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Comparison of Thermal-Hidraulic Performances of Vortex Generators Mounted on Heated Plate: Experimental Study and Flow Visualization

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Abstract

Improvement of heat transfer in fin and tube heat exchangers for improving energy efficiency is required to be performed. In the present study, an enhancement in the rate of heat transfer is done by manipulating fin geometry on the fin and tube using longitudinal vortex generators. Perforated concave delta winglet is introduced as the latest longitudinal vortex generator that can improve heat transfer better than previous vortex generators. Experimental study is conducted to investigate the thermal and hydraulic performance of perforated concave delta winglet vortex generators in a rectangular channel. From the results of the study, it is found that the heat transfer rate increases up to

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Preface to ICOMERA 2018

The International Conference on Mechanical Engineering Research and Application (ICOMERA 2018) is organized and hosted by the Department of Mechanical Engineering, Brawijaya University, and co-organized by Universiti Tun Hussein Onn Malaysia and National Sun Yat Sen University of Taiwan which aims to exchange ideas, knowledge, and expertise in various fields such as materials, design, energy conversion, manufacturing, and industrial engineering. On behalf of the Organizing Committee of the International Conference on Mechanical Engineering Research and Application in 2018 (ICOMERA 2018), we would like to express our gratitude and welcome all ICOMERA 2108 delegates to Malang, a city with a cool atmosphere. The event was held in Malang, Indonesia, in October 23-25, 2018.

The scientific papers published in the proceeding have been revised and approved by the Scientific Committee of The International Conference on Mechanical Engineering Research and Application (ICOMERA 2018). In this international conference, there are various full papers submitted from various regions. All articles have clear and concise presentation of the advanced research in mechanical engineering. The topics of the conference were: 1. Materials, 2. Energy Conservation, 3. Manufacturing, and 4. Design and Industrial Engineering.

Special gratitude for all committee, reviewers, keynote speakers, and the rector of Universitas Brawijaya as well as the Dean of Faculty of Engineering for all their hard work, support and encouragement. We do hope this international conference will sustainably be hosted and develop the society continuously.

Agung Sugeng Widodo, Ph.D.

The Chairman of ICOMERA 2018

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Comparison of Thermal-Hidraulic Performances of Vortex Generators Mounted on Heated Plate: Experimental Study and Flow Visualization

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Abstract. Improvement of heat transfer in fin and tube heat exchangers for improving energy efficiency is required to be performed. In the present study, an enhancement in the rate of heat transfer is done by manipulating fin geometry on the fin and tube using longitudinal vortex generators. Perforated concave delta winglet is introduced as the latest longitudinal vortex generator that can improve heat transfer better than previous vortex generators. Experimental study is conducted to investigate the thermal and hydraulic performance of perforated concave delta winglet vortex generators in a rectangular channel. From the results of the study, it is found that the heat transfer rate increases up to 78.9% of the baseline by using three pairs of concave delta winglet vortex generators with three holes. This value is 27.3% higher than using delta winglet vortex generator with three holes. However, this increase in heat transfer rate is also accompanied by an increase in pressure losses in the flow. Pressure drop increases up to five times from the baseline by installing three pairs of three-hole concave delta winglet vortex generators.

Keywords: *antioxidant additives, induction period, Acid value, oxidation stability*

1. Introduction

Fin and tube is one of the compact heat exchangers that are widely used in the chemical industry, power generation, refrigeration and air conditioning, automotive, etc. Energy efficiency by improving the rate of heat transfer in the fin and tube heat exchanger is a crucial matter that is needed. Therefore, heat transfer improvement on the fin side of the fin and tube needs to be performed because of the high thermal resistance in this area. One of the ways to reduce thermal resistance is to install a vortex generator (VG) on the fin side.

Wu and Tao studied numerically the laminar convection heat transfer within a rectangular channel by applying longitudinal vortex generators based on the field synergy principle [1]. They investigated the effect of presence and without punched holes on the installation of longitudinal vortex generators (LVGs) to heat transfer improvement. From the results of their study, there was better heat transfer enhancement with a smaller pressure drop in the case of punched holes. At their next stage, they analyzed in more detail some of the parameters that affect the improvement of heat transfer and flow resistance [2]. They observed that the increase in heat transfer improvement was always marked by a decrease in

Performance Evaluation of Sustainable Coolant Techniques on Burnishing Process

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Abstract. Cryogenic coolant in machining is very significant effects on the surface quality. Flood coolant in existing finishing processes and lubricant techniques give the less effectiveness performance to machine tool, temperature and surface integrity. Cryogenic coolant significantly affects the mechanical properties of material by changing the microstructure under heat treatment. Dry condition trust force higher cryogenic condition was more effective in order to decrease the thrust force compared with dry and MQL conditions. Parameters to be evaluate are burnishing force, surface roughness and temperature using burnishing process with diameter 12mm of tool radius 1mm and 2mm. The application of cryogenic condition in burnishing process reduces the amount of thrust force against dry condition and MQL conditions. Cryogenic condition recorded the lowest average thrust reduction compared to dry and MQL, respectively. The reduction of thrust force reduces the force of kinetic friction at the tool and workpiece interfaces.

