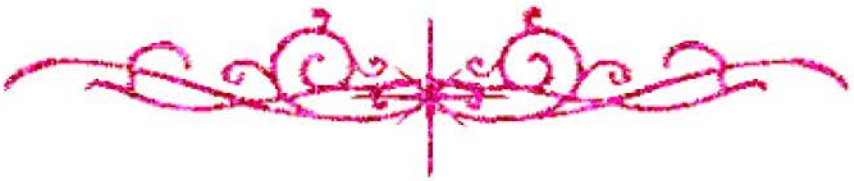
بسم الله الرحمن الرحيم

HOSSAM MAGHRABY

شبكة المعلومات الجامعية

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم



HOSSAM MAGHRABY

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها

علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

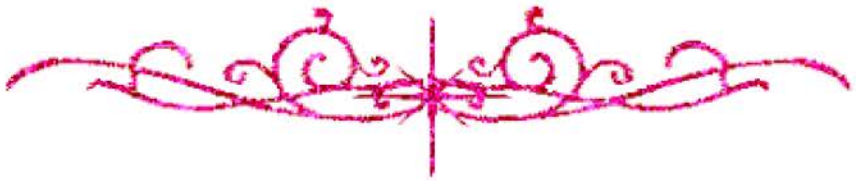
يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

HOSSAM MAGHRABY

شبكة المعلومات الجامعية

بعض الوثائق الأصلية تالفة



HOSSAM MAGHRABY

شبكة المعلومات الجامعية

بالرسالة صفحات

لم ترد بالأصل

HOSSAM MAGHRABY

" Narrow-Gap CO_2-Welding in the Vertical Position "

A thesis submitted to
the University of Alexandria, Faculty of Engineering,
Production Engineering Department

for the degree of

Doctor of Philosophy

in Production Engineering

By:

Eng. Magdy Mostafa El Rayes

Supervised by:

Prof. Dr. Aly El Ashram

Prof. Dr. Mahmoud Hamed

Production Engineering Dept.,

Faculty of Engineering,

University of Alexandria

Prof. Dr. Eng. Lutz Dorn

Head of Welding Institute,

Technical University of Berlin,

Germany

Alexandria, December 1994

We certify that we have read this thesis and that in our opinion it is fully adequate in scope and quality, as a disertation for the degree of Doctor of Philosophy.

Exam committee :-

1. Prof. Dr. Ahmed Salem El-Sabagh,

   Department of Mechanical Design and Production,

   Faculty of Engineering - University of Ein Shams.

2. Prof. Dr. Mohamed Rashad El-Hebiry,

   Department of Mechanical Engineering,

   Faculty of Enigneering - University of Cairo.

Exam and Supervisory committee:-

1. Prof. Dr. Aly El-Sayed El-Ashram,

   Department of Production Engineering,

   Faculty of Engineering - University of Alexandria.

2. Prof. Dr. Eng. Lutz Dorn,

   Welding Institute,

   Technical University of Berlin.

For the Faculty Council :-

Prof. Dr. Adel Mohamadein

Vice Dean for Graduate Studies & Research,

Faculty of Engineering - University of Alexandria.

This work is the result of mutual co-operation between the Technical University of Berlin, Germany and the University of Alexandria, Egypt under the regulation of the joint scientific channel program, the experimental work has been carried out in the laboratories of the Welding Institute - Technical University of Berlin.

List of Contents : **Page**

ACKNOWLEDGMENT

I am indebted to Prof. Dr. Aly El Ashram and Prof. Dr. Mahmoud Hamed for their dynamic involvement in Alexandria and Berlin, constructive guidance and unlimited help in revising and correcting this work.

I also wish to express my sincere thanks and deepest gratitude to Prof. Dr. Lutz Dorn for hosting me in his department, providing materials and facilities, his encouragement and his knowledgeous discussions.

The faithful help and assistance given by Mr.D.Chmilewski, Mr.H.Luedtke, Mr.A.Trampenau and all co-workers at the institute's work shop and laboratories are gratefully acknowledged.

Abstract

MIG welding using Narrow-Gap Welding technique (NGW) is a well known process in which the gap width, depending on plate thickness, varies between 7 to 30 mm and is mostly applied in the flat position.

In this work, a narrow-gap technique has been developed for welding mild steel plates in which reduced gap width between 3 to 5 mm has been used. Such narrow width was made possible by keeping the contact tube outside the gap and making use of a long stick-out. Welded plate thickness had been limited up to 12 mm, which is the most widely used in the welded structures. Moreover, carbon dioxide was used as a shielding gas, which is the most economic compared to other gases normally used. Welding has been performed in the vertical-up position in one single pass. Welding experiments had been conducted using either direct or pulsed current under different frequencies and off-time ratios of pulse. The filling wire was either solid or flux cored.

The results show that the above described process could be used sucessfully to weld steel plates in the vertical position without weaving motion. With respect to the mechanical properties, the narrower gap of 3 mm achieved a better toughness and strength. On the other hand, welding with 5 mm gap gave more stable process. Metallographic studies showed that the narrower the gap width the finer is the weld metal microstructure.

The proposed combination is recommended as a most economical process for fabricating welded structures such as tanks in which the plate thickness rarely exceeds 16 mm.