# TABLE OF CONTENTS

The Application of Multidisciplinary Design Optimization in IC Engine's Energy Saving ......................................................... 1  
Zhao Lifeng, Li Yunqing, Meng Yunxia

Study on Exhaust System Parameters for Fuel Economy Improvement of Small Gasoline Engine ........................................ 5  
Peng He, Yunqing Li, Lifeng Zhao

A Repetitive Control Strategy of AC Electronic Load with Energy Recycling ................................................................. 10  
Wang Shaokun, Hou Zhenyi, Peng Chuanbiao

Convective Heat Transfer and Flow Resistance Characteristics in Sinusoidal Corrugated Tube ........................................ 14  
Hu Yonghai, Tong Zhengming

The Study of the Impact of Technology Advance on China’s Energy Consumption Per Unit GDP ........................................ 19  
Shang Jie, Li Ningning

Research on Chinese Household Practical Energy Technologies ........................................................................................................ 23  
Zhang Bo, Chen Hongbo

Spray Characterization of a Swirl-type Injector for Gasoline Direct Injection Engines ....................................................... 28  
Li Yunqing, Li Bo, Wang Defu

Spray Impingement Characterization of a Swirl Type Injector for Gasoline Direct Injection Engines .................................. 33  
Li Bo, Li Yunqing, Wang Defu

Research on Chinese Renewable Energy's Chain Development Strategy Based on Vis Analysis ............................................. 39  
Li Xiaoyu, Zhang Mingyu, Zhang Kai

Study on New Energy and Renewable Energy Industry Development Strategy and Deployment of Beijing Based on SWOT Analysis ................................................................. 43  
Li Xiaoyu, Zhang Mingyu, Wu Wenbing

Characteristics of Heat Transfer for Al2O3-water Two-phase Fluids .................................................................................. 47  
Yanhong Zong, Daqiang Cang, Yi Jin, Rongjun Wang

Development and Application of Novel Energy-savings Material in Steel Industry ................................................................. 52  
Cang Daqiang, Zong Yanbing, Bai Hao, Zhou Huiming

Automatic Meter Reading System Based on Power Line Communication of LonWorks ............................................................... 57  
Lin Weijie, Wu Qixuan, Huang Yuewen

A New Type of VAWT and Blade Optimization .......................................................................................................................... 62  
Hu Yonghai, Tong Zhengmin, Wang Shanshan

Improving the Efficiency of Solar Photovoltaic Power Generation in Several Important Ways .................................................. 67  
Dai Qinghui, Chen Jun

An Instantaneous Model and Its Implementation in Speed Regulator for HEV Engine ................................................................. 70  
Zhang Yunxiao, Feng Qishan

Mode Analysis on MW Grade Wind Turbine .......................................................................................................................... 75  
Miao Lei, Shan Guangkun, Yao Xingjia

Research on Performance of Aerostatic Journal Bearing with Variable-section Pressure Equalizing Groove of Elastic Membrane ................................................................. 79  
Zhang Jun-an, Liao Bo, Dong Hao, Liu Bo

Study of Fender NC Incremental Sheet Metal Forming ........................................................................................................ 85  
Zhou Liuru

Study on the Preparation Technology and Fretting Damage Resistance Property of Coatings on Titanium Alloy ................................................................. 88  
Yang Lingling, Song Dandao, Shi Xiao

Experimental Study on the Effects of Oil / Water Emulsion on Machining Stainless Steel .................................................. 92  

Research on the Motion Control System of Multilayer Cloth-cutting Machine ........................................................................ 96  
Shi Weimin, Wang Songjie, Gu Yeqin, Fan Yunlei

Reinforcement Study on Photosensitive Resins Toughness with SiC Whiskers ......................................................................... 101  
Liu Yongfeng, Wang Ailing, Zha Liming, Chang Biao

Study on CNC/CAD/CAPP/CAM Integration a System Modeling for Rotational Parts ......................................................... 105  
Hu Deji, Cao Wenjie, Liu Yanling

Research on the Numerical Fitting Method of the Spiral Surface Cross-section ........................................................................ 109  
Zhao Wei, Tong Shijun, Hu Deji, Ma Suchang, Yan Lijun

