer system are recycled to the vibrating screen once a while by pumping the top portion of water inside the tank.

FIELD TRIAL AND FINDINGS

A field trial was carried out in one of FELDA mills and the results revealed that the machine was capable of removing sand and stones in the MPD.

The percentage of sand removal depends on the freshness of the FFB processed and also the hot water temperature used for spraying. The average sand/stone removal was around 71.42%, but if stones are excluded, the removal could be as high as 93.00%. The oil losses from the system was around 0.04% on sample and the make up of hot water is about 0.125 m³ t⁻¹ of MPD being washed

COSTING FOR THE MPD WASHING SYSTEM

Sand and stone have caused high wear and tear to the palm oil mill machinery. This has contributed to the high



maintenance cost. The most affected machine is digester, screw press and sludge separator. Below is the cost of repairs, replacement and overhaul of those machine for the mill that process 200 000 t FFB yr⁻¹ (3600 hr).

TABLE 1. MAJOR MAINTENANCE COST FOR MACHINERY

Stations	IRH	Cost	ARH	Extra Cost
Press				
1. Ws	1 200	15 300	900	5 100
2. Wpc	2 800	6 840	1 800	4 560
Digester				
1. Sa	3 000	3 240	2 010	1 620
2. Ea	3 000	2 592	2 000	1 296
3. Wl	1 year	1 440	9 month	432
4. B1	1 year	3 060	9 month	918
Clarification				
1. N	1 300	2 880	700	2 160
2. B	1 400	3 600	700	3 600
			Total	19 686

Notes:

- * IRH - ideal running hours
- ARH - actual running hours
- Ws - worn screw : Wps - worn press cake
- St - stirrer arms : Ea - expeller arms
- Wl - wall liner : B1 - bottom liner
- N - nozzles : B - bushing

Total extra maintenance cost per year
= RM 19 686

Cost of the MPD washing systems and its installations
= RM 36 000 unit⁻¹

For a 40 t hr⁻¹ mill, two units are required.
So the total cost for the MPD system and installations
= RM 72 000

Assuming that the MPD system is capable of removing sand in palm oil mill, the current maintenance cost incurred could be reduced by RM 19 686.

So the expected payback period is:

$$= \text{RM } 72\,000 / \text{RM } 19\,686$$

$$= 3.65 \text{ years}$$

If the parts replacement needed by the centrifugal pump, desander, etc. due to sand abrasion are included, the expected payback period will be within 3.5 years.

THE BENEFIT

Incorporation of the system will prolong the life span of the machinery especially at press station and oil room due to sand abrasion. Indirectly, it will reduce the production



Figure 2. The MPD washing system.

cost of the oil. Removing of trash will also reduce the oil losses at press station as well as oil carry-over by the underflow of continuous settling tank, thus better OER could be expected.

The MPD system is also small and will occupy a small space compared to the FFB washing system. The investment cost of less than RM 100 000 is far below that of the FFB washing system which is more than RM 1 000 000. The maintenance cost is also reduced substantially.

The efficiency of the MPD washing system could be as high as 93% without much effect on oil quality and oil losses. In order to minimize the oil losses, spray water could be used as dilution water for crude palm oil slurry.

For a 40 t hr⁻¹ mill capacity, two units of MPD washing system are required and the expected payback period is about 3.5 years.

REFERENCE

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