

# 目次 CONTENTS

《制造技术与机床》2023年第05期(总第731期) No.05.2023 Total Issue No.731

## 1 | 国内外动态 / Information at Home and Abroad

### 专题专访 / Special Topics & Interview

3 | 通用技术集团携旗下全新产品重磅亮相CIMT2023|本刊编辑部

4 | 融合创新 数智未来|本刊记者 / 谭弘颖  
——2023机床制造业CEO论坛在京召开

7 | 迎春开新局 绿色助成长|本刊记者 / 谭弘颖  
——“第十一届机床产品创新与设计高峰论坛·绿色”在京召开

11 | 五轴引领 高端智胜|本刊记者 / 谭弘颖 刘艳  
——华中数控高端五轴数控系统新品发布会在京举行

12 | 形无所限 永续全面|本刊记者 / 高扬  
——山高刀具“山海阔·行高远”媒体见面会在京顺利举行

### 故障诊断 / Fault Diagnosis

13 | 基于MDFF和DCNN-SVM混合网络的滚动轴承故障诊断研究/徐卫晓  
井陆阳 孙显斌 谭继文

Research on rolling bearing fault diagnosis based on MDFF and DCNN-SVM hybrid network/  
XU Weixiao, JING Luyang, SUN Xianbin, TAN Jiwen

21 | 基于ICEEMDAN及PFA-ELM的齿轮箱故障诊断研究/刘凯 李磊 王磊  
陈庆辉 金奕扬 许家伟

Fault diagnosis research of gearbox based on ICEEMDAN and PFA-ELM/LIU Kai, LI Lei,  
WANG Lei, CHEN Qinghui, JIN Yiyang, XU Jiawei

### 特种加工 / Non-traditional Machining

28 | 放电参数对短电弧铣削TC4加工性能影响的研究/唐伟 许燕 周建平  
汪兵兵 秦曹阳 季玉

Study on the effects of short electric arc milling on TC4 machining performance/TANG Wei,  
XU Yan, ZHOU Jianping, WANG Bingbing, QIN Caoyang, JI Yu

35 | 图像处理和双链基因的退火算法用于激光切割路径的优化/常翠芝 高文良  
杨潇 李自成 黄元峰

Laser cutting path optimization using image processing and annealing algorithm with double  
chain gene/CHANG Cuizhi, GAO Wenliang, YANG Xiao, LI Zicheng, HUANG Yuanfeng

41 | 加工参数对金属砂轮电火花精密成型修整的影响/张子英 李学会  
EDM forming precision of metal diamond grinding wheel affected by machining parameters/  
ZHANG Ziying, LI Xuehui

### 切削加工 / Cutting Processing

49 | 考虑机床几何误差的球头刀三坐标NC铣削刀位控制/黄梦翔 牛兴华  
朱浩铭 张大卫 王向东

Tool position control for three-coordinates NC milling with ball-end cutter considering  
geometric errors of machine tools/HUANG Mengxiang, NIU Xinghua, ZHU Haoming,  
ZHANG Dawei, WANG Xiangdong

- 57 | 基于多模态感知融合的钛合金加工刀具磨破损分析/喻志勇 宋戈 姜振喜  
李卫东 毛一砚

Tool wear analysis of titanium alloy parts based on multi-mode perception fusion/YU Zhiyong,  
SONG Ge, JIANG Zhenxi, LI Weidong, MAO Yian

- 64 | 基于 DEFORM-3D 轴向振动钻削 304 不锈钢有限元仿真/吕康 付朝霞  
陈伟 胡建 刘书明 王晓宇

Finite element simulation of 304 stainless steel based on DEFORM-3D axial vibration drilling/  
LV Kang, FU Zhaoxia, CHEN Wei, HU Jian, LIU Shuming, WANG Xiaoyu

- 69 | 三偏心蝶阀车削方法研究/程膺豪 贾衡 李鹏 马欢 陆佳 文闻  
Research on turning method of triple eccentric butterfly valve/CHENG Yinghao, JIA Heng,  
LI Peng, MA Huan, LU Jia, WEN Wen

### 综述 / Special Reports

- 74 | 制造工艺参数的智能优化设计方法进展/邓建新 刘光明 王令 袁邦颐  
黄海宾

Research progress of intelligent optimization design of manufacturing process parameters/  
DENG Jianxin, LIU Guangming, WANG Ling, YUAN Bangyi, HUANG Haibin

- 81 | 绿色机床标准体系研究/薛瑞娟 黄祖广 刘志峰 曹华军 吴瞿 张颖  
李聪波 张雷

Research on green machine tool standard system/XUE Ruijuan, HUANG Zuguang,  
LIU Zhifeng, CAO Huajun, WU Di, ZHANG Ying, LI Congbo, ZHANG Lei

### 设计与研究 / Design and Research

- 94 | 基于机器视觉的双臂协作机器人拧紧装配实验研究/常琛扬 王平安 李秉洋  
Experimental research on tightening assembly of dual arm collaborative robot based on machine  
vision/CHANG Chenyang, WANG Pingan, LI Bingyang

