Investigation of Stress Intensity Factor in a Single Edge Notched Bend Test Piece

by

Mohd Nurul Amin b Adnan

Final Report submitted in partial fulfilment of
the requirements for the
Bachelor of Engineering (Hons)
(Mechanical Engineering)

JUNE 2009

Universiti Teknologi PETRONAS
Bandar Seri Iskandar
31750 Tronoh
Perak Darul Ridzuan

CERTIFICATION OF APPROVAL

Investigation of Stress Intensity Factor In a Single Edge Notched Bend Test Piece

by

Mohd Nurul Amin b Adnan

A Final Report submitted in partial fulfilment of

the requirement for the

Bachelor of Engineering (Hons)
(Mechanical Engineering)

January 2009

Approved by,

…….
(Dr Khairul Fuad)
Project Supervisor

Universiti Teknologi PETRONAS

Tronoh, Perak

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources and persons

_____

(MOHD NURUL AMIN B ADNAN)

ACKNOWLEDGEMENT

Praise to Almighty God. With his blessing, helpfulness and loveliness, He gave me strength and health to complete this Final Year Project.

Special thanks to my parents, my siblings, and all my family members for their endless support and pray upon my luck and success.

My great thanks to my supervisor, Dr Khairul Fuad for his help, patient, ideas and advise in the progression and accomplishment of this project.

Not to forget Mr, Juliandra, lecturers and to all my friends who helps me a lot throughout this time. Your helps are greatly appreciated

Thank You

ABSTRACT

A research has been conducted on the title of Investigation of Stress Intensity Factor in Single Edge Notched Bend Test Piece in partial fulfillment of Final Year Project. The research is about comparing empirical analysis and finite element analysis (FEA) in investigating stress intensity factor on the standard bend test piece by referring and following the American Standard of Testing Material (ASTM) Standard Test Method for Plane-Strain Fracture Toughness of Metallic Materials (E 399 – 90 – Reapproved 2001). FEA is conducted using ANSYS v.11 Software and analysis used linear elastic fracture mechanics (LEFM) approach with plane strain problem condition and modeled it in half symmetry geometry. FEA and empirical analyses were conducted in order to determine the relation and effect of span length ratio, s/W and thickness to width ratio, B/W with Stress intensity factor, K with respect to crack dept ratio, a/W. The empirical analysis and FEA were conducted to compare and validate the results. By using KCALC command in ANSYS, the procedures and methodology of using the command in the ANSYS have been recorded in step-by-step instruction for further references. Several corrective actions have been taken to reduce the error between analytical and finite element analysis. From the results, stress intensity factor, K is inversely proportional with span length to width ratio, s/W and thickness to width ratio, B/W while it is proportional to the crack length ratio, a/W. There are variations between analytical and empirical and finite element analysis but the error is considerably accepted.

TABLE OF CONTENT