Keywords: sustainable, coolant technique, burnishing, performance

1. Introduction

Burnishing process is one of popular topic in recent advanced manufacturing studies. It is involved between input and output parameters. To be competitiveness, performing and continuous improvement in machining processes are really needed. Machining processes should be more efficient to deal with high quality product, cost saving in productions, and an environmentally friendly. El-Khabeery and El-Axir [1] studied on the effect of roller-burnishing on the surface roughness, surface micro-hardness and residual stress of Aluminium Alloy 6061-T6. Experimental work successfully on a lathe activity to establish the effect of burnishing speed, depth of penetration, burnishing time and the initial hardness. Shiou and Chen [2] studied the ball burnishing surface finish process on the surface plastic injection mold using machining center. The parameters experiment such as ball material, burnishing speed, burnishing force, and feed, were selected as the factors of Taguchi's design of experiment (DOE) to proof the optimal burnishing parameters that have an influence on surface roughness. Revankar et al. [3] investigated the internal machined and burnished by an internal ball burnishing tool. The experimental work to establish the effect of burnishing parameters such as burnishing speed, feed rate, depth of penetration and number of passes. The improvement on surface micro hardness in aluminium alloy (Ti–6Al–4V) is very significant.

Korzynski [4] studied the eccentric ball burnishing or eccentric burnishing. It's very easy method to hold oil or coolant pockets in slide bearing sleeve surfaces. It can be applied on lathe machines with a

The parametric study on anti-corrosion properties produced by electrochemically exfoliated

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Abstract. Graphene nanocomposite coatings has arisen topic of vast scientific interest due to the superior properties of graphene. In this study, we used electrochemically exfoliated graphene (EC-graphene) as a filler of polystyrene paints. Using solution blending method, a fine dispersion of polystyrene graphene (PS/G) paints could be attained. The anti-corrosion properties were proven by potentiodynamic polarization curves. The PS/G paints could boost the anti-corrosion properties with the loading of 0.5 wt% ECG, in which the corrosion rate decrease two degree levels from 2.37×10^{-3} to 2.32×10^{-5} mm/yr.

Keywords: polystyrene, electrochemically exfoliated graphene, coating, corrosion

1. Introduction

Nanocomposite coatings become massive potential for industrial coating applications recently. Creating and improving the novel structure and properties of material, flatters to be the fastest-growing area research of interest. Nanocomposite coatings can enhance durability and performance through smart coatings at lower cost [1-3]. Nanocomposite coatings introduce nanofillers into organic polymers to get superior properties. Organic polymeric coatings prevent corrosion by forming a barrier to insulate the metal from the corrosive environment. Yet, polymeric coatings are permeable to the corrosive species [4]. Hence incorporating nanofillers can lessen the permeability and extend the lifetime of the composite coatings [5].

Graphene is a single atom thick sheet comprised of sp2-hybridized carbon atoms, exhibits unique physicochemical properties and exceptional mechanical properties [6]. Graphene also has good barrier properties and impermeable to all gases and liquids [7]. Due to this reason, graphene can be developed as an outstanding candidate for nanofiller of polymeric coatings. Polystyrene has an excellent colour and chemical stability which usually used for protective and decorative coatings. Yu, Y.H et al [8] were success making well-dispersed polystyrene (PS)/modified-GO for corrosion protection using *in situ* miniemulsion polymerisation. However, need complex steps for its preparation.

Some studies [9, 10] used electrochemically exfoliated graphene (ECG) as filler for their nanocomposite coatings and prepared it with simple method. They just prepared the suspension by solution blending and obtain outstanding anti-corrosion properties for their coatings. Thus, in this work,

Experimental Study on the Influences of Air Flow in an Integral Hydrocarbon Display Cabinet to its Temperature and Energy Performances

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Abstract. This paper presents results on temperature energy performance tests of an integral refrigerated hydrocarbon (HC) display cabinet for retail food applications. Heat from the condensing unit of the cabinet is rejected to both ambient air and water/glycol mixture flowing in a closed water circuit. **A**ir flow in the cabinet loaded with M-packages as test products was studied in order to analyze effects of air flow rate in the cabinet to its temperature and energy performances. The product and air temperatures as well as energy consumption of the cabinet were measured. The tests were conducted in a test chamber at climate class 3. It was found that the HC display cabinet with integral condensing unit was found to provide excellent energy performance with an Energy Efficiency Index below the requirement to qualify for enhanced capital allowances. The refrigeration system of the cabinet could also achieve a COP of 3.15. The study also found that higher air flow rate in the cabinet could make the product temperatures a little bit better, but the energy consumption increased approximately 7% when air flow rate was increased from 1200 $m^3 h^{-1}$ to 1800 $m^3 h^{-1}$. Air flow distribution in the cabinet was necessary to be optimized in order to comply with M0 classification cabinet.

1. Introduction

Vertical refrigerated display cabinets are commonly used in retailed food stores to ensure safety of the food products. These cabinets keep and display food for the customers at different levels of temperature within the retail stores. Various types of vertical refrigerated display cabinets can be found in retail stores including the stand-alone or centralized systems. Stand-alone units are self-contained refrigeration systems. For the centralized applications, the display cabinet evaporators in sales area are feed by the centralized refrigeration system which located in the machinery room. With regards to their opening, there are two types of vertical refrigerated display cabinets: open-type and door type. The open-type refrigerated display cabinets are widely used in retail stores to attract the costumers and increase the sales. The absence of any physical obstacle like a glass door between the customer and product display area is preferred for commercial reasons. The main advantage of the open type refrigerated display cabinets over the door type ones is to allow consumers free access to food [1].

Retail refrigeration systems using HFC refrigerants are responsible for substantial greenhouse gas emissions from leakage of refrigerant to the ambient and indirect emissions from the electrical power