Study on Reconfiguration Cost Modelling of Reconfigurable Manufacturing System ............................................................... 113  
Chen Jie, Zhang Liangwei, Luo Jianqiang

Experimental Investigation on Electrochemical Micromachining ................................................................................................. 119  
Deng Ya, Guo Zhongning, Mo Binghua
Spherical Harmonic Analysis Based on Projection Rays for 3D Model Retrieval .......................................................... 124
Lin Lin, Ding Gang, Chen Fangyu

A Research on the Automatic Generation of the Network Diagram .................................................................................. 129
Lin Lin, Ding Gang, Xu Lianfang

Experiments Study of Ultrasound Combined Electrical Micromachining Micro-structures on Working Surface of Friction Units .......................................................................................................................... 134
Wang Zhanhe, Zhu Yongwei, Fan Zhongjian, Yun Naizhang

Experimental Study on Numerical Control Electrochemical Machining of Rotary Parts .................................................. 139
Kang Min, Fu Xuqiang, Ji Haihong

Information Extraction System Model Based on STEP-NC Program .................................................................................. 144
Luo Yongsheng, Jiang Tingzhao

A Solution for Ethernet-based Real-time Communication Network of Distributed Numerical Control System ............................................................................................................................................................................... 149
Tao Lin, Jiang Tingbiao, Zhang Xiangli

Deformation Mechanism Analysis on Laser Brazing CBN Gear-honing-tool ................................................................. 155
Liang Guoxing, Lv Ming, Ma Lin, Song Yonggang

Effect of Part-cutter Deflection on Flexible Milling Force in High Speed Peripheral Milling Process .......................... 161
Qi Houjun, Zhang Dawei, Yan Bing, Cai Yujun

A Novel Method for Fabrication of Meso-scale Cutting Tool ............................................................................................. 166
Jiang Fang, Wang Xinbin, Meng Aiping

Finite Element Analysis of Steel Cord Conveyor Belt Splice .............................................................................................. 170
Song Weigang, Shang Wenjie, Li Xiaoxen

Study on the Acoustic System of the Ultrasonic Micro Milling Machine ........................................................................ 176
Zhang Yundian, Lan Hongyu

Study on Reverse Copying Precision of Micro Electrode Array Fabricated by Micro-EDM ................................................. 182
Zeng Weiliang, Liu Ying, Wang Zhenlong

Design and Development of Megasonic System and Its Application to PZT Nano Powder Dispersion .............................................. 186
Peng Yun, Wang Wei

Structural Design and Experimental Study of a Precision Positioning Table ....................................................................... 192
Wu Yimin, Yan Shijing, Zhou Zhige, Wang Haixia

Kinematics Analysis and Experimental Study on Ultrasonic Vibration Honing ......................................................................... 197
Wang Jianqing, Shao Yanjun, Zhu Xijun

Research on the Modify of Mechanism of Fluid Magnetic Abrasivetool ............................................................................... 201
Li Weidong, Zhang Hong

Research on Straightness Error Evaluation of Shaft Parts Based on Genetic Algorithms with Transfer-operator .......... 204
Yan Liwen, Yan Bing, Cai Lanrong, Qi Houjun, Zhao Wei

Cutting Performance and Failure Characteristic of New Cutting Tool in Dry Milling of High-strength Steel ............................................................................................................................................................................... 209
Liu Zhizheng, Wang Xinbin

Characteristic of Surface Profile and Roughness in Micro Turn-milling of Aluminum Alloy 2A12 ........................................ 213
Liu Zhizheng, Wang Xinbin

Theoretical Analysis and Numerical Simulation of External Spline Cold Rolling .............................................................................. 217
Zhang Dawei, Li Yongtang, Fu Jianhua, Zheng Quangang

Pipe Routing and Assembly Planning Technology in Virtual Environment ............................................................................. 224
Jianhua Liu, Ruxin Ning, Qidong Hu

Dynamics Analysis of Cutting Mechanism of Underwater Guillotine Pipe Saw ............................................................................. 231
Gong Haixia, Wang Ying, Han Jakui, Jia Peng

Research on the Simulation System of NC Milling .................................................................................................................. 236
Hu Yanjuan, Wang Yiqiang, Guang Xuesong, Wang Yao, Yuan Xiuhua

Assembly Simulation Research for Hydraulic Transformer with Virtual Manufacturing Technology ............................................. 240
Zang Faye

