Experimental Investigation Of Spur Gear Efficiency

This book gathers select contributions from the 32nd

International Congress and Exhibition on Condition Monitoring and Diagnostic Engineering Management (COMADEM 2019), held at the University of Huddersfield, UK

in September 2019, and jointly organized by the University of Huddersfield and COMADEM International. The aim of the Congress was to promote awareness of the rapidly emerging

interdisciplinary areas of condition monitoring and diagnostic engineering management. The contents discuss the latest tools and techniques in the multidisciplinary

field of performance monitoring, root cause failure modes analysis, failure diagnosis, prognosis, and proactive management of industrial systems. There is a special focus

on digitally enabled asset management and covers several topics such as condition monitoring, maintenance, structural health monitoring, non-destructive testing and other

allied areas. Bringing together expert contributions from academia and industry, this book will be a valuable resource for those interested in latest condition

monitoring and asset management techniques. After two succesful conferences held in Innsbruck (Prof. Manfred Husty) in 2006 and Cassino in 2008 (Prof

Marco Ceccarelli) with the participation of the most important well-known scientists from the European Mechanism Science Community, a further

conference was held in Cluj Napoca, Romania, in 2010 (Prof. Doina Pisla) to discuss new developments in the field. This book presents the most recent research

advances in Mechanism Science with different applications. Amongst the topics treated are papers on Theoretical kinematics, Computational kinematics,

Mechanism design, Mechanical transmissions, Linkages and manipulators, Mechanisms for biomechanics, Micro-mechanisms, Experimental mechanics, Mechanics of

robots, Dynamics of multi-body systems, Dynamics of machinery, Control issues of mechanical systems, Novel designs, History of mechanism science etc. Recent

advancements in mechanical engineering are an essential topic for discussion. The topics relating to mechanical engineering include the following: measurements of

signals of shafts, springs, belts, bearings, gears, rotors, machine elements, vibration analysis, acoustic analysis, fault diagnosis, construction, analysis of

machine operation, analysis of smart-material systems, integrated systems, stresses, analysis of deformations, analysis of mechanical

properties, signal processing of mechanical systems, and rotor dynamics. Mechanical engineering deals with solid and fluid mechanics, rotation, movements,

materials, and thermodynamics. This book, with 15 published articles, presents the topic “ Symmetry in Mechanical Engineering ” . The presented topic is interesting. It is

categorized into eight different sections: Deformation; Stresses; Mechanical properties; Tribology; Thermodynamic; Measurement; Fault diagnosis; Machine. The

development of techniques and methods related to mechanical engineering is growing every month. The described articles have made a contribution to mechanical

engineering. The proposed research can find applications in factories, oil refineries, and mines. It is essential to develop new improved methods, techniques, and

devices related to mechanical engineering. The influence of lubricant viscosity and additives on the average wear rate of spur gear pairs was investigated experimentally.

The gear specimens of a comprehensive gear durability test program that made use of seven lubricants covering a range of viscosities were examined to measure gear tooth wear. The

measured wear was related to the as-manufactured surface roughness, the el astohydrodynami c film thickness, and the experimentally determined contact fatigue

lives of the same specimens. In general, the wear rate was found to be inversely proportional to the viscosity of the lubricant and to the lambda ratio (also sometimes called

the specific film thickness). The data also show an exponential trend between the average wear rates and the surface fatigue lives. Lubricants with similar viscosities but differing

additives and compositions had somewhat differing gear surface fatigue lives and wear rates.

A Comparative Study of the Impact of Dip and Jet Lubrication

Methods on Spur Gear Contact Fatigue and Efficiency
An Experimental Investigation Into the Influence of Various Errors on the Transmission Error and Root

Stresses of Spur Gears
Dudley's Handbook of Practical Gear Design and Manufacture, Second Edition
The Geometry of Involute Gears
Symmetry in Mechanical

