Proceedings of ASME 2023
International Design Engineering
Technical Conferences and
Computers and Information in
Engineering Conference

(IDETC-CIE2023)

Volume 11

2023 International Power Transmission and Gearing Conference (PTG)

August 20-23, 2023 Boston, Massachusetts

**Conference Sponsors**Design Engineering Division

Computers and Information in Engineering Division

© 2023 The American Society of Mechanical Engineers, 2 Park Avenue, New York, NY 10016, USA (www.asme.org)

All rights reserved. Printed in the United States of America. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of the publisher.

INFORMATION CONTAINED IN THIS WORK HAS BEEN OBTAINED BY THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS FROM SOURCES BELIEVED TO BE RELIABLE. HOWEVER, NEITHER ASME NOR ITS AUTHORS OR EDITORS GUARANTEE THE ACCURACY OR COMPLETENESS OF ANY INFORMATION PUBLISHED IN THIS WORK. NEITHER ASME NOR ITS AUTHORS AND EDITORS SHALL BE RESPONSIBLE FOR ANY ERRORS, OMISSIONS, OR DAMAGES ARISING OUT OF THE USE OF THIS INFORMATION. THE WORK IS PUBLISHED WITH THE UNDERSTANDING THAT ASME AND ITS AUTHORS AND EDITORS ARE SUPPLYING INFORMATION BUT ARE NOT ATTEMPTING TO RENDER ENGINEERING OR OTHER PROFESSIONAL SERVICES. IF SUCH ENGINEERING OR PROFESSIONAL SERVICES ARE REQUIRED, THE ASSISTANCE OF AN APPROPRIATE PROFESSIONAL SHOULD BE SOUGHT.

ASME shall not be responsible for statements or opinions advanced in papers or . . . printed in its publications (B7.1.3). Statement from the Bylaws.

For authorization to photocopy material for internal or personal use under those circumstances not falling within the fair use provisions of the Copyright Act, contact the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923, tel: 978-750-8400, www.copyright.com.

Requests for special permission or bulk reproduction should be addressed to the ASME Publishing Department, or submitted online at: https://www.asme.org/publications-submissions/journals/information-for-authors/journalguidelines/rights-and-permissions

ISBN: 978-0-7918-8739-4

## TABLE OF CONTENTS

Flank Modification Based on the Predetermined Contact Characteristics for Spiral Bevel and	
Hypoid Gears	1
Yi-Hui Lee, Kuan-Hung Chen, Zhang-Hua Fong	
Finite Element Contact Analysis and Redesign of Rotorcraft Planetary Gear Sets With Asymmetric Profiles	9
Karthikeyan Marambedu, Michael Hurrell, Sandeep Vijayakar, Timothy Krantz, Mark Valco	
Multi-Degree-of-Freedom Load Distribution Modeling of Cross-Axis Gearing	26
The Effect of Geometrical Quality on the Stress-State in the Plastic Gear	34
Tooth Bending Strength in the VHCF Area	45
A Novel Ultrasonic Fully Reversible Bending Fatigue Test Specimen for Simulated Gear Tooth Bending Fatigue	55
Numerical and Experimental Study on the Correlation Between Wear and Transmission Error of Carbon Fiber-Reinforced Polymer Gears Cured in Autoclave	66
Acoustic Emission Damage Parameter for Cumulative Fatigue Damage Prediction in Gear Single Tooth Bending Fatigue	78
An Experimental Study on the Accuracy of Cumulative Damage Models in Gear Tooth Bending Fatigue	88
Design of Tooth Flank Modifications in Transmission Systems Considering Dynamic  Misalignments	99
Influence of Fixed Ring Gear Structural Compliance on the Quasi-Static and Dynamic Response of Epicyclic Gear Sets	109
Torque Characteristics of a Planetary Gear Train During Gear Shifting Under Two Inputs and One Output Tandem Driving Conditions	118
Three-Dimensional Steady-State and Transient Response Modelling of Geared Systems Under Stick-Slip Motion Generated Excitations	127
An Experimental Investigation of the Effects of Lubrication on Rattling Motions and Noise of a  Gear Pair	136

A Proposal of an Efficient and Accurate Methodology for Accounting the Static Transmission Error in Epicyclic Gearset	144
Impact of Shaft Misalignments in Planetary Gearboxes	154
Calculation of Partial Transmission Ratios of Two-Stage Gearboxes by Volume Minimization	164
Gearbox Fault Detection via Physics-Informed Parallel Deep Learning Model Architecture	171
Investigation of Isotropic Superfinishing Effects on Ground Hypoid Gears	178
Non-Contact Measurement of Spiral Bevel Gears Using the Laser Profiler on the Five-Axis Machine	191
Quality & Error Tendencies of Gears Printed by Stereolithography Three-Dimensional Printer	199
Effect of Tool Profile Modification on the Loaded Contact Performance for Face-Hobbed Hypoid  Gear  Xinqi Wei, Yawen Wang, Teik Lim	205
Power Loss and Damage Behavior of Gears Operating Under Loss of Lubrication	212
Investigations on Ways to Improve the Scuffing and Wear Behaviour of Oil Free Water-Based Lubricants for Gear Applications	223
A Quasi-Static Load Distribution Model for Deep Groove Ball Bearings	233
Performance Investigation of Fluid-Lubricated Thrust Bearings With Varying Textured Pad Surfaces Using Computational Fluid Dynamics	244
Ceramic Bearing Endurance Within a Transmission	251

## **Author Index**