FRANCESCA MARIA CURA'

CURRICULUM VITAE
1984 - Master Degree in Mechanical Engineering - Politecnico di Torino
1989 – PhD in Applied Mechanics - Politecnico di Torino
1989 – Researcher Assistant in Machine Design - Politecnico di Torino
2005 – Associate Professor in Machine Design - Politecnico di Torino

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TEACHING (Politecnico di Torino):
Mechanical behaviour of materials
Fundamental of Structural mechanics
Fundamental of Machine Design
Machine Design (master course)
Dynamic effects of gears (PhD Course)

RESEARCH
Research leader of the group:
Design and experimental activities about transmission components and thermography.
Research topics:
Gears transmissions: static and dynamic analysis (gears, spline couplings, bearings).
Fretting damage.
Fatigue of materials and thermography**:** random fatigue;cumulative damage; damage parameters (mechanical and dissipative).
Structural dynamics: vibrations, acoustic, fluid-structure interaction, damping materials (viscoelastic).

The research group "Design and experimental activities about transmission components and thermography" works in the field of fatigue damage (thermal methods in fatigue) and in the field of mechanical transmissions (gears, spline couplings, bearings, shafts) from both static and dynamic point of view. Mechanical transmissions refer generally to both aerospace and automotive applications and the corresponding approaches are developed in a dedicated way.

PHD TUTOR (Politecnico di Torino) of the following thesis:
Ing. Andrea Mura, "*Numerical methods for the analysis of structures with viscoelastic materials*" (Politecnico di Torino, 2008).
Ing. Alessandra Gallinatti, "*Theoretical and experimental study of the thermal emission in metallic materials subjected to fatigue loads*" (Politecnico di Torino, 2009).
Ing. Vincenzo Cuffaro, "*Prediction method for the surface damage in splined couplings*" (Politecnico di Torino, 2013).
Ing. Waqar Kureshi, "*Prediction of fretting wear in crowned splined couplings*" (Politecnico di Torino, 2017).

MASTER TUTOR of more than fifty master thesis in the last five years **(**Politecnico di Torino).

RECENT INDUSTRIAL PROJECTS:
GReen **E**ngine for **Ai**r **T**raffic **2020 (A**dvanced **GEA**r **DES**ign Laboratory)
Technologies and Systems for Electric Mobility (**THOR**)

RECENT SCIENTIFIC PAPERS

F. Curà, A. Mura, “Experimental procedure for the evaluation of tooth stiffness in spline coupling including angular misalignment”, *Mechanical Systems and Signal Processing*, 40, 545–555 (2013).
V. Cuffaro, F. Curà, A. Mura, “Test Rig for Spline Couplings Working in Misaligned Conditions”, *Journal of Tribology* 136(1), January 2014.
F. Curà, A. Mura, “Experimental and theoretical investigation about reaction moments in misaligned splined couplings”, *Mechanical Systems and Signal Processing*, 45, 504–512 (2014).
F. Curà, R. Sesana, “Mechanical and thermal parameters for high-cycle fatigue characterization in commercial steels”, *Fatigue Fract Engng Mater Struct*, 37, 883–896 (2014).
F. Curà, A. Mura, C. Rosso, “Effect of rim and web interaction on crack propagation paths in gears by means of XFEM technique”, *Fatigue Fract Engng Mater Struct*, Vol. 38 (10), 1237–1245 (2015).
F. Curà, “Method for calculating the application factor K_A in gears subjected to variable working conditions”, Procedia Engineering, 101 (2015), 109-116.
V. Cuffaro, F. Curà, A. Mura, “Damage identification on spline coupling teeth by means of roughness parameters”, *Theoretical and Applied Fracture Mechanics*, 82, 9-16 (2016).
F. Curà, W. Qureshi, A. Mura, “A Methodological Approach for Incremental Fretting Wear Formulation”, *Tribol Lett* (2016) 64:20 Article in Press DOI: 10.1007/s11249-016-0760-1.
F. Curà, “ISO Standard based method for calculating the in-operation application factor K_A in gears subjected to variable working conditions”, *International Journal of Fatigue*, 2016; 91:459-465.
F. Curà, R. Sesana, “LCF damage model effectiveness for steel super alloys”, *Engineering Fracture mechanics*, 160, 172-184 (2016).
A. Mura, F. Curà, L. Pasculli , “Optimisation methodology for lightweight gears to be produced by additive manufacturing techniques”, *Proc IMech Part C*, 2017.
Mura A., Curà F., Adamo F., “Evaluation of graphene grease compound as lubricant for spline couplings”, *Tribology International*, 117 (2018), 162-167.
F. Curà, A. Mura, C. Rosso, “Influence of high speed on crack propagation path in thin rim gears”, *Fatigue Fract Engng Mater Struct*, published online. DOI: 10.1111/ffe.12481.
F. Curà, A. Mura, “Experimental and theoretical investigation about reaction moments in misaligned splined couplings”, *Mechanical Systems and Signal Processing*, 45, 504–512 (2014).
V. Cuffaro, F. Curà, A. Mura, “Damage identification on spline coupling teeth by means of roughness parameters”, *Theoretical and Applied Fracture Mechanics*, 82, 9-16 (2016).
F. Curà, W. Qureshi, A. Mura, “A Methodological Approach for Incremental Fretting Wear Formulation”, *Tribol Lett* (2016) 64:20 Article in Press DOI: 10.1007/s11249-016-0760-1.