Engineering

Abstract: In this study, load-independent (spin) power losses of a gearbox operating under dip-lubrication conditions are investigated experimentally. A family of final drive helical gear

pairs from an automotive transmission is considered as the example for this investigation. A dedicated gearbox is designed and fabricated to operate a single gear or a gear pair under given

speed conditions. The test gearbox is incorporated with a high-speed test bed with power loss measurement capability. A test matrix that consists of sets of tests with (i) single spur, helical gears, or

disks with no teeth, and (ii) helical gear pairs of varying gear ratios is executed with three different transmission fluids at various temperatures and immersion depths. Power losses from single gear and

gear pair tests at identical operating conditions are compared to break down the total spin loss to its main components, namely gear drag loss, gear mesh pocketing loss, and bearing/seal

loss. In addition, the space around the gears within the gearbox will be altered to quantify any influences of enclosures and peripheral shrouds on the spin losses of a rotating gear. Of all the many types of machine

elements which exist today, gears are among the most commonly used. The basic idea of a wheel with teeth is extremely simple, and dates back several thousand years. It is obvious to any

observer that one gear drives another by means of the meshing teeth, and to the person who has never studied gears, it might seem that no further explanation is required. It may therefore come

as a surprise to discover the large quantity of geometric theory that exists on the subject of gears, and to find that there is probably no branch of mechanical engineering where theory and practice are

more closely linked. Enormous improvements have been made in the performance of gears during the last two hundred years or so, and this has been due principally to the careful attention given to the shape of

the teeth. The theoretical shape of the tooth profile used in most modern gears is an involute. When precision gears are cut by modern gear-cutting machines, the accuracy with which the actual

teeth conform to their theoretical shape is quite remarkable, and far exceeds the accuracy which is attained in the manufacture of most other types of machine elements. The first part of this book deals with spur gears,

which are gears with teeth that are parallel to the gear axis. The second part describes helical gears, whose teeth form helices about the gear axis. Multiphase flows, which can involve compressible or

incompressible linear or nonlinear, fluids, Are found in all areas of technology, at all length scales and flow regimes. In spite of their ubiquitousness, however multiphase flow continues to be one of the most

challenging areas of computational mechanics and experimental methods, with numerous problems remaining unsolved to date. Because the multiphase flow problems are so complex,

advanced computational and experimental methods are often required to solve the equations that describe them. The many hhallenges include modelling nonlinear fluids,

modelling and tracking interfaces, dealing with multiple length scales, characterizing phase structures, and treating drop breakup and coalescence. Models must be validated, which

requires the use of expensive and difficult experimental techniquess. This book presents contributions on the latest research in these techniques, presented at the sixth in a biennial series of conferences on

the subject that begain in 2001. Featured topics include: Bubble and drop dynamics, Flow in porous media, Turbulent flow, Multiphase flow simulation, Image processing, Heat transfer, Interaction of

gases, liquids and solids, Interface behaviour, Small scale phenomena, Atomization processes, and Liquid film behaviour. This work describes an experimental investigation

with the aim to evaluate and establish wire spark erosion machining (WSEM) as a viable alternative for high quality miniature gear manufacturing. External spur type miniature brass (ASTM

858) gears with 12 teeth, 9.8 mm outside diameter and 5 mm face width were manufactured by WSEM. The research work was accomplished in four distinct experimental stages viz., preliminary,

pilot, main and confirmation. The aim, scope and findings of each stage are progressively presented and discussed. In essence, the investigation found that it was possible to manufacture miniature gears

to high quality by using WSEM. Gears up to DIN 5 quality with a good surface finish (1.2 µm average roughness) and satisfactory surface integrity were achieved. The results suggest that WSEM should be

considered a viable alternative to conventional miniature gear manufacturing techniques and that in some instances it may even be superior. This work will prove useful to researchers and professionals in

the field of miniature and micro-scale manufacturing and machining. Gears Advances in Asset Management and Condition Monitoring Spur-gear-system Efficiency at Part and Full

Load Proceedings of the 33rd IMAC, A Conference and Exposition on Structural Dynamics, 2015 Proceedings of the 3rd International Conference of IFToMM Italy

This the fifth volume of six from the

Annual Conference of the Society for Experimental Mechanics, 2010, brings together 25 chapters on Emerging Energy Systems. It presents early findings from experimental and computational investigations including Material

State Changes in Heterogeneous Materials for Energy Systems, Characterization of Carbon Nanotube Foam for Improved Gas Storage Capability, Thermoresponsive Microcapsules for Autonomic Lithium-ion Battery Shutdown,

Service Life Prediction of Seal in PEM Fuel Cells, and Assessing Durability of Elastomeric Seals for Fuel Cell Applications.

