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IMPROVED WELDING REFURBISHMENT PROCEDURE FOR SUPERALLOYS GAS TURBINE USING FEA WITH EXPERIMENTAL VERIFICATION

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MSc

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MOHD SARIZAL BIN ABU BAKAR

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of the requirements for the degree of
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DEDICATION

To my parents Abu Bakar Bin Md Daud and Hapsah Bt Tan.

To whom I owe everything.

To my wife, Zummy Dahria Binti Mohamed Basri.

Thank you for standing and believing in me.

AUTHOR'S DECLARATION

I declare that the work in this 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 of acknowledged as referenced work. The topic has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

I, hereby acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi Mara, regulating the conduct of my study and research.

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ABSTRACT

This study presents Finite Element Anaysis application to improve process in Superalloys gas turbine components welding refurbishment. Refurbishment of Superalloys gas turbine components is one of the methods use to reduce cost in operating and prolong gas turbine components life cycle, with welding as one of the major repair technique. Close tolerance requirements in gas turbine components fabrication and refurbishment practice demanded the improvement of welding procedure in order to minimize the problem of distortion. Uncontrolled distortion will lead to parts rejection and reduction in gas turbine efficiency. This work will present methods to obtain optimum welding parameters through simulation by SYSWELD and experimentation. The works presented here are divided into three case studies with final aim to improve repair procedure of Superalloys gas turbine components. Case Study 1 confirmed the suitability of SYSWELD code using Goldak model to simulate Superalloys material welding for 3.2mm thickness material. Case Study 2 focuses on finding optimum parameters to perform multipass welding namely interval time and choice of filler material. The fillers used in this study are Inconel 617, Inconel 625, C 263 and Hastelloy X. Base material employed in this study is Inconel 718.It was found that the best filler is Inconel 617 and optimum interval time is 50 seconds. Case Study 3 showed FEA result on multipass welding performed at the tip of gas turbine blade. The result from this case study shows that FEA can be used to analyze repair welding works and subsequently helps to improve repair procedure of Superalloys gas turbine components.