

Performance study of a *Jatropha curcas* l. fruit shelling machine for kernel recovery in biodiesel production

ABSTRACT

The presence of *Jatropha* shells and husks during the process of oil extraction can affect oil yield and output quality. A shelling machine has been developed at the Universiti Putra Malaysia (UPM) to supersede the time-consuming manual method to remove shells and husks directly from the whole fruits for kernel recovery. The output kernels are in broken forms that ease the oil extraction process. The machine basically consists of cracking rollers, a vibratory sieve as the first stage separator, and a blower as the second stage separator. The performance of the machine was evaluated using five different blower air speeds (3.5, 6.2, 9.5, 12.6, and 13.4 ms⁻¹) and the size of the mesh on the sifter was fixed. The 9.5 ms⁻¹ speed was selected as optimal as the highest separation efficiency of 66.98% could be achieved. The considerations to determine the separation efficiencies included kernel recovery, the percentage of shells and the percentage of husks removed. At the optimal setting, the shell and husk removal achieved 97.17% and 55.21%, respectively, while the kernel recovery achieved 87.88%. A total of 12.12% kernels were lost and most of the losses were kernels in tiny broken form. The results indicated that a further improvement of the machine is necessary with the application of strategies to create highly different physical properties between the kernels and other impurities to enhance the effectiveness of the removal of impurities while maintaining a low kernel loss.

Keyword: Blower separator; *Jatropha*; Kernel recovery; Shelling machine