The urgent need to keep pace with the accelerating globalization of manufacturing in the 21st century has

produced rapid advances in manufacturing research, development and innovation. This book presents the proceedings of the 15th International Conference on Manufacturing Research (ICMR 2017), which also incorporated the 32nd

National Conference on Manufacturing Research (NCMR) and was held at the University of Greenwich, London, UK, in September 2017. The conference brings together a broad community of researchers who share the common goal of developing and

managing the technologies and operations key to sustaining the success of manufacturing businesses. The book is divided into 13 parts, covering topics such as advanced manufacturing technologies (including additive, ultra-precision and

nano-manufacturing); manufacturing systems (digital and cyber-physical systems); product design and development (including lifecycle management and supply-chain collaboration); information and

communication (including innovation and knowledge management); and manufacturing management (including lean, sustainable and cost engineering). With its comprehensive overview of current developments, this book will be of

interest to all those involved in manufacturing today. The influence of lubricant viscosity and additives on the average wear rate of spur gear pairs was investigated experimentally. The gear specimens of a comprehensive gear durability test

program that made use of seven lubricants covering a range of viscosities were examined to measure gear tooth wear. The measured wear was related to the as-manufactured surface roughness, the elastohydrodynamic film thickness, and

the experimentally determined contact fatigue lives of the same specimens. In general, the wear rate was found to be inversely proportional to the viscosity of the lubricant and to the lambda ratio (also sometimes called the specific film thickness). The data

also show an exponential trend between the average wear rates and the surface fatigue lives. Lubricants with similar viscosities but differing additives and compositions had somewhat differing gear surface fatigue lives and wear rates. Krantz, Timothy L.

and Kahraman, Ahmet Glenn Research Center NAS A/TM-2005-213956, ARL-TR-3126, E-15272

Abstract: In this study, the influence of different gear steels on the contact fatigue life of ground spur gear pairs was investigated. The

three gear steels considered in the study were (i) AISI 8620, (ii) AISI 4620M, and (iii) AISI 5120M. Batches of gears made out of these three materials using the same finishing process at about the same roughness and hardness levels were

used in these tests. Each specimen was qualified for its dimensional accuracy, hardness and surface roughness amplitudes before being tested on standard, FZG type, four-square test machines according to well-defined procedures and failure criteria.

Interim inspections throughout each test were used to describe the mechanisms leading to pitting failures. The pitting data obtained for each gear material were tabulated and analyzed statistically whenever possible. The pitting fatigue life results of ground

gears made of these materials were compared to each other as well as to baseline shaved gear and super-finished gear data obtained in previous related studies. The results indicated that hard grinding gears increases the pitting life of spur gears

substantially in comparison to a baseline of shaved gears. Ground gears were also shown to provide improvements in the same order as super-finished gears. Proceedings of the 2010 Annual Conference on Experimental and Applied Mechanics

Experimental Techniques, Rotating Machinery, and Acoustics, Volume 8

An Experimental Investigation of the Impact of Engineered Surface Processes on Efficiency of Spur Gears

An Experimental Investigation of Materials and

Surface Treatments on Gear Contact Fatigue Life

Recent Advances in Theoretical, Applied, Computational and Experimental Mechanics

The purpose of this project was to investigate the relative load-carrying capabilities of spur

and helical gears with increased-profile contact ratio (greater than 2) by carrying out a program of experimental investigation to assess the influence of increased load sharing among teeth on load capacity. This report presents the results of an

experimental program to substantiate load intensity and load sharing of a particular high-profile contact ratio (greater than 2) spur and helical 1-to-1 speed-ratio gear design. Baseline test gear geometry with a minimum-profile contact ratio of 1.30

was chosen to be consistent with present aircraft design practice to permit comparison with the high-contact-ratio gear geometry which had a minimum-profile contact ratio of 2.10. A strain-gage survey was conducted on 9.0-pitch spur and helical gears to

ascertain the load-sharing characteristics of the high-profile contact ratio tooth geometry and to provide information for deriving equations to determine the load intensity at any point of contact. (Author). This book presents the proceedings of the 3rd International

