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PII: S0142-1123(17)30136-6
DOI: http://dx.doi.org/10.1016/j.ijfatigue.2017.03.024
Reference: JIJF 4287

To appear in: *International Journal of Fatigue*

Received Date: 21 January 2017
Revised Date: 6 March 2017
Accepted Date: 22 March 2017

Please cite this article as: Takazaki, D., Kubota, M., Komoda, R., Oku, Y., Makino, T., Sugino, M., Effect of Contact Pressure on Fretting Fatigue Failure of Oil-Well Pipe Material, *International Journal of Fatigue* (2017), doi: http://dx.doi.org/10.1016/j.ijfatigue.2017.03.024

Effect of Contact Pressure on Fretting Fatigue Failure of Oil-Well Pipe Material

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Abstract

As the result of a full-scale test of a thread joint connecting oil-well casing pipes, fretting fatigue failure at the middle of the thread engagement part was identified. The objective of this study is to understand the mechanism of the fretting fatigue failure at the middle of the contact part. A similar failure mode was reproduced by a bridge-pad type fretting fatigue test under gross slip conditions. It was found that the crack position moved from the contact edge toward the inside of the contact part with the progress of the fretting wear.

Keywords: Fretting fatigue; Crack nucleation; Carbon steel

1. Introduction

From the view point of the position where the fretting fatigue failure occurred, two cases have been identified in past studies. For example, Hattori et al. [1], Nagata et al. [2], Lindley et al. [3], Mutoh et al. [4], and Sato et al. [5] studied the fretting fatigue failure at the contact edge of dovetail joints for steam turbines or jet engines. On the other hand, Makino et al. [6] and Kubota et al. [7, 8] studied the fretting fatigue failure at the inner contact part considering the interferential-fitted part of large diameter axles. Based on these studies, the fretting fatigue failure tends to occur at the contact edge when the contact pressure is relatively high and the relative slip range is relatively small, and at the inner contact part when the contact pressure is relatively low and the relative slip