

UNIVERSITI TEKNOLOGI MARA

**AUTO-REGRESSIVE WITH EXOGENOUS INPUT (ARX)
MODELING ON HEATING PROCESS IN STEAM
DISTILLATION ESSENTIAL OIL EXTRACTION
SYSTEM**

NURLAILA ISMAIL

Thesis submitted in fulfillment of the requirements
for the degree of
Master of Science

Faculty of Electrical Engineering


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Candidate's Declaration

I declare that the work in the thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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Name of Candidate : Nurlaila binti Ismail
Candidate's ID No. : 2008264868
Programme : EE780
Faculty : Faculty of Electrical Engineering
Thesis Title : Auto-Regressive with Exogenous Input (ARX)
Modeling on Heating Process in Steam Distillation
Essential Oil Extraction System

Signature of Candidate : 

Date : 18 February 2011

ABSTRACT

This thesis presents a new ARX model of heating process in steam distillation essential oil extraction system by using system identification approach. Two experiments were carried out; the first is a simple direct heating system and the second is an automation heating system based on the steam distillation essential oil extraction (SDEOE) plant. The experiments were performed at the pilot plants in the Distributed Control System (DCS) Laboratory in Level 5, Faculty of Electrical Engineering, UiTM. A computer and a data acquisition were used to log the input-output data from the experiments. The MATLAB version R2006a was used to estimate design ARX model and the model estimate is done by using linear regression method. In order to validate the estimate model, several methods were used such as Multiple Correlation Coefficient or model fitting (R^2 value), One-Step Ahead Prediction (1-SAP) with its residual and correlation tests of residual which comprises of Autocorrelation Function (ACF) and Crosscorrelation Function (CCF). It is noticed from both experiments that partial data of the whole input-output data is sufficient to produce an adequate ARX model.

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