Conference of IFToMM ITALY, held online on September 9-11, 2020. It includes peer-reviewed papers on the latest advances in mechanism and machine science, discussing topics such as biomechanical engineering, computational

kinematics, the history of mechanism and machine science, gearing and transmissions, multi-body dynamics, robotics and mechatronics, the dynamics of machinery, tribology, vibrations, rotor dynamics and vehicle dynamics. A valuable, up-to-date

resource, it offers an essential overview of the subject for scientists and practitioners alike, and will inspire further investigations and research. SYROM conferences have been organized since 1973 by the Romanian branch of the International Federation for the

Promotion of Mechanisms and Machine Science IFToMM, Year by year the event grew in quality. Now in its 10th edition, international visibility and recognition among the researchers active in the mechanisms science field has been

achieved. SYROM 2009 brought together researchers and academic staff from the field of mechanisms and machine science from all over the world and served as a forum for presenting the achievements and most recent results in research and

education. Topics treated include conceptual design, kinematics and dynamics, modeling and simulation, synthesis and optimization, command and control, current trends in education in this field, applications in high-tech products. The

papers presented at this conference were subjected to a peer-review process to ensure the quality of the paper, the engineering significance, the soundness of results and the originality of the paper. The accepted papers fulfill these criteria and make the

proceedings unique among the publications of this type.

This volume presents the proceedings of the 12th IFToMM International Symposium on Science of Mechanisms and Machines (SYROM 2017), that was held in "Gheorghe Asachi”

Technical University of Iasi, Romania, November 02-03, 2017. It contains applications of mechanisms in several modern technical fields such as mechatronics and robotics, biomechanics, machines and apparatus. The book presents original

high-quality contributions on topics related to mechanisms within aspects of theory, design, practice and applications in engineering, including but not limited to: theoretical kinematics, computational kinematics, mechanism design,

experimental mechanics, mechanics of robots, dynamics of machinery, dynamics of multi-body systems, control issues of mechanical systems, mechanisms for biomechanics, novel designs, mechanical transmissions, linkages and

manipulators, micro-mechanisms, teaching methods, history of mechanism science, industrial and non-industrial applications. In connection with these fields, the book combines the theoretical results with experimental tests.

An Experimental

Investigation of the Influence of the Lubricant Viscosity and Additives on Gear Wear
An International Survey of Shock and Vibration Technology
Advances in Mechanisms Design
Proceedings of ICTACEM 2017
An Experimental Investigation of the

Pulsations in the Discharge of Spur Gear Pumps

This book covers the current advances and practices in tribological applications of composite materials

under various processes, presenting the development, characterization, and morphological properties of composite materials in tribological applications.

It covers a wide range of subjects, extending from fundamental research on the tribological characteristics of various multi-phase materials to

the final applications of composites in wear loaded, technical components. It brings together contributions from researchers

who discusses innovative experimental approaches and analytical techniques, creating a reference with comprehensive coverage of modern research

techniques and the potential application of tribological composites in biomedical, aerospace, automotive, marines and construction industries. This volume

will be of interest to material science researchers working in both industry and academia Acoustic emission (AE) is one of many technologies

for health monitoring and diagnosis of rotating machines such as gearboxes. Although significant research has been undertaken in understanding

the potential of AE in monitoring gearboxes this has been solely applied to spur gears and slow speed roller bearings. This research presents an

experimental investigation that assesses the effectiveness of both AE and vibration technologies in identifying various types of defects on in a helical

gearbox; the first known attempt. Furthermore, the application of advanced signals processing techniques such as Spectral

kurtosis (SK) and wavelet analysis were studied on AE and vibration signatures. It is shown that the application of advanced signal processing

methods is particularly necessary for monitoring helical gears. The application of SK and wavelet analysis was found to be effective in denoising the

acquired signals. The first chapter of this thesis is an introduction to this research and briefly explains motivation and theoretical

background supporting this research. The second chapter summaries the relevant literature to establish the current level of the knowledge in

this field. The third chapter describes methodologies and experimental arrangement utilized for this investigation. Chapter 4

discusses helical gear diagnosis for both natural and seeded surface defect.

