UNIVERSITY OF ZILINA

TRANSCOM 2019

13th international scientific conference of young scientists on sustainable, modern and safe transport

under the auspices of

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BOOK OF ABSTRACTS

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29 - 31 May 2019
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TRANSCOM 2019

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First Editions
Printed by EDIS-Editing centre of University of Žilina in 2019
Printed from the original materials

ISBN 978-80-554-1565-9

Analysis of the cause of the girth gear tooth fracture occurrence at the bucket wheel excavator

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Abstract

Premature damages and fractures of components and structures of bucket-wheel excavators at open-pit mine often occur in exploitation, caused either by inadequate design or insufficient knowledge of the material properties, welded joints and flaws in component production technology. The bucket-wheel excavator, TAKRAF SRs 2000 × 32/5.0 was employed on the excavation of barren soil for 5.000 *h* (a few weeks more than a year after the assembly) when the fracture of the tooth of the girth gear, which enables the circular motion of the upper structure of the bucket-wheel excavator, occurred. The gear was, according to the manufacturer's certificate, made of the cast steel GS 40 MnCrSi3 V. The paper presents calculations of the stress variations cycles' number for one tooth, as well as of the fracture mechanics parameters – the critical stress intensity factor and critical crack length. It was established that the fracture of the tooth occurred due to an initial crack existing in its base, which originated during the gear's manufacturing, i.e. due to the so-called "manufacturing-in defect".

Keywords: Bucket-wheel excavator; girth gear; tooth fracture; fracture mechanics parameters;