

Accepted Manuscript

Quantification of the fatigue severity of porosity in Aluminium Alloy 7050-T7451 thick plate

B. Dixon, S. Barter, R. Mazeika

PII: S0142-1123(18)30205-6

DOI: <https://doi.org/10.1016/j.ijfatigue.2018.05.019>

Reference: IIJF 4691

To appear in: *International Journal of Fatigue*

Received Date: 30 April 2018

Revised Date: 16 May 2018

Accepted Date: 17 May 2018



Please cite this article as: Dixon, B., Barter, S., Mazeika, R., Quantification of the fatigue severity of porosity in Aluminium Alloy 7050-T7451 thick plate, *International Journal of Fatigue* (2018), doi: <https://doi.org/10.1016/j.ijfatigue.2018.05.019>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Quantification of the fatigue severity of porosity in Aluminium Alloy 7050-T7451 thick plate

B. Dixon^{a1}, S. Barter^a and R. Mazeika^b

^a*Aerospace Division, Defence Science and Technology Group, 506 Lorimer Street, Fishermans Bend, Victoria, 3207, Australia*

^b*Fortburn Pty Ltd.*

Highlights

- The fatigue severity of porosity in AA7050-T7451 thick plate was quantified.
- Over 100 polished coupons were tested to failure.
- The porosity and crack growth that caused failure of each coupon was measured.
- The length and area of the porosity was a poor indicator of its fatigue severity.

Abstract

Porosity is a well-known cause of fatigue cracking in aluminium alloy components when they are subjected to cyclic loading. This is well understood for many situations where castings are used in critical structure. However, fatigue cracking from porosity can also occur in thick wrought plates of high strength aluminium alloys. Such plates are used in aircraft components and can have significant amounts of shrinkage porosity present due to the lack of sufficient rolling prior to machining. An example of such behaviour has been observed in early production F/A-18 A-D Hornet components, where fatigue cracks nucleated from porosity during several structural durability tests. This demonstrated the potential for porosity to cause fatigue cracks in these airframe components during service. The present study quantifies the fatigue severity of the porosity present in the Aluminium Alloy (AA) 7050-T7451 thick plate that is used for some F/A-18 A-D Hornet critical structural components. To this end, over one hundred polished AA7050-T7451 coupons were fatigue tested to failure and the crack growth from the porosity that precipitated the fatigue failure of each coupon was measured using quantitative fractography. The data measured for each porosity discontinuity was then used to determine the fatigue crack depth that would have produced equivalent crack growth if it had existed at the start of the fatigue life. This crack depth, denoted the equivalent pre-crack size of the

¹ Corresponding author e-mail address: Ben.Dixon@dst.defence.gov.au

Download English Version:

<https://daneshyari.com/en/article/7171353>

Download Persian Version:

<https://daneshyari.com/article/7171353>

[Daneshyari.com](https://daneshyari.com)