Chapter 5 reports on an experimental investigation in which

several technologies such as AE, vibration and motor current signature analysis, were applied to identify the presence of a naturally fatigued

pinion shaft in an operating gearbox. Chapter 6 details an investigation which compared the applicability of AE and vibration

technologies in monitoring a naturally degraded roller bearing. It has been concluded that AE is a strong diagnostic tool for early diagnosis of

bearings faults. However, the application of condition monitoring for helical gear diagnosis was fraught with some degree of complexity as compared to

spur gears. This implies that condition monitoring of the gears using AET can be challenging. On the contrary, the applicability of AET for

bearing diagnosis was promising and it offered an absolute advantage over the conventional v ibrationdiagno sis. Furthermore, the

application advanced signals processing methods such as Spectral Kurtosis and wavelet was found to be promising in denoise the recorded AE

signals. It was also concluded that the use of different signal processing methods is often necessary to achieve meaningful

diagnostic information from the signals. Abstract: In this study, an experimental investigation is performed to investigate the impact of various gear

errors on transmission error and root fillet stresses. A test set-up is devised to operate a pair of spur gears under loaded, low-speed conditions.

Two measurement systems; one an optical encoder-based transmission error measurement system and the other a multi-channel strain measurement

system, are developed and implemented with the test set-up. A set of test gears having various types and tigh tly-controlled magnitudes of manufacturing errors are

designed and procured. These errors include indexing errors of different tooth sequences, pitch line run-out errors and lead wobble

errors. An extensive test matrix is executed to quantify the impact of these errors on the loaded static transmission error and the root stresses

of the spur gears. At the end, the same test conditions are simulated by using a recent feature of gear analysis model (LDP) to assess the accuracy of

its predictions. For gear scuffing experiments, the standard ISO 14635-1 FZG Scuffing Test was performed on AISI 8620 type A spur gears.

These experiments included four uncoated gear pairs and one gear pair coated with an experimental PVD coating. Uncoated gears encountered scuffing

during Stages 11 and 12. A high correlation between temperature and scuffing results was detected for both coated and uncoated specimens.

Proceedings of The 12th IFToMM International Symposium on Science of Mechanisms and Machines (SYROM 2017)

An Experimental Investigation

of the Effect of Spacing Errors on the Loaded Transmission Error of Spur Gear Pairs Proceedings of the 10th IFToMM International Symposium on

Science of Mechanisms and Machines, held in Brasov, Romania, october 12-15, 2009 Tribological Applications of Composite Materials Computational

Methods in Multiphase Flow VI

Noise and vibration performance of a gear system is critical in any industry. Vibrations caused by the excitations at the gear meshes propagate to the

transmission housing to cause noise, while also increasing gear tooth stresses to degrade durability. As such, gear engineers must seek gear designs that are nominally quiet with low vibration amplitudes. tudes.

They must also ensure that this nominal performance is robust in the presence of various manufacturing errors. This thesis research aims at an experimental investigation of the influence of one

type of manufacturing error, namely random tooth spacing errors, on the vibratory responses of spur and helical gear pairs. For this purpose, families of spur and helical gear test specimens

having intentionally induced, tightly controlled random spacing error sequences are fabricated. These specimens are paired and assembled in various ways to achieve different

sequences of composite spacing errors. Static and dynamic motion transmission error measurements from these tests are compared to the baseline case of “no error” gear to quantify the impact of random spacing

errors on the dynamic response. These comparisons show that there is a significant, quantifiable impact of random spacing errors on both spur and helical gear dynamics. In general, vibration amplitudes of gear

pairs having random spacing errors are higher than those of the corresponding no-error gear pairs. In the frequency domain, gears having random spacing errors exhibit broad-band spectra with

significant non-mesh harmonics, pointing to potential noise quality issues. The experimental data illustrates the cyclic nature of loads and resultant stresses on spline teeth caused by rotation of the

spline teeth in relation to the gear mesh that loads the splined joint. A nonlinear relationship between torque applied and resultant stress is revealed, as well as the relationship between the

location of maximum stress along the face width and the amount of lead crown modification applied. Through correlations to the experimental results, the model is shown to be accurate; it

captures several unique effects of spur and helical gear loading conditions.
In this study, an experimental investigation of the effects of tooth surface roughnesses on gearbox power

losses is performed. Spur gears with five different surface roughness pairings are considered as specimens. They include (i) gears having hard ground surfaces to serve as the baseline condition,

