

UNIVERSITI TEKNOLOGI MARA

**ASSESSMENT AND IMPROVEMENT OF
ENERGY UTILIZATION IN PALM OIL MILL
BY USING MICROSOFT EXCEL AND
ASPEN HYSYS SOFTWARE**

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ABSTRACT

Despite having a significant contribution to the economic growth, palm oil mill industry is undoubtedly categorized as a sector that consumes enormous energy. However, the energy consumed or utilized in the palm oil mill need to be managed properly in order to minimize the excess of energy generated. In this study, an actual crude palm oil process located at Bestari Jaya, Malaysia was analyzed using energy assessment approached and process simulation. This was intended to assess the amount of energy required in the palm oil mill as well as to define possibilities in improving the energy utilization in the palm oil mill. The energy assessment was conducted by performing mass and energy balance analysis by using Microsoft Excel, while goal seek method in the Microsoft Excel and process simulation by using Aspen HYSYS V8.8 were also conducted to predict the theoretical amount of steam and energy required for the crude palm oil process. Based on the assessment conducted, the amount of steam consumed in the sterilization and digestion processes were obtained at 0.13 ton/h FFB and 0.04 ton/h FFB, respectively. These values were considered acceptable since both values shows a good agreement with other studies. Besides, the total actual amount of steam and energy utilization was also obtained through the assessment; the values were 15283 kg/h of steam and 10980 kW, respectively. But, through goal seek method and process simulation, the result indicates that the reduction of energy and steam utilization in the selected palm oil mill can be made up to 9.51% and 10.41%, respectively. As a conclusion, it is proposed that better control system should be employed in the palm oil mill such as implementing a proper control system for temperature and flowrate as to monitor the steam utilization. Besides, proper maintenance of equipments was also suggested to be conducted in the plant as to improve the efficiency of equipments, so that, heat loss generation could also be minimized.

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CHAPTER ONE

INTRODUCTION

1.1 Research Background

Energy assessment is an important step in assisting industrial companies to develop a better understanding on how the energy being used within the building, process or system. By conducting the energy assessment, possibility for energy saving and improvement could be identified together with the areas where the waste of energy occurs. Since the energy spending is a major expense to industrial companies [1], the growing trends of energy cost will continue to rise, thus, will result to a poor sustainability of the companies in the future. Therefore, it is crucial to implement the energy assessment to reduce the manufacturing costs.

Palm oil mill industry can be considered as one of the major industries with large amount of energy generation and consumption [2][3][4]. These are due to the high steam and electricity utilization during the milling process [5]. In addition, the excess of energy produced from steam and electricity during the milling process could also increase the production costs. Nevertheless, the capability and efficiency of palm oil mill process can still be improved if the energy assessment could be implemented [2]. The reduction of the excess energy produced from the palm oil mill industry could be made if the amount of required energy could be identified within the process.

By reviewing the present energy consumption pattern during a period of normal operation, the energy assessment can be made [6]. Analyzing the energy bills and performing the energy balance are some of the very useful method to assess the energy [7][6]. These should examine the plant's energy cost as well as quantified and balance the energy input against the energy output. As for this, computer-aided programs could be the fastest and easiest way to perform the energy assessment.