EFFECT OF LOADING RATES ON FRACTURE TOUGHNESS OF HDPE

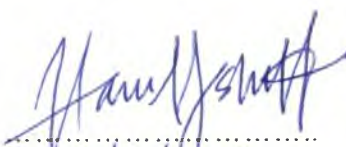## HASSNOL ISHRAFF B MOHD YUSOF

(99758348)

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" I declare that this thesis is the result of my own work except the ideas and summaries which I have clarified their sources. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any degree."

Signed : ....

Date : ......9/4/02....

Hassnol Ishraff B Mohd Yusof

UiTM No: 99758348

ABSTRACT

The objective of this project is to examine or to study the effect of various loading rates applied to a High Density Polyethylene (HDPE). Two types of tests have been conducted.

For the Quasi-static test, the experiment states a method for determining the opening mode plane strain fracture toughness (K_{IC}) and the critical crack tip opening displacement (CTOD) fracture toughness. The method uses the fatigue precracked specimens. These are tested in controlled monotonic loading at a constant rate in stress intensity factor within the range 0.5 $MPa.m^{0.5}s^{-1}$ during the initial elastic deformation. The machine used for the testing is 'Instrons Model 4260 Screwdriver' testing machine. The testing apparatus is called a 'three point bend test'. In addition, the specimen's Young modulus (E) and Poisson's Ratio (v) must be calculated by conducting a tensile test. The specimen used for the tensile test is HDPE *dog bone* tensile specimen.

In High rate speed loading test,we want to determine K_{IC} , the critical stress intensity factor and energy release rate at various impact velocities on HDPE (high density polyethylene) at room temperature. The machine used for the testing is ESH single shot (testing) machine. The speed can reach up to 20 m/s. Theoretically, the HDPE behaves in brittle manner after the testing.

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