(ii) chemically polished surfaces with isotropic lay, (iii) ground-polished surfaces at roughness amplitudes that are comparable to chemically polished surfaces, (iv) ground-polished surfaces that are

rougher than smooth ground-polished surfaces, and (v) a ground surface mating with a ground-polished surface. An efficiency test set-up is used to measure gearbox power losses under these surface

conditions within the ranges of transmitted torque, speed and oil inlet temperature. Tests under unloaded conditions were performed to isolate the load-independent power losses and remove them from the

loaded tests to determine load-dependent power losses. Several roughness parameters including those defined in relation to the bearing-area curve are quantified for each test to investigate

which correlated to power loss. Results indicate that the load-independent losses are not influenced by surface treatments while load-dependent losses increase with increased surface roughness

amplitudes. An increase in oil temperature, or decrease in viscosity, is seen to increase the gear mesh friction power loss while reducing rolling power losses of bearings, which appears to

neutralize changes to gear mesh power losses.
This volume contains selected papers presented at the 7th International Conference on Theoretical, Applied, Computational and

Experimental Mechanics. The papers come from diverse disciplines, such as aerospace, civil, mechanical, and reliability engineering, physics, and navel architecture. The contents of this volume focus on

different aspects of mechanics, namely, fluid mechanics, solid mechanics, flight mechanics, control, and propulsion. This volume will be of use to researchers interested in the study of mechanics across disciplines.

An Experimental Investigation of the Impact of Random Spacing Errors on the Transmission Error of Spur and Helical Gear Pairs An Experimental Investigation of Churning Power Losses of a Gearbox

Volume 2: Analysis of Load Carrying Capacity and Strength Design New Advances in Mechanism and Machine Science Soft Computing in Condition Monitoring and Diagnostics of Electrical and

Mechanical Systems

This book explores the geometric and kinematic design of the various types of gears most commonly used in practical applications, also considering the problems concerning their cutting processes. The cylindrical spur and helical gears are first

considered, determining their main geometric quantities in the light of interference and undercut problems, as well as the related kinematic parameters. Particular attention is paid to the profile shift of these types of gears either generated by rack-type cutter or by pinion-rack cutter. Among other things, profile-

shifted toothing allows to obtain teeth shapes capable of greater strength and more balanced specific sliding, as well as to reduce the number of teeth below the minimum one to avoid the operating interference or undercut. These very important aspects of geometric-kinematic design of

cylindrical spur and helical gears are then generalized and extended to the other examined types of gears most commonly used in practical applications, such as straight bevel gears; crossed helical gears; worm gears; spiral bevel and hypoid gears. Finally, ordinary gear trains, planetary gear trains and face gear

drives are discussed. This is the most advanced reference guide to the state of the art in gear engineering. Topics are addressed from a theoretical standpoint, but in such a way as not to lose sight of the physical phenomena that characterize the various types of gears which are examined. The

analytical and numerical solutions are formulated so as to be of interest not only to academics, but also to designers who deal with actual engineering problems concerning the gears Abstract: Gear and transmission efficiency is one of the major issues in the automotive and aerospace industries. Both fuel

economy and emission characteristics of vehicles are influenced by the efficiency of the drive trains and transmissions. The literature on gear efficiency is limited to few models. Accuracy of these models was not demonstrated, mainly due to the lack of experimental data, especially under high-

speed conditions. Recent experiments by Chase [1] and Petry-Johnson [2] provided an extensive set of experimental data on efficiency for unity-ratio, precision spur gears operating at high-power conditions, representing racing applications. This experimental database was instrumental in

validating the efficiency model of Xu, et al [3] for spur gears. This study presents experiments with the aim of extending this jet-lubricated spur gear efficiency database to non-unity ratio, production quality gear pairs having various surface treatments and operating with different lubricants under typical

passenger vehicle conditions. As a separate study, it also provides a complete spin loss database for unity-ratio gears operating under dip-lubricated conditions. Direct comparisons between the two lubrication methods are also presented. Lastly, details of a design study for development of a

test machine for efficiency measurements for helical gears is presented.

