INVESTIGATION ON THE STICKINESS FACTOR FOR THE THRESHER OPERATION IN PALM OIL MILL INDUSTRY

S.F. Salleh.*, Saree S., Sanaullah K., Sawawi M., Rajaee N.

Faculty of Engineering Universiti Malaysia Sarawak 94300, Kota Samarahan, Sarawak, Malaysia *Corresponding Author: sshanti@unimas.my

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ABSTRACT

Malaysia is aiming to increase the national Oil Extraction Rate (OER) from the current rate of 20.20% in year 2016 to 23.0% in year 2020 through a combination of monitoring and quality control. In palm oil mill, thresher is the equipment used to detach the fruit from bunches which cause oil losses but the optimum operation may can keep these losses within the industry accepted limits. Thresher machine performance and important parameters affecting the cleaning efficiency of the thresher were identified as forces acted on the thresher, weight loaded inside thresher, types of palm fruits, stickiness factor, machine dimension and thresher material. Series of analytical equations were investigated to calculate the important characteristic of the stickiness forces between the fruit bunches and the fruit (dura and "tenera") with the material of the thresher. The radius of two types of fruits varieties are ranging from 0.02256 m to 0.03014 m for dura; and 0.02597 m to 0.03336 m for "tenera". The total force were calculated using various loading options, rpm and materials of the thresher manufacturing body using a method of numerical basis. The loading has a proportional effect on the amount of the centrifugal force exerted by the fruit bunches on the periphery of the thresher where more centrifugal force has been exerted in the direction from inside to the outside at the body of the thresher in the case of more loading in the thresher. The centrifugal force responsible for the blockage of the openings inside the body of the thresher varies proportionally in the form of a straight line which depicts that the higher the rpm the higher would be the force exerted from the outside to open the clearings.

INTRODUCTION

In tenth Malaysian Plan, Malaysia target is to increase the production output of the palm oil industry to gross domestic product to RM 21.9 billion with export earnings of RM 69.3 billion. As stated by Malaysian Palm Oil Board (MPOB) in April 2014, Indonesia and Malaysia produce about 85% of the world's palm oil. Other producer countries such as Thailand, Columhia, Nigeria, Papua New Guinea and Ecuador also produces oil palm as one of their major economics crops [1]. Currently, Malaysia is the second world largest producer and exporter of palm oil which produces 19 Million Tonnes per year of palm oil as shown in Table 1.

Country	Million Tonnes per year
Indonesia	31
 Malaysia	19
 Thailand	2.1
Columbia	1
Nigeria	0.93

Table 1: Production of Palm Oil in Million Tonnes per Year [1]

Research and development activities has been done to improvise continuous innovation efforts for sustaining and creating investment in Malaysia to find new opportunities, solutions and uses of palm oil. Most studies investigated on the effect of steriliser of oil palm fruits, steriliser performance and efficiency [2]. Besides, some of the efforts are investigated about oil palm as a renewable and sustainable energy source in Malaysia [3,4]. These efforts result in maximizing the usage of empty fruit bunch hence increased the palm oil fruit output productivity demands.

It is necessary to investigate the palm oil mill thresher design by keeping in view all those factors that effects its efficiency in order to play a part in nation's progress in terms of the research and development to help the nation to achieve 10th Malaysia Plan. Over the years, the national Oil Extraction Rate (OER) has not made significant improvement, providing an opportunity for Malaysia to increase the national average through a combination of monitoring and quality control. In meeting national target to increase the oil extraction rate, thresher machine performance and important parameters during palm oil mill operation have to take into consideration. Palm oil mill output productivity depends mainly on the threshing quantity. Fruit stripping or threshing is the process of fruit detaclument from the bunch and is the