

MATHEMATICAL MODELLING AND SIMULATION OF THRESHER OPERATION IN PALM OIL MILL

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Abstract: The development of the palm oil mill has been on a downward trend recently due to world economic recession, the technological input for oil extraction is the factor that contributes to this production setback in the industry. Therefore, there is a need to develop an advanced technology that will enable a spontaneous increase in the oil extraction rate (OER). This study is aimed at the development of the technological mode of operation for the thresher unit which has seldom been neglected over the years. Computational numerical analysis has been selected for this study focusing on the stickiness and centrifugal force of the thresher. The resistance force has been obtained through the calculation of all the loads obtained from the thresher body as well as from its revolution per minute (rpm). The calculation on the impact of the opposite force on the internal and external part of the thresher was conducted. It has proposed to verify gravity of forces of the fruit spikelet has on the thresher. The result from this study will be useful in the design of an efficient process for achieving high oil extraction rate in the palm oil mill industry.

Keywords: Thresher, resultant force, palm oil mill, oil extraction rate (OER).

Introduction

The impact of Palm Oil Mill industry in Malaysian economy is in the positive growth over the past decades, this is evident from its major contribution to the gross domestic product (GDP) (Balu *et al.*, 2018). The growth of this important sector is as a result of intense research and development of new processing technology used in the palm oil industry. As the innovation in this technology is continually developed, there is a need to intensify the production to meet the growing demand for palm oil in the international market. The optimization of basic unit operations equipment such as the thresher is vital to increase production. However, despite the efforts on the minimizing losses during thresher operation, the absence of thorough study of force analysis in the thresher that enables the attainment of increased production is still scarce (Sivasothy *et al.*, 2005).

The need for innovative technologies to replace the traditional methods in the design of various unit operations especially the thresher in the Malaysia palm oil mill industry need further exploration as well as intense research. This innovation is aimed at to increase the Oil Extraction Rate (OER) which has been on the decline in recent times. It is equally important to note that an increase in OER will have a multiplier effect on the overall growth in Malaysia economy as well as meet the global demand for palm oil and its allied products. Malaysia palm oil mill industry has been encouraged to adopt any alternative methods to upgrade the product quality. Since the quality of palm oil produced largely depends on the threshing efficiency, it will be worthwhile to analyze and optimize the performance of the thresher. The main function of the thresher is to detach the fruits from the bunch which is the first stage in the palm oil production process. The extraction efficiency is estimated from the losses at different stages of