The International Conference on the Theory of Machines and Mechanisms is organized every four years, under the auspices of the International Federation for the Promotion of

Mechanism and Machine Science (IFToMM) and the Czech Society for Mechanics. This eleventh edition of the conference took place at the Technical University of Liberec, Czech Republic, 4-6 September 2012. This volume offers an international selection of the most important

new results and developments, in 73 papers, grouped in seven different parts, representing a well-balanced overview, and spanning the general theory of machines and mechanisms, through analysis and synthesis of planar and spatial mechanisms, dynamics of machines and mechanisms, linkages

and cams, computational mechanics, rotor dynamics, biomechanics, mechatronics, vibration and noise in machines, optimization of mechanisms and machines, control and monitoring systems of machines, accuracy and reliability of machines and mechanisms, robots

and manipulators to the mechanisms of textile machines.
Experimental Techniques, Rotating Machinery & Acoustics, Volume 8: Proceedings of the 33rd IMAC, A Conference and Exposition on Structural Dynamics, 2015, the eighth volume of ten from the Conference brings together

contributions to this important area of research and engineering. The collection presents early findings and case studies on fundamental and applied aspects of Structural Dynamics, including papers on: Experimental Techniques Processing Modal Data Rotating Machinery Acoustics

Adaptive Structures
Biodynamics Damping
Near-Net Shape Manufacturing of Miniature Spur Gears by Wire Spark Erosion Machining
Condition Monitoring of Gearboxes Using Acoustic Emission
Proceedings of TMM 2012
Advances in Manufacturing

Technology XXXI COMADEM 2019

This study was conducted to evaluate the effect of surface finish on spur gear power losses under jet lubrication. Four different surface finish

combinations were tested: (i) hard ground surface pair, (ii) chemically polished surface pair, (iii) super honed surface pair and (iv) hard ground against chemically

polished surface pair. The test was conducted at 432 different operating condition combinations of speed, torque, lubricant type and inlet temperature. An FZG back-to-

back set up was used to conduct the test. Surface roughness inspections were carried out at regular intervals to monitor any changes in surface roughness chara

cteristics. The measured power losses were resolved into spin (load independent) and mechanical (load dependent) power losses. The relation between both losses and

various operating conditions were explored. As expected, spin power loss did not vary with variation in surface finish. Mechanical power loss increased with increase in

speed and torque. Various surface roughness and operating parameters such as BAC curves and lambda ratio were calculated for each surface finish combination to

study their correlation to power losses measured. For smoother surfaces, an increase in temperature decreased power loss as the viscosity of the lubricant decreased and

hence rolling friction losses dominating the mechanical power loss decreased. However, for rougher surfaces sliding friction losses seemed to be dominant due to

high amounts of asperity contact. Thus, more cases of higher power loss at high temperatures were observed for rougher surfaces.

An experimental investigation of spur gear

efficiency is conducted under various jet-lubricated and dip-lubricated conditions. A test methodology is developed to measure load-independent (spin) and load-dependent

(mechanical) losses to a gearbox containing a single spur gear pair. An experimental test matrix is defined to study the influence that the lubrication method has on

these losses. The test matrix includes two dip-lubricated conditions that vary in submersion level of the gear pair, and four jet-lubricated conditions that vary in the

gear mesh target location and velocity of the oil. Results indicate that the spin power losses are impacted by the lubrication method significantly while the

mechanical losses are not influenced. An investigation of spur gear contact fatigue is conducted under several lubrication schemes from the efficiency study. A test methodology is

developed to evaluate variations in tooth geometry due to surface wear, roughness, and pitting life. Pitting lives under each lubrication method are analyzed

statistically to quantify any meaningful differences in gear pitting life. Results indicate that contact fatigue lives from jet-lubricated tests are as high as dip-lubricated ones

as long as jet velocities are sufficient.

A unique, single source reference for all aspects of gears, Dudley's Handbook of Practical Gear Design and Manufacture, Second Edition

provides comprehensive and consistent information on the design and manufacture of gears for the expert and novice alike. The second edition of this industry standard boasts

seven new chapters and appendices as well as a wealth of updates throughout. New chapters and expanded topics include: Gear Types and Nomenclature, Gear Tooth

Design, Gear Reactions and Mountings, Gear Vibration, The Evolution of the Gear Art, Novikov Gearing and the Inadequacy of the Term, and thoroughly referenced Numerical Data

Tables.
Features:
Offers a single-source reference for all aspects of the gear industry
Presents a comprehensive and self-consistent collection of

knowledge, practical methods, and numerical tables Discusses optimal design and manufacture of gears of all known designs for the needs of all industries

