Accepted Manuscript

Effect of Broken Wire on Bending Fatigue Characteristics of Wire Ropes

Dekun Zhang, Cunao Feng, Kai Chen, Dagang Wang, Xiang Ni

PII:         S0142-1123(17)30274-8
DOI:        http://dx.doi.org/10.1016/j.ijfatigue.2017.06.024
Reference:  JIJF 4380

To appear in:  International Journal of Fatigue

Received Date:  7 July 2016
Revised Date:  14 June 2017
Accepted Date:  18 June 2017


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.
Effect of Broken Wire on Bending Fatigue Characteristics of Wire Ropes

Dekun Zhang\textsuperscript{1*}, Cunao Feng\textsuperscript{2*}, Kai Chen\textsuperscript{1}, Dagang Wang\textsuperscript{2}, Xiang Ni\textsuperscript{2}

\textsuperscript{1}School of Materials Science and Engineering, China University of Mining and Technology, Xuzhou 221116, China
\textsuperscript{2}School of Mechatronic Engineering, China University of Mining and Technology, Xuzhou 221116, China

Abstract: The life of damaged wire rope is difficult to judge and the damaged wire rope is prematurely replaced resulting in an enormous economic waste. This paper studies the effect of different distributions of pre-broken wires on bending fatigue behavior of wire ropes using a self-made bending fatigue test facility. The fatigue lives of wire ropes with different distributions of pre-broken wires were studied using both visual inspection and commercial non-destructive inspection technology, combined with electron microscopy. It is found that broken wires on the surface reduce the bending fatigue life of wire ropes. The broken wires increase the stress in the inner wire strands as well as the contact force between the wires. This leads to a concentration of severe wear, which accelerates the density of broken wires locally, leading to short fatigue lives especially in the case with the most concentrated number of pre-broken wires (1\times4). After numerous wires fail by wear and fatigue, others fail by tensile overload, as evidenced microscopically by necking and ductile failure. The damage in the rope at failure defined by counting broken wires is nearly 50\% smaller than the damage value given by the commercial non-destructive damage value, based on magnetic measurements.

Keywords: wire rope; broken wire; bending fatigue; failure mechanism

The multi-rope friction hoist system delivers coal, lifts and lowers materials and staffs. Its reliability directly affects mine's productivity and people's security. Once the rope is broken, it will lead to a serious accident [1-3]. To ensure the safety and reliability of the lifting system, a strict national standard for safe use and scrap of wire ropes was applied in China. During the operation, the effect of corrosion, wear, break and many other surface damages of the rope is inevitable [4-6].

\*Corresponding author. Tel.: +86 13952207958; +8615262021821; Fax: +86 051683591916.
E-mail address: dkzhang@cumt.edu.cn (Dekun Zhang)
cumtfca@126.com (Cunao Feng)
دریافت فوری متن کامل مقاله

امکان دانلود نسخه تمام متن مقالات انگلیسی
امکان دانلود نسخه ترجمه شده مقالات
پذیرش سفارش ترجمه تخصصی
امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
امکان دانلود رایگان ۲ صفحه اول هر مقاله
امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
دانلود فوری مقاله پس از پرداخت آنلاین
پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات