

1. Record Nr.	UNINA9910558501403321
Titolo	Advances in engine and powertrain research and technology : design, simulation, testing, manufacturing / / edited by Tigran Parikyan
Pubbl/distr/stampa	Cham, Switzerland : , : Springer, , [2022] ©2022
ISBN	9783030918699 9783030918682
Descrizione fisica	1 online resource (417 pages)
Collana	Mechanisms and Machine Science ; ; v.114
Disciplina	629.25
Soggetti	Engines Design and construction
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Intro -- Preface -- Acknowledgements -- Contents -- Dynamics and Vibrations/Tribology and Lubrication -- Efficient Modeling of Engine Parts and Design Analysis Tasks in Simulation of Powertrain Dynamics: An Overview -- 1 Introduction -- 1.1 Usual Problems in Internal Combustion Engines and Design Analysis Tasks -- 1.2 Two Types of Powertrain Dynamics Calculation Projects -- 2 The Right Simulation Tool for Each Project Phase and Task -- 2.1 Two Levels of Software Tools to Simulate Powertrain Dynamics -- 2.2 Simulation Levels Versus Project Phases -- 3 Efficient Dynamic Modeling of Engine Parts -- 3.1 Two Types of Dynamic Models of Crankshaft -- 3.2 Generating Structured Model of Crankshaft -- 4 Design Analysis Tasks -- 4.1 Early Phase Workflow -- 4.2 Preliminary Checks -- 4.3 Cranktrain Unbalance Analysis -- 4.4 Crankshaft Modal Analysis -- 4.5 Engine Mounting Analysis -- 4.6 Powertrain Torsional Vibration Analysis -- 4.7 Cranktrain 3D Dynamics in Frequency Domain -- 4.8 Crankshaft Strength and Durability -- 4.9 Hydrodynamic Analysis of Slider Bearings -- 5 Conclusion -- References -- Crankshaft Torsional Vibration Analysis in a Mid-Size Diesel Engine: Simulation and Experimental Validation -- 1 Introduction -- 2 Theoretical Modelling -- 2.1 Inertia of the System -- 2.2 Determination of the Torsional Stiffness -- 2.3 Determination of the System Damping -- 2.4

Crankshaft Excitation Torque -- 2.5 Dynamic Characteristics of the System -- 2.6 System's Steady-State Response -- 3 Simulated and Experimental Results -- 4 Conclusions -- References -- Scuffing Behavior of Piston-Pin/Bore Bearing in Mixed Lubrication -- 1 Introduction -- 2 Experimental Setup -- 3 Test Procedure -- 3.1 Journal Oscillation and Dynamic Load -- 3.2 Constant Pin Speed and Dynamic Load -- 4 Test Results and Discussions -- 5 Scuffing Modeling and Scuffing Failure Criterion.

6 Numerical Analysis Results and Discussions for the Bench Test Case -- 7 Numerical Analysis Results and Discussions for the Engine Case -- 8 Some Typical Measures to Mitigate Scuffing Failure -- 9 Conclusions -- References -- A Review on the Rotor Dynamics of Automotive Turbochargers -- 1 Introduction -- 2 Linear Analysis of Turbochargers -- 3 Turbocharger Nonlinear Response -- 3.1 Effect of Self-excited Vibrations -- 3.2 Effect of Unbalance -- 3.3 Influence of Radial Bearing System -- 3.4 Impact of Thrust Bearing on Turbocharger Response -- 3.5 Temperature Variations in Turbochargers -- 4 Current Trends in Rotor Dynamics of Turbocharger -- References --

Combustion/CFD/Emissions/Fuels -- Development of Gasoline Low Temperature Combustion Engine System Compatible with SULEV30 Emissions -- 1 Introduction -- 2 Experimental Setup -- 3 Results and Discussion -- 3.1 Homogeneous Stoichiometric Spark-Ignition Combustion (Baseline) -- 3.2 Low Temperature Combustion (LTC) Strategy Development -- 4 Passive SCR Aftertreatment System (PASS) -- 5 Federal Test Procedure (FTP) Drive Cycle Test Results -- 6 Conclusions -- References -- Simulation of Multistage Autoignition in Diesel Engine Based on the Detailed Reaction Mechanism of Fuel Oxidation -- 1 Introduction -- 2 Short Description of DRM Under Consideration -- 3 Object of Investigations and Mathematical Model -- 4 Results of Calculations -- 5 Influence of the Fuel Cetane Number -- 6 Conclusions -- References -- Towards Lower Engine-Out Emissions with RCCI Combustion -- 1 Introduction -- 1.1 RCCI and Low-Temperature Combustion Concepts -- 1.2 Fuels in RCCI Combustion Concept -- 1.3 Scope of the Study -- 2 Methodology -- 3 Utilized Fuels -- 4 Experimental Setup -- 5 Results -- 5.1 Variation of HVO SOE Timing -- 5.2 Variation of Energy Share Supplied by the NG -- 5.3 Variation of the EGR Rate -- 5.4 Summary.

6 Conclusions -- References -- Investigation of Charge Mixing and Stratified Fuel Distribution in a DISI Engine Using Rayleigh Scattering and Numerical Simulations -- 1 Introduction -- 2 Experimental Setup -- 2.1 Engine and Conditions -- 2.2 Optical Diagnostics, Image Acquisition and Post-Processing -- 3 Numerical Simulations -- 4 Results and Discussion -- 5 Conclusions -- References -- Evolution of Fuels with the Advancement of Powertrains -- 1 Introduction -- 2 Land Domain -- 2.1 Petrol -- 2.2 Diesel -- 2.3 Fatty Acid Methyl Esters (FAME) -- 2.4 Paraffinic Diesel -- 2.5 Liquefied Petroleum Gas (LPG) -- 2.6 Natural Gas - Biomethane -- 3 Maritime Domain -- 3.1 Distillate Marine Fuels -- 3.2 Residual Marine Fuels -- 3.3 Liquefied Natural Gas (LNG) and Methanol -- 4 Aviation Domain -- 5 Conclusion -- References -- Hybrid and Electrified Powertrains -- Methodology for TurboGenerator Systems Optimization in Electrified Powertrains -- 1 Introduction -- 2 Methodological Framework -- 3 Thermodynamic Model -- 3.1 Energy and Exergy Analysis of the Simple Turbogenerator System Configuration -- 3.2 Energy and Exergy Analysis of the Modified Turbogenerator System Configurations -- 4 Vehicle Model -- 4.1 Components Sizing -- 4.2 Powertrain Model -- 4.3 Auxiliaries and Cabin Thermal Comfort Models -- 4.4 Energy Management Strategy -- 5 Results -- 6 Concluding Remarks --

References -- On the Road Towards Zero-Prototype Development of Electrified Powertrains via Modelling NVH and Mechanical Efficiency -- 1 Introduction -- 2 Noise, Vibration and Harshness (NVH) -- 3 Mechanical Efficiency and Tribology -- 4 Lubricant Additives and the Role of Surface Coatings in Traction Motor Bearings -- 5 Suggestions for Future Developments -- References -- Testing/Calibration/Monitoring/Diagnostics.

Calibration of a Real Time Cycle SI Engine Simulation Model in the Entire Engine Operating Map -- 1 Introduction -- 2 Experimental Results -- 3 Real Time Simulation Model -- 4 Calibration Method and Model Parametrization -- 4.1 Calibration of Gas Exchange -- 4.2 Calibration of Turbulence Model -- 4.3 Calibration of Ignition Delay -- 4.4 Calibration of Combustion Model -- 4.5 Calibration of Cylinder Heat Transfer -- 5 Validation of Parametrized Model -- 6 Conclusions -- References -- Model-Based Calibration of Transmission Test Bench Controls for Hardware-in-the-Loop Applications -- 1 Introduction -- 2 Transmission HiL Test Rig: Hardware (HW) and Software (SW) -- 2.1 Hardware Components -- 2.2 Software Components -- 3 System Model and Analysis -- 3.1 Open-Loop System Equations -- 3.2 Closed-Loop State-Space Model -- 3.3 Model Experimental Validation -- 4 Sensitivity Analysis of the Linear Model -- 4.1 Sensitivity to Gear Ratios -- 4.2 Sensitivity to PID Gains -- 5 Controller Experimental Validation -- 6 Conclusions -- Appendix-Closed-Loop State Space Matrices -- References -- Turbomachinery Monitoring and Diagnostics -- 1 Introduction -- 2 Vibration Measurement and Instrumentation -- 2.1 Vibration Sensors -- 2.2 Instrumentation -- 2.3 Digital Data Processing -- 3 Tools for Vibration Monitoring and Diagnosis -- 3.1 Vibration Time Waveform -- 3.2 Vibration Spectrum -- 3.3 Vibration Waterfall -- 3.4 Envelope Spectrum -- 3.5 Phase -- 3.6 Orbit -- 3.7 Shaft-Centerline Plot -- 3.8 Frequency Response Function -- 3.9 Operating Deflection Shape (ODS) -- 4 Vibration Condition Monitoring -- 4.1 Condition Based Maintenance System -- 4.2 Condition Monitoring Versus Machinery Diagnostics -- 4.3 Condition Evaluation Based on Statistical Data -- 5 Vibration Diagnosis -- 5.1 Standards Overview -- 5.2 Initial Analysis -- 5.3 Common Analysis -- 5.4 Fault Table. 5.5 Symptom Table -- 5.6 Flow Chart -- 6 Recent Trends in Vibration Monitoring and Diagnosis -- 6.1 MEMS Accelerometers -- 6.2 Wireless Sensors -- 6.3 Cloud Monitoring -- 6.4 The Use of Artificial Intelligence in Monitoring and Diagnosis -- 6.5 Vibration Video Motion Magnification -- 7 Conclusion -- References -- Manufacturing -- Manufacturing of Structural Components for Internal Combustion Engine, Electric Motor and Battery Using Casting and 3D Printing -- 1 Introduction -- 2 Overview of Power Unit Casting Components -- 3 Casting Process -- 3.1 Use of Casting Process -- 3.2 Investment Casting -- 3.3 Sand Casting -- 3.4 Permanent Mold Casting/Tilting Mold/Low-Pressure Die Casting -- 3.5 High-Pressure Die Casting (Cold Chamber/Hot Chamber Process) -- 3.6 Trend of the Modern Times: Giga Casting -- 3.7 Quality and Tolerances of Casting Components -- 4 Materials -- 4.1 Alloys -- 4.2 Aluminum Alloys -- 4.3 Magnesium Alloys -- 4.4 Material Simulation -- 4.5 Joining Technology -- 5 Additive Manufacturing -- 6 Filling and Solidification Simulation (FSS) -- 6.1 FSS of High-Pressure Die Casting -- 6.2 FSS of Iron Sand Casting -- 6.3 Numerical Simulation and Software -- References -- Author Index.
