

## Accepted Manuscript

Modelling of acoustic emission generated by crack propagation in spur gear

Ram Bihari Sharma, Anand Parey

PII: S0013-7944(17)30638-0

DOI: <http://dx.doi.org/10.1016/j.engfracmech.2017.07.030>

Reference: EFM 5632

To appear in: *Engineering Fracture Mechanics*

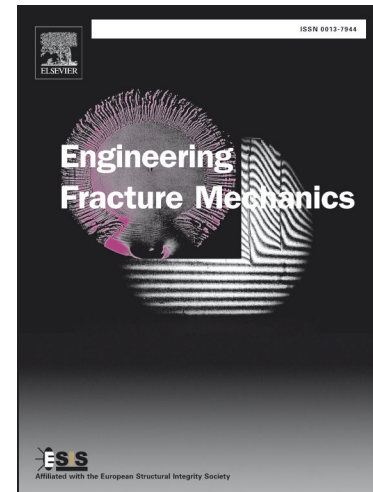
Received Date: 20 June 2017

Revised Date: 21 July 2017

Accepted Date: 24 July 2017

Please cite this article as: Bihari Sharma, R., Parey, A., Modelling of acoustic emission generated by crack propagation in spur gear, *Engineering Fracture Mechanics* (2017), doi: <http://dx.doi.org/10.1016/j.engfracmech.2017.07.030>

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.



# Modelling of acoustic emission generated by crack propagation in spur gear

Ram Bihari Sharma, Anand Parey

Mechanical Engineering Department, School of Engineering, Indian Institute of Technology  
Indore, India

[phd1301203009@iiti.ac.in](mailto:phd1301203009@iiti.ac.in), [anandp@iiti.ac.in](mailto:anandp@iiti.ac.in)

## Abstract

Acoustic emission (AE) is used for gear fault diagnosis. A lot of experimental studies are available in the literature for fault diagnosis. In this study, a theoretical model to correlate the AE energy, generated by crack propagation in gear tooth, to the parameters allied with crack has been proposed based on linear elastic fracture mechanics. It was concluded that AE amplitude is influenced by stress intensity, the length of crack propagation, the progressive area swept out by the propagating crack, and crack length in the gear tooth. The developed theoretical model is validated with the results of experimental investigation found in literature and satisfactory agreement has been observed.

Keywords: Acoustic emission, crack propagation, gear, stress intensity.

## 1. Introduction

Acoustic emission (AE) is defined as the transient elastic stress wave that is spontaneously generated by the rapid release of strain energy from localized sources within and/or, on the surface of the material due to the changes in the internal structure under the stress [1]. The application of AE for condition monitoring of various materials, structural elements and components like a bearing, gear, machine tool, etc is very effective. Sources of AE generation include crack initiation and crack propagation, impact, friction, cyclic fatigue, material loss, cavitation, leakage, plastic deformation etc [2, 3]. The crack growth from a perspective of fracture is one of the major concerns because it can create the disaster failures. During the initiation and propagation of the crack, the detectable elastic stress waves release away from the crack which can offer an early cautioning of imminent failure of gear. The detection of crack formation or propagation is a critical step during the condition monitoring of machine components. AE measurement is quite sensitive towards the crack as AE signal is engendered at the incipient stage of crack initiation or propagation.

Scrubby [4] mentioned that AE is used as a diagnostic technique for the investigation of fracture because it provides the information regarding the growth of defect. Cracking and fracture processes generally produce high levels of an amplitude of burst AE signals [5]. It has been noted from publications to date that there is a possibility of the diagnosis of crack initiation, propagation and fracture using the AE technique in the various components viz gear, bearing, shaft, compact tension specimen etc. [6-18]. Singh et al. [6] have investigated the gear tooth cracking using AE technique. They established the viability of AE, released during crack initiation and propagation, to detect the growing crack in gear tooth. They presented experimental findings on the crack initiation and propagation in gear tooth using AE by single tooth bending fixture. It has been postulated that as the crack propagates with growing number of cycles, the amplitude of the identified AE signal increases with enhanced

Download English Version:

<https://daneshyari.com/en/article/5013805>

Download Persian Version:

<https://daneshyari.com/article/5013805>

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