Explains concepts in accessible language and with a logical organization, making it simple to use even by beginners in the field Provides adequate

recommendations for gear practitioners in all areas of gear design, production, inspection, and application Includes practical examples of successful use of tools

covered in the Handbook ? Logically organized and easily understood, the Handbook requires only a limited knowledge of mathematics for adequate application to

almost any situation or question. Whether you are a high-volume gear manufacturer or a relatively small factory, the Handbook and some basic common sense can direct the

sophisticated design of any type of gear, from the selection of appropriate material, production of gear blanks, cutting gear teeth, advanced methods of heat treatment, and

gear inspection. No other sources of information are necessary for the gear designer or manufacturer once they have the Handbook. This book addresses a range of

complex issues associated with condition monitoring (CM), fault diagnosis and detection (FDD) in smart buildings, wide area monitoring (WAM), wind energy conversion

systems (WECSs), photovoltaic (PV) systems, structures, electrical systems, mechanical systems, smart grids, etc. The book’s goal is to develop and combine all

advanced nonintrusive CMFD approaches on a common platform. To do so, it explores the main components of various systems used for CMFD purposes. The content is divided into

three main parts, the first of which provides a brief introduction, before focusing on the state of the art and major research gaps in the area of CMFD. The second part

covers the step-by-step implementation of novel soft computing applications in CMFD for electrical and mechanical systems. In the third and final part, the simulation

codes for each chapter are included in an extensive appendix to support newcomers to the field. Experimental Investigation of Shrouding on Meshed Spur Gear Windage

Power Loss
New Trends in Mechanism Science
Experimental Mechanics on Emerging Energy Systems and Materials, Volume 5
Advances in Italian Mechanism

Science SYROM 2009

Abstract: An experimental investigation of high-speed spur gear efficiency was conducted for both jet-lubricated, dry sump conditions and dip-lubricated conditions. Inspection methodologies were

developed for the documentation of gear surface roughness and wear after each test. An experimental test matrix including gears of two different modules and surface roughness levels operating under jet-lubrication conditions with four different gear

lubricants was developed to quantify the influence of these parameters on load-dependent (mechanical) and load-independent (spin) power losses. The spur gear efficiency test machine was modified for dip-lubricated load

independent power loss measurements, allowing direct comparison to jet-lubricated conditions using the same test fixtures. An experimental test matrix including unity ratio gears of different module and face width operating in an oil bath of four different levels for a

range of rotational speed and oil viscosity was developed. The influence of rotational speed, oil viscosity, oil bath level, and rotational direction on load independent power loss was quantified. This paper complements recent investigations

[Handschuh et al. (2014), Talbot et al. (2016)] of the influences of tooth indexing errors on dynamic factors of spur gears by presenting data on changes to the dynamic transmission error. An experimental study is performed using an accelerometer-based

dynamic transmission error measurement system incorporated into a high-speed gear tester to establish baseline dynamic behavior of gears having negligible indexing errors, and to characterize changes to this baseline due to application of tightly-controlled

intentional indexing errors. Spur gears having different forms of indexing errors are paired with a gear having negligible indexing error. Dynamic transmission error of gear pairs under these error conditions is measured and examined in both

time and frequency domains to quantify the transient effects induced by these indexing errors. These measurements are then compared against the baseline, no error condition, as a means to quantify the dynamic vibratory behavior induced due to the tooth indexing errors.

These comparisons between measurements indicate clearly that the baseline dynamic response, dominated by well-defined resonance peaks and mesh harmonics, are complemented by non-mesh orders of transmission error due the transient behavior induced by

indexing errors. In addition, the tooth (or teeth) having indexing error imparts transient effects which dominate the vibratory response of the system for significantly more mesh cycles than the teeth having errors are in contact. For this reason, along

with the results presented in Talbot et al. (2016), it was concluded that spur gears containing indexing errors exhibit significant deviations from nominal behavior, at both a system and time-domain level. Experimental Investigation of Spur Gear Efficiency and

the Development of a Helical Gear Efficiency Test Machine
Investigation of Increased Load Capacity of Spur and Helical Gears with Increased Contact Ratio
Novel Methods for Condition Monitoring and Diagnostics
An Experimental

Investigation of the Influence of Various Gear Steels on the Contact Fatigue Lives of Hard Ground Spur Gears
Analysis and Design