Formability Analysis and Optimization of the Braking Cylinder Block for One Drawing Step ..................................................... 246
Wu Chengge, Fung Qianguan, Zhao Kangpei, Li Sixiang, Zhang Zunqiao, Hou Yingcheng

Applications of CFD in Design of Oil-mist Cooling and Separation ....................................................................................... 251
Chen Shenrong, Xu Gaochun, Zhu Hongping, Ruan Hegen, Li Limin

Hierarchical Modeling and Simulation of Dynamic Production Logistic System ........................................................................... 256
Chen Huawe, Wang Aimin, Ning Ruxin

Physically Based Collision Response in Virtual Assembly .......................................................................................................... 261
Hou Weiwei, Liu Jianhua, Ning Ruxin

Study of Assembly Line Dynamic Balancing Based on Simulation ............................................................................................ 265
Wang Hongjun, Wang Hongfeng, Zhang Huicun
Layout Research of Campus Traffic System Based on System Simulation ................................................................. 269
Jiang Lian-Fu, Sun Gui-Tao, Zhang Na

Material Logistic Process Control in Hierarchical Workshop Model ................................................................. 274
Chen Huawei, Wang Aimin, Ning Ruxin

Study on the Mechanisms and Simulation of the Tool Wear Process in Machining of Stainless Steels with Carbide Tools ................................................................. 280
Xie Lijing, Li Lin, Ding Yue, Wang Xihun

Simulation of Heat Transfer Performance for Integral Steel Fin-tube Through ANASYS ........................................ 285
Zong Yanbing, Cang Daqiang, Bai Hao, Wang Haofei, Gao Yufeng

Vibration and Noise Measurement Synchronous and Analysis on Paper Transmitting System for Sheet-fed Offset Press ................................................................. 290
Wang Yiming, Wu Shuqin, Peng Ming, Bai Jianjun

Development of a Novel Three-axis Force Sensor ................................................................................................. 295
Zhang Xin

Real-time Measurement Method for Object Space 6-D Information ................................................................. 299
Tian Yingzhong, Gao Yu, Zhang Zhenyou, Li Ming

Automatic Pairing Measurement of Servo Valve Nozzles and Experimental Research ......................................... 303
Pan Xudong, Wang Guanglin, Hu Yang, Shao Dongxiang

A Study on the Properties of Rapidly Prototyped Wood-plastic Composites Based on Selective Laser Sintering ................................. 307
Xin Zongsheng, Guo Yanling, Yu Ping, Zeng Weiliang

Reverse Engineering System Based on Cross-sectional Image Measuring System ........................................ 312
Zhao Liqin, Wang Biao

Research on the Initial Design Feature for CAD Modeling ........................................................................ 317
He Chaoming, Liu Guangshuai, Xiong Ying, Lei Huatang

Cracking Behavior of Laser Cladding Forming Nickel Based Alloys .................................................................. 322
Song Jianli, Li Yongfeng, Fu Jianhua, Deng Qilin, Hu Dejin

Numerical Simulation of the Three-dimensional Temperature Field in Laser Cladding Forming Process .................. 327
Song Jianli, Liu Zhiqi, Qi Huiping, Du Shiwen, Li Yongtang, Deng Qilin

Research and Application of Parametric Design for Overhead Traveling Crane Based on the Holographic Model ................................................................. 333
Wu Shufang, Wang Zongyan, Wang Yi, Wang Xingwen

Rapid Variant Design Method of Crane Based on Parameterized Templates ........................................ 338
Lu Chunyue, Wang Zongyan, Zhang Weiqiang

Coaxial Powder Delivery System for Laser Metal Deposition Shaping ................................................................. 344
Zhang Kai, Liu Weijun, Shang Xiaofeng

Research on Data Processing Technology of Rapid Prototyping Based on Laser-induced Chemical Liquid Deposition ........................................................................ 349
Song Danlu, Yang Lingling, Chen Weichuang, Shi Xiao

Parameter Identifications of the Hydraulie Mount ................................................................................ 354
Zhang Yunxia, Shangguan Wen-Bin, Fang Zuhua

Circular-economy-oriented EPR: the Status Quo & Countermeasures in China .................................................. 359
Ma Xiangyang, J. Duval, Cao Rui