Meccanica
DOI 10.1007/s11012-016-0535-7

Experimental characterization of roughness parameters for fretting wear in spline couplings

Waqar Qureshi · Francesca Cura · Andrea Mura

Received: 2 February 2016 / Accepted: 7 September 2016
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Available online at www.sciencedirect.com
ScienceDirect
Procedia Engineering 101 (2015) 109 – 116
Procedia Engineering
www.elsevier.com/locate/procedi

3rd International Conference on Material and Component Performance under Variable Amplitude Loading, VAL2015

Method for calculating the application factor K_A in gears subjected to variable working conditions

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Original Article

MECHANICAL ENGINEERS
MECHANICAL ENGINEERING SCIENCE

Proc IMechE Part C:
J Mechanical Engineering Science
2017, Vol. 231(24) 4684–4692
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sagepub.co.uk/journalsPermissions.nav
DOI: 10.1177/0954406216669177
journals.sagepub.com/home/pic
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Prediction of fretting wear in aero-engine spline couplings made of 42CrMo4

Waqar Qureshi, Francesca Cura and Andrea Mura

Meccanica
DOI 10.1007/s11012-016-0535-7

Experimental characterization of roughness parameters for fretting wear in spline couplings

Waqar Qureshi · Francesca Cura · Andrea Mura

Meccanica (2018) 53:413–424
https://doi.org/10.1007/s11012-017-0730-1

Theoretical and numerical evaluation of tilting moment in crowned teeth splined couplings

Francesca Curà · Andrea Mura

Available online at www.sciencedirect.com

ScienceDirect

Procedia Structural Integrity 7 (2017) 476–483

Structural Integrity Procedia

www.elsevier.com/locate/procedia

3rd International Symposium on Fatigue Design and Material Defects, FDMD 2017, 19-22 September 2017, Lecco, Italy

Investigation of crack propagation path in tube gears

Francesca Curà[a], Andrea Mura[a]*, Carlo Rosso[a]

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Abstract

In this paper, the crack propagation behaviour in tube gears has been investigated. This kind of gear find application in aerospace

Available online at www.sciencedirect.com

ScienceDirect

Procedia Structural Integrity 5 (2017) 1326–1333

Structural Integrity Procedia

www.elsevier.com/locate/procedia

2nd International Conference on Structural Integrity, ICSI 2017, 4-7 September 2017, Funchal, Madeira, Portugal

Fatigue damage in spline couplings: numerical simulations and experimental validation

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Available online at www.sciencedirect.com

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Structural Integrity Procedia 00 (2017) 000–000

Structural Integrity Procedia

www.elsevier.com/locate/procedia

2nd International Conference on Structural Integrity, ICSI 2017, 4-7 September 2017, Funchal, Madeira, Portugal

Surface factor assessment in HCF for steels by means of empirical and non destructive techniques

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Meccanica (2017) 52:1975–1984
DOI 10.1007/s11012-016-0535-7

Experimental characterization of roughness parameters for fretting wear in spline couplings

Waqar Qureshi · Francesca Cura · Andrea Mura

Available online at www.sciencedirect.com

ScienceDirect

Procedia Structural Integrity 5 (2017) 1393–1400

Structural Integrity Procedia

www.elsevier.com/locate/procedia

2nd International Conference on Structural Integrity, ICSI 2017, 4-7 September 2017, Funchal, Madeira, Portugal

Evaluation of the fretting wear damage on crowned splined couplings

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Abstract

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Original Article

Institution of MECHANICAL ENGINEERS

Journal of MECHANICAL ENGINEERING SCIENCE

Proc IMechE Part C:
J Mechanical Engineering Science
2018, Vol. 232(1) 57–65
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DOI: 10.1177/0954406216674981
journals.sagepub.com/home/pic
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Multibody approach for the dynamic analysis of gears transmission for an electric vehicle

G Belingardi, V Cuffaro and F Curà

Abstract

The dynamic analysis of a gear transmission system for electric vehicle is analyzed by means of a multibody approach. The architecture of the transmission is constituted of one gear ratio, with the differential integrated in the same gear box. The multibody model of the complete transmission has been created and optimized in order to get the dynamic response of the system. In particular, the frequency response function of the system in terms of rotational speed and loading forces has been determined. Furthermore, the dynamic transmission error has also been determined.

Keywords

Gear transmission, electric vehicle, multibody approach, dynamic transmission error

Date received: 2 May 2016; accepted: 27 September 2016

Introduction

In last decades, great emphasis has been devoted to design methods of high-speed and lightweight transmissions, both in aerospace and automotive applications.

By reasoning in global terms, a gear transmission consists of a very complex system comprising interconnecting shafts and couplings, within which the gear box may itself be considered as an independent gear system.

The dynamic response of a gear system is one of the most important aspects to be taken into account.

Once a gear is designed as a function of the torque to be transmitted, it is necessary to analyze it from both kinematic and dynamic points of view.

Theoretically, the rotation of two gears, with perfect involute teeth and infinite stiffness, is a function of input motion and gear ratio. A constant rotational speed of the output shaft would therefore result from a constant rotational speed of the input shaft. Owing to both intended shape modifications (microgeometries) and unintended ones, such as the positioning errors, gears may have a motion error of the output gear with respect to the input one.

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Procedia Structural Integrity 8 (2018) 204–211

Structural Integrity Procedia

www.elsevier.com/locate/procedia

AIAS 2017 International Conference on Stress Analysis, AIAS 2017, 6-9 September 2017, Pisa, Italy

Methodology development to design a representative test specimen for wear damage in spline couplings

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