

MODELING OF PALM KERNEL OIL FROM SC-CO₂ EXTRACTION

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ABSTRACT

A mathematical model is developed in order to study the effect temperature and pressure toward the extraction of palm kernel oil using a supercritical carbon dioxide. A sets of secondary data were obtained from previous studies which consist of a sets of temperature, pressure and amount of oil yield. In this study, the artificial neural network is used to simulate the effect of temperature and pressure towards the oil extraction. In order to obtain the desired output, the suitable number of neuron must be selected. To choose the suitable number of neuron, the sets of data were inserted into the neural network model and let to train by manipulating the variable from 1 neuron to 25 neuron. The result for mean squared error for each variable were then tabulated and compared. Based on the result, the least MSE was 18 neuron number. Then, by using the chosen neuron number the simulation were let to run and trained until the best regression is obtained. Regression R Values measure the correlation between outputs and targets. R value of 1 means a close relationship, 0 a random relationship. The regression obtained from the simulation is 0.958. This indicate that there are a good relation between the experimental and theoretical data. The data for experimental and theoretical were then compared and the error obtained is within the acceptable range which is 3.356%

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CHAPTER 1

INTRODUCTION

1.1 Research Background

Palm kernel is the edible seed of the oil palm trees. It is originally from Africa and become one of the main commodity crop for the nation. According to Okpala (2015), the fruit of the palm oil tree is known for its usefulness in producing palm kernel oil from the kernels and palm oil from the fleshy part of the fruits. The demand for the palm kernel are increasing and the palm kernel are introduced to other parts of the world such as Sri Lanka, Malaysia and Sumatra.

Oil Palm was introduced in Malaysia in 1870 and has become one of the main commodity crop in Malaysia. Due to variety application of the palm kernel oil, the demand for the oil in Malaysia shown a rapid growth every year. More planted area for plantation of palm kernel tree were discovered. The production of the palm kernel oil managed to increase from 1.3 million tonnes in the year 1999 to 4.7 million tonnes in the year 2011. Malaysia currently accounts for 39 % of world palm oil production and 44% of world exports (Idrees, A., 2014)

In general, the method for palm kernel oil extraction are mechanical extraction and solvent extraction. The mechanical extraction process are done in three basic processes which are the (a) kernel pre-treatment, (b) screw-pressing, and (c) oil clarification. The mechanical extraction are suitable for both small and large capacity operation. On the other hand, solvent extraction processes can be divided into kernel pre-treatment, oil extraction and solvent recovery.