

INFLUENCE OF DIFFERENT FILLERS ON
MICROSTRUCTURE AND TENSILE PROPERTIES OF
WELDED AA5083 ALUMINIUM ALLOY JOINTS

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**INFLUENCE OF DIFFERENT FILLERS ON MICROSTRUCTURE AND TENSILE
PROPERTIES OF WELDED AA5083 ALUMINIUM ALLOY JOINTS**

**By
TAN CHENG SHEN**

**A thesis submitted in partial fulfillment
of the requirements for the award of the degree of
Bachelor of Applied Science (Maritime Technology)**

**DEPARTMENT OF MARITIME TECHNOLOGY
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DEPARTMENT OF MARITIME TECHNOLOGY

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**DECLARATION AND VERIFICATION REPORT
FINAL YEAR RESEARCH PROJECT**

It is hereby declared and verified that this research report entitled: Influence of Different Fillers on Microstructure and Tensile Properties of Welded AA5083 Aluminium Alloy Joints by Tan Cheng Shen, Matric No. UK 18315, have been examined and all errors identified have been corrected. This report is submitted to the Department of Maritime Technology as partial fulfillment towards obtaining the degree of Bachelor of Applied Science (Maritime Technology), Faculty of Maritime Studies and Marine Science, Universiti Malaysia Terengganu.

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DECLARATION

I hereby declare that this thesis entitled “Influence of Different Fillers on Microstructure and Tensile Properties of Welded AA5083 Aluminium Alloy Joints” is the result of my own research except as cited in the references.

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**PENGARUH PENGISI ALOI YANG BERBEZA-BEZA KE ATAS
MIKROSTRUKTUR DAN SIFAT-SIFAT TEGANGAN ALOI ALUMINIUM
AA5083**

ABSTRAK

Pengadukan yang unik menjadikan aluminium dan aloi-aloi sejenisnya salah satu daripada bidang kejuruteraan dan pembinaan yang paling versatil terdapat pada hari ini. Aluminium adalah ringan malah aloi-aloinya mempunyai kekuatan melebihi keluli lembut yang kekal kukuh pada suhu rendah, ketahanan kakisan yang sangat baik, pantulan cahaya yang tinggi, konduktor elektrik dan haba yang baik, tidak magnetik, tidak toksik dan lain-lain. Penyelidikan ini dilakukan untuk menyiasat pengaruh pengisi kimpalan yang berbeza pada mikrostruktur dan sifat-sifat tegangan aloi aluminium 5083. Aluminium 5083 boleh dikimpal dengan aloi pengisi 5183 dan 5356 yang mana kedua-dua aloi pengisi ini mungkin sesuai untuk kimpalan aloi asas. Sebab untuk memilih aloi pengisi selain daripada jenis yang lain adalah ditentukan mengikut keperluan aplikasi dan perkhidmatan komponen yang dikimpal. *Gas Metal Arc Welding* (GMAW) atau *Metal Inert Gas* (MIG) telah dipilih untuk mengimpal aloi aluminium 5083. Sifat-sifat mekanikal kimpalan dikaji menggunakan mesin ujian tegangan dan kekerasan. Selain itu, makrostruktur dan mikrostruktur kimpalan, termasuk zon bungkak dan haba zon terjejas diperhatikan dengan menggunakan mikroskop optik dan pengimbasan elektron mikroskop (SEM). Rintangan kakisan aloi aluminium AA5083 telah disiasat dengan menggunakan kaedah *Salt Spray Chamber*. Hasil keputusan daripada ujian-ujian tersebut dipersembahkan dalam tesis ini. Tesis ini menunjukkan bahawa sifat-sifat kekuatan tegangan aloi 5083 yang dikimpal dengan pengisi 5356 menghampiri kesamaan sifat-sifat aloi asas tetapi kemuluran aloi 5356 adalah rendah. Manakala pengisi 5183 menunjukkan kemuluran yang terbaik, kekuatan tegangan yang baik tetapi rendah pada kekuatan kadar hasil.

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ABSTRACT

A rare aggregation of properties makes aluminium and its alloys one of the most versatile engineering and construction materials available today. Aluminium is light in weight, yet some of its alloy has strengths exceeding the mild steel which retains strong at low temperatures, excellent corrosion resistance, high reflectivity, good electrical and heat conductor, non-magnetic, non-toxic and other properties. This research investigated different fillers on microstructure and tensile properties of welded AA5083 aluminium alloy joints. Aluminium 5083 can be successfully welded with filler alloys 5183 and 5356 which any of these three filler alloys may be suitable for welding this base alloy. The reason to choose one of these filler alloys over the others is determined on the application and service requirements of the component being welded. Gas Metal Arc Welding (GMAW) or Metal Inert Gas (MIG) has been chosen to weld aluminum alloy 5083. The mechanical properties of the weld were investigated using the tensile testing machine and hardness. Besides, the microstructure of the welds, including the nugget zone and heat affected were observed using optical microscopy. The corrosion resistances of welded AA5083 aluminium alloy joints were investigated in a highly corrosive environment made in the salt spray chamber. The results of these tests are presented in this paper. This study revealed that, the tensile strength of 5083 alloy welded with filler 5356 was nearly similar to the base metal but the ductility was considerably lower while filler 5183 displayed excellent ductility, good tensile strength but low in yield strength.