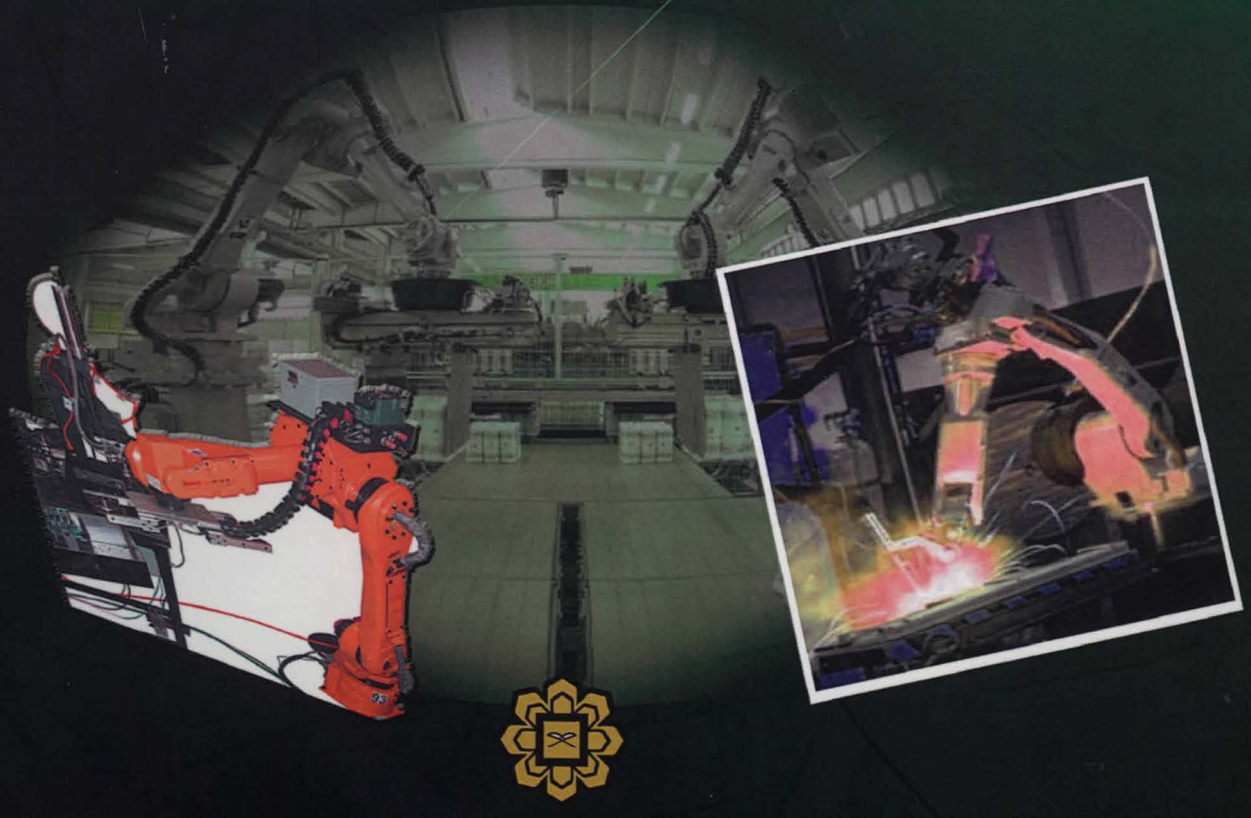
MECHATRONICS BOOK SERIES

ROBOTICS AND AUTOMATION

Rini Akmeliawati
Wahju Sediono
Nahrul Khair Alang Md. Rashid



IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

MECHATRONICS BOOK SERIES: ROBOTICS AND AUTOMATION

Editors

Rini Akmeliawati
Wahju Sediono
Nahrul Khair Alang Md. Rashid

IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

Rini Akmeliawati, Wahju Sediono & Nahrul Khair Alang Md. Rashid: Mechatronics Book Series Robotics and Automation

ISBN: 978-967-418-152-9

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :
IIUM PRINTING SDN.BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan
Tel: +603-6188 1542 / 44 / 45 Fax: +603-6188 1543
EMAIL: iiumprinting@yahoo.com

TABLE OF CONTENTS

CHAPTER 30

Development of an Intelligent Controller for Tropical Food Storage System: A Review

Momoh-Jimoh Eyiomika Salami, Md. Raisuddin Khan, Oluwo Adeyinka Abdulquadri[c]

Mechatronics Engineering Department, International Islamic University Malaysia (IIUM)

[c]yinkostics2@yahoo.com

30.1. Introduction

30.1.1 Background

Handling of postharvest products is a very delicate issue most especially as it concerns prolonged storage of the products to make them available outside their seasons. An effective storage process results in availability of the products in acceptable conditions long after harvest. A second advantage is relative stability in the market prices of the products that are stored. Table.1 illustrates the postharvest losses incurred both in developed and developing countries. One can infer from the table that for developing countries a higher percentage of the losses occur between the production sites (farms) and the retail and consumer sites. Traditionally the storage process should commence immediately after harvest save for those items that need to undergo curing processes.

Table1. Estimated postharvest losses of fresh produce in developed and developing countries.

	Locations	Developed Countries		Developing Countries	
		Range (%)	Mean (%)	Range (%)	Mean (%)
1	From production to retail sites	2 - 23	12	5 - 50	22
2	At retail, food service and consumer sites	5 - 30	20	2 – 20	10
3	Cumulative Total	7 - 53	32	7 - 70	32

Source: A. A. kader [1].

Harvested produce emit heat, moisture, carbon dioxide and ethylene gases due to physiological processes taking place within the body of the produce. Under storage, especially in confined spaces these emissions can be detrimental to the produce if not properly evacuated. Thus, a need for proper conditioning of the storage environment arises. The objectives of food storage are sustenance of product quality and reduction in weight loss of the products. Maintaining appropriate storage temperature and humidity levels play a major role in prolonging product shelf life.

A particularly economical method of storage employs air draught upwards through the produce pile thus conveying away the by-products. If conditions are suitable, ambient air is employed to optimize the operational cost. To further improve on the storage process automatic control is employed. The thermodynamic process within the storage environment involves heat and mass exchange between the products and the environment (flowing air). As the air flows through the product pile its heat and moisture receiving capacities drop due to saturation effects. The resulting temperature and moisture gradients set up within the storage volume make the storage process a complex and nonlinear one. In steady state, the temperature and moisture gradients with respect to product height within the storage volume remains relatively constant.

30.1.2 Problems associated with the food storage process

At some point in the flow the heat and moisture receiving capacities of the air drops since it becomes saturated due to the initial contact with products located upstream. This action often