New Developments of CRM in Theory: The Integration Between CRM and Other Business and Technology Orientations ........................................................................ 364
Ma Xiangyang, J. Duval, Cao Rui

Multi-constrained Module Partition for DFMC ................................................................................................. 369
J. Chen, Y. W. Zhao, F. Y. Li, J. F. Li

Research of Product Requirement Design for the Concurrent Design ................................................................. 376
Liu Junying, Li Suling

The Research and Implementation of Knowledge Management Technology in the Ship Collaborative Design .......... 380
Xu Zhaohui, Hu Xiaoping, Yu Baohua, Ye Hongxian

Study on the Modern Generalized Optimization Design Based on Collaborative Virtual Technology ................ 385
Wang Xuewen, Duan Lei, Xiang Hu, Li Kunpeng, Yang Zhaojian, Shu Xuefeng

An Algorithm of Robust Design: Orthogonal Optimum Design and Variance Ratio Analysis ................................ 390
Li Yongxian, Sun Mingli

The Innovative Design on the Scheme of the Vertical Turn Stereo Garage Based on TRIZ and AD ......................... 395
Zhang Ruijun, Zhang Mingqin, Wang Xiaowei, Han Lifang, Li Min
A Study of Critical Path Algorithm Based on Transforming Complex Relations Into Dummy Tasks ........................................... 401
Liu Gang, Gao Qi, Jiao Wenzhe, Zhang Shanhui, Wang Peigang

Finite Element Analysis on the Rolling-mill Housing of the Dry-powder-embedded Zinc-air Battery

Plate Forming Equipment .................................................................................................................................................... 406
Guan Yuming, Wang Pengfei, Xiao Yanchun, Xu Bo

The Conditions of Inventory Cost for the Supplier Adopting VMI Strategy .......................................................................... 411
Xu Zhangyi, Huang Jicheng, Li Menglian

FEM Analysis and Optimization for the Welded Metal Belows Mechanical Seal .......................................................... 414
M. Ahmat, H. Isimayi, R. Noor, M. Geni

Cutting Parameter Optimization for Large Diameter Hydraulic Cylinder of 7A04 Aluminum Alloy .................................. 417
Zeng Zhiquan, Yang Fuhua, Du Wenhua

Optimal Tolerance Design for Green Manufacturing ........................................................................................................... 422
Liu Shaogang, Wang Ping, Jin Qiu

A Hybrid Algorithm for Surplus Material Utilization Based on Integrated Evaluation and Matching

Rules ........................................................................................................................................................................... 425

Optimization Design of Metallic Seal Pair Structure for Triple Offset Butterfly Valve .......................................................... 430
Ding Qingxin, Sun Guangbin, Zhao Honglin, Zhang Shimin

Simultaneous Topology and Sizing Optimization of Trusses by an Improved Genetic Algorithm ...................................... 435
Guo Lihua, Tang Wencheng, Yuan Man

Group FEM Model and Application for Tube Shape Prediction in Stretch Reducing Process ............................................. 440
Yu Hui, Du Fengshan

The Reverse Design Method for Cam Contours and Motion Specification ............................................................................. 444
Ge Zhenghao, Su Penggang, Yang Fulian, Jiang Meng

Model Repair in Polygonal Meshes Using a Surface Oriented Algorithm ................................................................................. 448
Liu Guangshuai, Li Bailin, He Chaoming, Tian Yaling

Research of Critical Techniques Based on CAD/CAM Software .............................................................................................. 453
Sun Shufeng

A Genetic Algorithm for the Rectangular Packing Problem of Placement Function ........................................................ 458
Wang Jinmin, Zhu Yanhua, Wang Baochun

An Optimal Parameterization Algorithm for Discrete Surface ................................................................................................. 463
Liu Guangshuai, Li Bailin, He Chaoming, Tian Yaling

A Study of Spur Gear Torsional Mesh Stiffness .................................................................................................................. 469
Wu Zhifei, Wang Tie, Zhang Ruiqiang

Integration Model of Cooperation E-commerce Based on Web Services ................................................................................... 473
Li Gang, Qian Xingsan, Ye Chaoming

Research on Mapping Between Product Function Model and Assembly ................................................................................. 477
Tian Jiaping, Zhang Xu