- 98 | 基于 RBF 神经网络模型的数控车床主轴箱优化设计/乔雪涛 周世涛 李优华  
曹康 盛坤 张洪伟

Optimization design of CNC lathe spindle box based on RBF neural network model/  
QIAO Xuetao, ZHOU Shitao, LI Youhua, CAO Kang, SHENG Kun, ZHENG Kun, ZHANG Hongwei

- 105 | T型复合结构空气静压支承平台承载性能研究/崔心宽 卢志伟 张晓冰  
刘波 张君安

Research on bearing performance of T-type composite structure aerostatic bearing platform/  
CUI Xinkuan, LU Zhiwei, ZHANG Xiaobing, LIU Bo, ZHANG Junan

- 111 | 铆螺母安装过程仿真建模及锁紧力矩衰退规律研究/王立俊 柯书忠 高靖靖  
周玉宝 吕慧慧 李皓

Simulation modeling of rivet nut installation process and study of locking torque recession/  
WANG Lijun, KE Shuzhong, GAO Jingjing, ZHOU Yubao, LV Huihui, LI Hao

- 119 | 电磁驱快速刀具伺服闭环系统 DOB 补偿增益 PID 阻尼控制器设计/卢银菊  
刘萌萌 谢忠兵 李峰 张国强

Design of DOB compensation gain PID damping controller for electromagnetic drive fast tool  
servo closed-loop system/LU Yinju, LIU Mengmeng, XIE Zhongbing, LI Feng, ZHANG Guoqiang

### 工艺与制造 / Technology and Manufacture

- 124 | 焊接顺序及焊接方向对 X80 管线钢残余应力的影响/王浩博 陈小康 李建军  
王恪典

Effect of welding sequences and welding direction on the residual stress in X80 pipeline steel/  
WANG Haobo, CHEN Xiaokang, LI Jianjun, WANG Kedian

- 129 | 基于知识图谱的工艺决策方法研究/吕宽宽 薛进学 苗舒康 赵国强 王毅鹏  
Research on craft decision making method based on knowledge graph/LV Kuankuan, XUE Jinxue,  
MIAO Shukang, ZHAO Guoqiang, WANG Yipeng

135 | 飞秒激光制备不锈钢微纳结构工艺研究/肖强 何雪莉 徐睿

Study on micro/nano structure formation process of stainless steel machined by femtosecond laser/XIAO Qiang, HE Xueli, XU Rui

143 | 某运载火箭复杂薄壁壳体数控加工工艺研究/吴龙梅 康权 周明军

Research on NC machining technology for complex thin-walled shell of a carrier rocket/WU Longmei, KANG Quan, ZHOU Mingjun

### 检测与质量 / Test and Quality

150 | 圆锥体外表面铺贴机械手工作质量评估方法研究/霍凯 刘玉琳 孙江宏 王增刚 何宇凡

Research on working quality evaluation method of cone outer surface mounting manipulator/HUO Kai, LIU Yulin, SUN Jianghong, WANG Zenggang, HE Yufan

155 | 基于临界折射纵波的声时差-表面应力关系获取方法研究/戴玉红 牛娜娜 刘贺强 任慧玲 郝小琴 孙凡

Research on acoustic time difference-surface stress relationship acquisition method based on critical refractive longitudinal wave/DAI Yuhong, NIU Nana, LIU Heqiang, REN Huiling, HAO Xiaoqin, SUN Fan

159 | 基于综合因子模糊层次分析法的机械系统可靠性分配研究/胡启国 赵胜东 李致明 周小明 郝建旭 徐向阳

Research on reliability allocation of mechanical system based on comprehensive factor fuzzy analytic hierarchy process/HU Qiguo, ZHAO Shengdong, LI Zhiming, ZHOU Xiaoming, HAO Jianxu, XU Xiangyang

### 管理信息化 / Management and Informatization

166 | 仿真环境下混流装配线平衡和排序的优化研究/赵乾宏 朱成顺 张辉 孙高峰 方喜峰 齐杰

Research on optimization of balance and sequencing of mixed-model assembly lines in simulation environment/ZHAO Qianhong, ZHU Chengshun, ZHANG Hui, SUN Gaofeng, FANG Xifeng, QI Jie

173 | 基于多目标优化的改进遗传算法求解柔性车间调度问题/李长云 李霆誉 王志兵 谷鹏飞 林多

An improved genetic algorithm based on multi-objective optimization is used to solve the flexible job-shop scheduling problem/LI Changyun, LI Tingyu, WANG Zhibing, GU Pengfei, LIN Duo

179 | 基于交叉选择的变邻域蜂群算法求解置换流水车间调度问题/亓祥波 王宏伟 马志强

A variable neighborhood bee colony algorithm based on crossover and selection strategy for permutation flow-shop scheduling problem/QI Xiangbo, WANG Hongwei, MA Zhiqiang

投稿须知 | 188