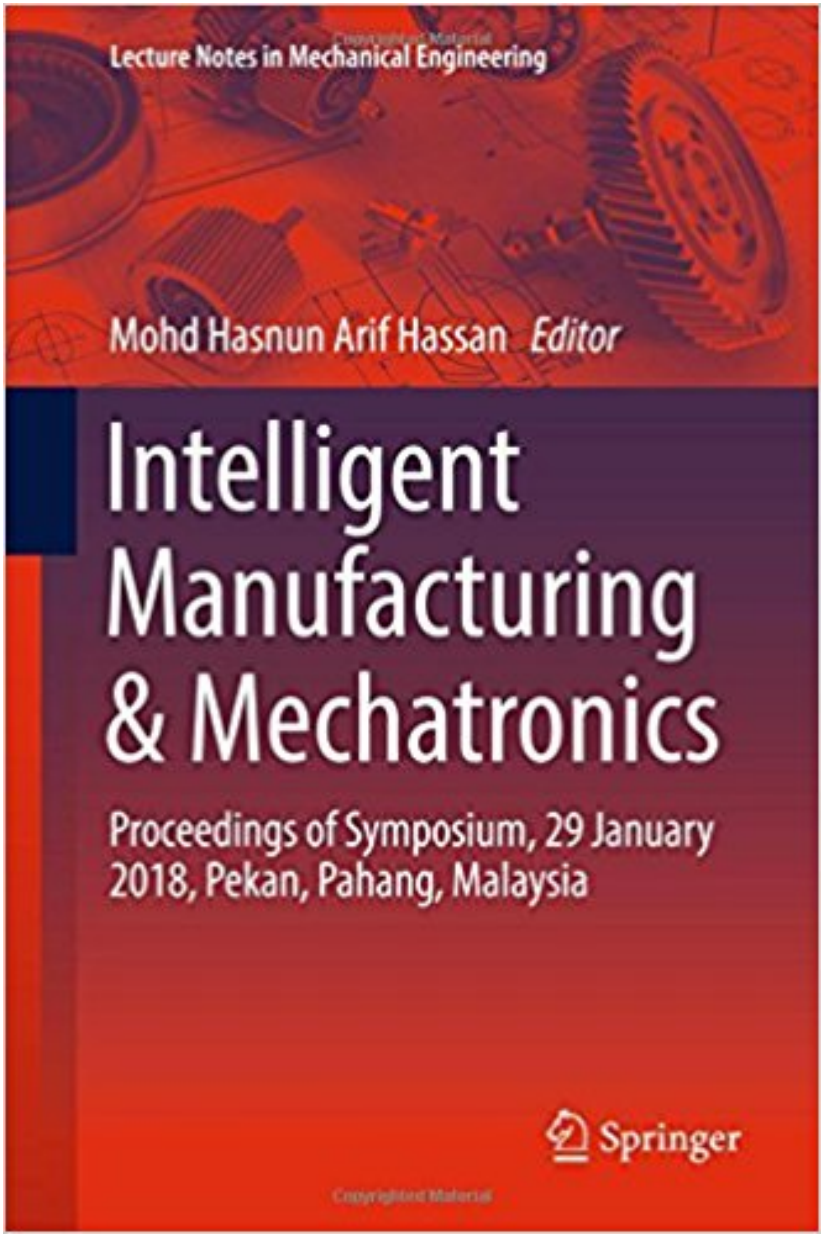

Intelligent Manufacturing & Mechatronics

Proceedings of Symposium, 29 January 2018, Pekan, Pahang, Malaysia

Editors: **Hassan**, Mohd Hasnun Arif (Ed.)