Design of Database System for High Speed Machining Based on Web .................................................................................. 482
Liu Lijuan, Yan Xiaohui, Wu Wenge

Arithmetic Research About Boolean Operation of Surfel Model Based on Hierarchical Bounding

Volumes ........................................................................................................................................................................... 487
He Chaoming, Liu Guangshuai, Xiong Ying, Lei Huatang

Research on a Weighting Alignment Method for Investment Casting Turbine Blade Shape Inspection .......................... 492
Cheng Yunyong, Zhang Dinghua, Huang Shengli, Bu Kun

Characteristic Parameters of Machine Joints and the Technology for Applying Them in Overall

Modeling ........................................................................................................................................................................... 496
Zhao Honglin, Wu Zhisheng, Zhang Guangheng, Ding Qingxin

Machining Feature Recognition for DFM Evaluation ............................................................................................................... 501
Zhang Xu, Qi Guangming, Zhang Jun

An Optimized Isoscallop Height Cutting Paths Planning Method Based on Cross-entropy

Optimization Algorithm ......................................................................................................................................................... 506
Pan Xin, Cai Yujun, Li Zhen, Sun Lijie

Welding Multi-robot Task Allocation for BIW Based on Hill Climbing Genetic Algorithm .................................................. 511
Li Yanping, Liu Haijiang

Study on Visualized Conversion Technology of Distributed Agent-based CAD Model ....................................................... 519
Tang Dingyong, Sun Linfa, Tao Yilun, Cheng Zheng

Research on Dynamic Characteristics of Printing Press' Paper Transferring System Based on

Experimental Modal Analysis ................................................................................................................................................ 523
Wang Yiming, Peng Ming, Wang Xinzhu, Cai Jifei

The Optimization of Shifting Coefficient in Internal Parallel Move Gears Transmission ................................................... 529
Han Gang, Zhang Chunlin, Zhi Huiqing, Wang Songlei
Study on the Variables in Designing the Internal Parallel Move Gears Transmission
Zhang Xiaoming, Han Gang, Zhang Chunlin, Wang Songlei

Application Study of Water Kettle Handle Injection Molding
Kuang Weihua, Cui Jianqiang

Case Study for Integrating the Line Balancing and the Shop Layout Based on AutoCAD
Pei Ling, Li Feng, Lin Fuquan, Wang Wei

Reliability and Maintainability Optimization of Mechanical System Based on the Life Cycle Cost
Wang Yaling, Li Fangyi, Yang Yong, Dong Zhengwen

A Characterization Model and a Normalization System of the LCIA for Chinese Electromechanical Products
Wang Xiaowei, Li Jianfeng, Li Fangyi, Zhang Ruijun, Wang Liming, Guo Anfa

Assessment on Green Degree of Biodegradable Packaging Material Based on LCA and FAHP Methodology
Guo Anfa, Li Jiafeng, Li Fangyi, Wei Baokun, Wang Xiaowei, Liu Gang

Study of Residual Life Prediction and Maintenance Decision-making of Portal Crane
Chen Yan, Sun Yuantao

Research on Theory of Reconfigurable for NC Machine Tool
Wang Youjun, Zhang Dinghua, Yao Kai, Hou Zhongming, Wu Fujia

Heater Operation Optimization in Tin Bath
Zhang Qin, Chen Zejing, Li Zhixin

The Effect of Annealing Process on the Microstructure of Fe-0.3%Si Electrical Steel

Distribution Characteristics of Point Discharge Effect in the Process of Electroplating CBN Gear-honing-tool...
Li Wenbin, Liang Guoxing, Yu Gang, Lv Ming

Kinematic and Finite Element Analysis of Upsetting Process by Slider-crank Mechanism
Kuang Weihua

Estimation of Uncertainty in Form Error CMM Measurement According to New GPS Standard System
Sun Yingda, Xu Wenyin, Zhu Liangrong, Du Huiqing, Zhang Ya

Tooth Flank Feature Analysis and Study on Grinding Method of Full Edge Gear Honer
Zhang Xiuqing, Lv Ming, Yan Hongyuan, Ma Lin

Localization Variation Stream Propagation Modeling of Multi-operation Machining in IL&SM Fixturing
Wang Qingsia, Li Beizhi, Mao Qibin

