

Accepted Manuscript

Semi-probabilistic method for residual lifetime of aluminothermic welded rails with foot cracks

S. Romano, D. Manenti, S. Beretta, U. Zerbst

PII: S0167-8442(15)30230-5

DOI: <http://dx.doi.org/10.1016/j.tafmec.2016.05.002>

Reference: TAFMEC 1710

To appear in: *Theoretical and Applied Fracture Mechanics*

Received Date: 10 December 2015

Revised Date: 16 May 2016

Accepted Date: 19 May 2016

Please cite this article as: S. Romano, D. Manenti, S. Beretta, U. Zerbst, Semi-probabilistic method for residual lifetime of aluminothermic welded rails with foot cracks, *Theoretical and Applied Fracture Mechanics* (2016), doi: <http://dx.doi.org/10.1016/j.tafmec.2016.05.002>

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.



Semi-probabilistic method for residual lifetime of aluminothermic welded rails with foot cracks

Romano, S.^a, Manenti, D.^a, Beretta, S.^{a,*}, Zerbst, U.^b

^a*Politecnico di Milano, Department of Mechanical Engineering, Via La Masa 1, I-20156
Milan, Italy*

^b*BAM Federal Institute for Materials Research and Testing, Division 9.1, D-12205*

Abstract

One of the most frequent and dangerous failure modes in continuous welded rails is fatigue crack propagation terminated by brittle fracture. Due to the brittleness of the weld material and HAZ and the scatter in its mechanical properties, a statistical approach is necessary. The paper deals with surface cracks at the foot base of aluminothermic welded rails, developing a probabilistic methodology for determining the day by day prospective failure probability. The investigations presented here comprise weld material characterization, simulation of fatigue crack propagation and finally the determination of the failure probability using the Monte Carlo method. The effect of various parameters, such as axle weight, initial crack size, residual stresses, fatigue crack propagation threshold and date of inspection were analysed. The results show that, independent of the date of the last inspection, almost any failure event happens in wintertime. This is in accordance with practical experience. However, from the proposed analysis it is evident that the main parameter controlling rail fracture is not only the minimum local temperature, but the temperature range over the whole year. Finally, the results are compared to the standard rail classification method.

Keywords: railway rails, foot crack, fatigue crack, failure probability, residual lifetime

*Corresponding author

Email address: stefano.beretta@polimi.it (Beretta, S.)

Download English Version:

<https://daneshyari.com/en/article/5019896>

Download Persian Version:

<https://daneshyari.com/article/5019896>

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