Mohd Hasnun Arif Hassan
Editor

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Preface

The Symposium on Intelligent Manufacturing and Mechatronics (SympoSIMM) 2018 was held at Universiti Malaysia Pahang in Pekan, Pahang, Malaysia, on 29 January 2018. It was organized by the Faculty of Manufacturing Engineering, Universiti Malaysia Pahang (UMP), in collaboration with the Faculty of Manufacturing Engineering of Universiti Teknikal Malaysia Melaka (UTeM), Melaka. Both parties aimed to provide a platform for deliberating empirical and theoretical research that are foreseen in the context of Industry 4.0. With the theme of "Strengthening Innovations Towards Industry 4.0", it is the first dedicated symposium to Industry 4.0 hosted by the organizers. The symposium was graced by a vivacious keynote speech entitled "The Ideas of Mechatronics" by Prof. Ir. Dr. Wan Azhar Wan Yusoff.

This symposium enticed 120 submissions from authors nationwide. All submissions underwent a strenuous peer review process from members of the Peer-Reviewing Technical Committee. The reviews were based on the manuscript's relevance to the tracks, novelty of the findings, the importance and presentation of the studies towards the particularity of Industry 4.0's current trends. Following the review process, only 65 submissions made it into the symposium, 15 submissions were withdrawn, and 40 submissions were rejected due to various reasons. The accepted submissions were divided into five tracks covering various scopes of manufacturing engineering and mechatronics stream, namely Intelligent Manufacturing, Robotics, Artificial Intelligence, Instrumentation, and Modelling and Simulation. This book was divided into five parts based on the aforementioned tracks.

We would like to express our gratitude to all members of the Organizing Committee, without which the organization of this symposium would never be possible. Special thank goes to the management of the Faculty of Manufacturing Engineering, Universiti Malaysia Pahang, for the support towards the successful organization of the symposium. Further, we would like to extend our thanks to all authors for their participation in the symposium and their valuable contribution to this book. Last but not least, we would like to appreciate the help from the

publisher, especially to Dr. Christoph Baumann and Mr. Arumugam Deivasigamani. We hope that the contents of this book will benefit the readers in embracing the new era of industrial revolution 4.0.

Pekan, Pahang, Malaysia
January 2018

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Contents

DETECTION OF METALLIC CONTAMINANT IN ALUMINIUM SODA CAN USING TMR SENSOR

Nurul A'in Nadzri, Mohd Mawardi, Saifudin Razali, Mohd Rusllim Mohamed, and Hamzah Ahmad

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Abstract. The contaminant is one of the big concerns in food processing industry and metallic objects can be one of the contaminant factors since most of the food processing equipment and tools are composed of metallic parts. Metal detector is used because these materials might cause injury to the consumers. Moreover, even the smallest particle of metals can cause to machinery failure. We have developed an inspection system for detecting the magnetic remanence of the contaminants. The system utilizes a Mag3110 magnetometer. Arduino operating software was developed for Mag3110 tuning, data acquisition, and identification of the presence of the contaminant. The system performance was evaluated using stainless steel balls. The developed system could detect a stainless steel ball having diameter as small as 0.1 cm. In order to optimize the position of the sensor, we performed a simulation of magnetic moment dipole. The signal will be sent to the control panel and it will give the results whether the metal object is presence or not. Besides, the simulation of this system is improved to enhance detection sensitivity. The magnetic response with respect to position of the sensor, different size of metal objects, and also the types of metal contaminant is studied as well.

Keywords: Metal detector, magnetometer, magnetic remanence.

1 Introduction

Canned foods are one of the processed foods that popular in this age. Due to this, to ensure the safety of the consumers finding a detector that can detect any foreign bodies in canned products before they are being distributed to market is important. A mixture of metallic contaminants to food is a serious problem not only for the user; it also can affect the mechanism and operation of the machine in the food processing line which can cause the high cost to repair the machine.

Metal detection is the most popular detection system method that has been used in food industries. This method can identify large metallic objects and work well in bulk containers of raw materials but it hard to detect metals such as stainless steel. Jae-Sung Kwan et al. proposed about detecting foreign object using x-ray in dry food