A Systematic Innovation Design Method Based on Patent
Zhang Lujun

An Economic Analysis on Marketing Channel Conflict
Zhao Longwen, Long Yan

Product Innovative Design Based on AHP/QFD/TRIZ
Zhang Fuying, Zhang Qibing, Wang Ping, Liu Hui

Study of Priority Assessment of Multiple Mechanical Product Projects Based on AHP and GRA
Chen Yan, Chen Hongming

Dynamics Characteristic Study of the Visco-elastic Suspension System of Construction Vehicles
Zhang Xin, Sun Dagang, Song Yong, Yan Bijuian

The Method of Making Production Plan in Mass Customization
Ma Yu Fang, Wang Fu Dong, Zeng Yue Ming

Modelling and Analysis of Value Chain of Scientific and Technological Innovation
Song Hua, Yun Jun

Active Push Technology for Multidisciplinary Auxiliary Knowledge in Product Design
Wang Shuang, Yin Guofa, He Zhongxue

The Study of a Self-adaptive Evolutionary Programming and Using in Engine CBR Design System
Yan Wei, Gao Qi, Liu Zhenggang, Zhang Shanhai, Liu Hui, Hu Yuping

Research on Level-2-computer Control System for Heat-furnace in Plate Heat Treatment Line
Li Hongjie, Gong Xiuqian, Wang Jianmei, Huang Qingxue

Fuzzy Control of the Ram Velocity in Energy-saving Servo Injection Molding Machines
Wang Shuo, Ying Ji, Zhou Weian, Ke Min

Research on Reliability Modeling of Complex System Based on Dynamic Fault Tree
Yuan Jing, Long Yong, Li Yanling, Xu Rui

Simulation Research of the Electro-hydraulic Control System of CVT Metal V-belt's Axial-misalignment
Zhang Faye
Study on Monitor System of Heating Ventilation Air Conditioning Based on LonWorks Technology .......... 660
Lin Weijie, Huang Yuewen, Wu Quuxuan

A Pulverized Coal Concentration Measurement System Based on Capacitance Sensor ............................................. 665
Chen Xia, Hu Hongli, Liu Zhihong

A Study of ECT Image Reconstruction Algorithm in Two-phase Flow Measurement .................................................... 669
Zhang Juan, Hu Hongli, Wang Congcong, Chen Xia

Local Image Contrast Enhancement Under Nonuniform Illumination ................................................................. 674
Jiao Linan, Sun Zhaoyun, Sha Aimin

A Computer Vision Approach for Fabric Defects Inspection ........................................................................ 679
Liu Shu-Guang, Qu Ping-Ge

Parallel Mechanism Character Arrays of Topology Graphs Isomorphism Identification and Creation Automatically ............................................................................................................................... 683
Ding Ling, Lu Yi, Wen Jia

Research on Trajectory Tracking Control of Nonholonomic Wheeled Mobile Service Robots ........................................ 688
Chang Jiang, Meng Qingxin

Multidisciplinary Collaborative Optimization Design of Robots .................................................................................. 693
Zhang Jing, Li Bailin, Liu Yongjun

Modified Particle Filter Algorithm for Mobile Robot Simultaneous Localization and Mapping ........................................... 698
Wang Zhongmin, Miao Dehua, Du Zhijiang

Constraint Forces Applied on Limbs of 3-RPS Parallel Manipulator in Static Equilibrium ........................................... 703
Cui Qunfeng, Zheng Xiangzhou

Inverse Kinematics Computation in Robotics Using Conformal Geometric Algebra .................................................... 708
Wang Chaoqun, Wu Hongtuo, Miao Qunhua

The Improved Potential Grid Method in Robot Path Planning ................................................................................ 713
Li Chunshu, Lu Haifeng, Cui Genqun

Research on Detection System for Coal Mine Detection Robot Based on the Technology of Information Fusion ................................................................. 718
Niu Zhigang, Fu Zhichao

Research on Path Planning for Coal Mine Detection Robot .................................................................................. 723
Niu Zhigang, Liu Xiaoheng

The Magnetic Field Analysis and Optimization of Permanent-magnetic Adhesion Device for a Novel Wall-climbing Robot .................................................................................. 728
Yao Pingxi, Li Dewei

Author Index