

# AIR-ASSISTED LOOSE FRUIT SEPARATING MACHINE

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**A** cost-effective loose fruit collection system is still one of the main targets of oil palm industry. Various inventions have been introduced but the objective has not been met due to the various technical limitations and constraints. Therefore, collection of loose fruits by raking is still being practiced, with a high percentage of debris. The debris content in raking activity can be as high as 60% by weight (Ahmad *et al.*, 1995).

The introduction of loose fruits separator machine was reported by Amirshah and Hoong (2003), where high percentage of debris in loose fruits that were collected using raking method has been reduced to an acceptable level. In their study, the loose fruits were collected using raking method as this method of gathering fruits offer the best option in terms of speed, particularly during periods of extended harvesting rounds due to labour shortage.

The reasons for having clean loose fruits before sending it to the mill is to have a higher oil extraction rate (OER). The large amount of trash will affect the mill productivity, as trash will absorb the oil hence resulting in the reduction of OER. There are also certain mills that penalise the estate if they keep sending large amount of trash (together with loose fruits) to them.

## DESIGN CONCEPT

The separator machine is a mobile type hence it can be moved from one place to another. The separation will be carried out on a vibrating bed.

In this development, the objective of the separating mechanism is to give zero debris and zero damage. Generally, the machine has the following mechanisms:

- gravity flow. The mixture of loose fruits and debris will be poured into the receiving hopper and allowed to flow down to the lower point. During the process of sliding down, this mixture will be

subjected to two methods of separation, *i.e.* first by double layer vibrating beds and second by an air stream.

- double layer vibrating mechanism. There are two stages of vibrating bed on the machine. The first vibrating bed is to ensure that the fruits are distributed into a single layer before they reach to the second stage. During the transition stage, *i.e.* from first bed to second bed this mixture (fruits and debris) will be exposed to air stream.
- air stream. The air stream is created to blow out the lighter materials such as dry leaflets, small stones and dry flower *etc.*

## PROTOTYPE

This is a one-man operated machine which is designed to be either a mobile type or stationary type. The prototype was powered by 6HP Kubota diesel engine. As for the vibrating mechanism, the off-centred flywheel generates the vibrating movement. Two high-speed fans that coupled directly to engine shaft using belt and pulley system produced the air stream. These fans are mounted to a shaft that is located above the second vibrating bed.

To make the separating process effective, a sufficient space or gap is created between the first and second vibrating beds in which the air stream is channelled. An air stream with a velocity of  $10 \text{ m s}^{-1}$  was found to be sufficient to blow out the debris.

During the operation, the operator needs to empty the bags of loose fruits onto the feeding compartment or the receiving hopper and the clean loose fruits are collected at the end of the second vibrating bed.

## RESULTS

A function test was conducted to assess the ability of machine to separate the debris and loose fruits. Manually collected loose fruits packed in fertilizer bags were used to test the machine (*Figure 1*).

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Figure 1. Fruits from fertilizer bags are emptied onto the receiving hopper and with the help of vibration mechanism and air stream, the clean fruits are collected just after the second bed.

From the observation, it was found that the machine was able to separate the debris from the loose fruits effectively. The average time taken to clean a bag of 25 kg loose fruits was 1.5 min with the percentage of 97% cleanliness.

Assuming that the output of the machine is 1 t hr<sup>-1</sup> and taking labour cost as RM 25 per day with five working hours per day; thus the cost of using the separating machine is RM 7 t<sup>-1</sup>.

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#### REFERENCES

AHMAD, H; AHMAD ZAMRI, Y and MOHD SALIH, J (1995). Loose fruit collector. *PORIM Information Series No. 19*.

AMIRSHAH, T and HOONG, HW (2003). Improved loose fruit collection system using sawit loose fruit separator. *Proc. of the PIPOC 2003 International Palm Oil Congress: Agriculture Conference*. p. 43.

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