

1	Design of a certain valve body flange hole system machining variable hole number fixed radius multi-axial head / Weina Tian Chunlei Cao	48	Research on Precise Positioning Technology for Large Equipment Lifting in Petrochemical Installation / Fuyan Ben Wenjie Ren Zhuliang Wang
4	Research on the Installation of Bolted Water Tank / Huahceng Liu	51	Application of nondestructive testing of large diameter and high density PE pipes / Jia Bin
8	The safety management measures of steam turbine equipment in thermal power plant / Hongchao Liu	54	Study on common faults and troubleshooting strategies of auxiliary equipment in thermal power plant / Bo Xie
11	Study on the safety management and risk prevention measures during the maintenance of chemical equipment / Fabo Yin Xuzeng Han	57	Analysis of machine tool thermal deformation problem and application study of temperature compensation / Jinjie Chen
14	Countermeasures of mechanical engineering automation design based on intelligent technology / Yi Wang	60	Analysis on the safe operation and management of sewage treatment mechanical equipment / Tang Cong Xu Feng Chen Miao
17	Lightweight design for columns of machining tool based on orthogonal experimental method / Xinpeng Xu	63	The design and manufacturing application of replaceable head and claw / Zhaozhui Lin Fengbin Guo Chuanlei Bai
20	Study on the evaluation mode of the essential safety degree of chemical process equipment / Bihao Cui Qi Lou Zhong Xu Shengzhou Lu Guanglie Sha	66	Principles of deep cooling separation and energy saving measures of ethylene plant / Yinghua Yan
23	Thinking on safety risk and equipment integrity safety management measures / Shuai Liu Hongbin Wang	69	Analysis of Operation and Maintenance Strategies for Dry Gas Seals in Centrifugal Compressors / Huanhuan Shi
26	Production efficiency analysis of three-phase electrode of 33000 KVA / Mingdong Liu Baonian Yan	72	Application of mechatronics technology in mechanical engineering / Chun Lu Lu Yu
29	Application analysis of digital nitrile rubber system in the construction of special nitrile rubber project / Xiaodong Wang	75	The development direction and prospect of mechanical engineering and automation in the industrial field / Hongjie Wang
32	Research on fatigue damage assessment and life span prediction method of Marine platform structure / Yanan Chen	78	Design of flange hole system of certain valve body / Yinjie Zhao Chunlei Cao
35	Research on the replacement method of heavy-duty horizontal equipment in the middle layer of the frame / Fangying Yu Xin Qiao Kuan Wang Zhanchao Tian	81	Countermeasures on mechanical design and manufacturing in the context of information technology / Xinying Hao
38	Analysis of the application prospect of intelligent technology in large-scale equipment hoisting / Xin Qiao Hongtao Song Yu Jing Fangying Yu	84	Welding deformation control based on a telescopic arm fork loading frame / Rong Hua Gang Chao Yiming Lu
41	Application research of new material and new process in the appearance and modeling of MV855 vertical machining center / Shen Miao	87	Research on the local high point of hot rolled strip / Lingzhi Feng Xuebin Huang Aiqing Wang Yun Sun
45	Study on motion accuracy reliability analysis and optimization design of flexible mechanism	90	Research on operation efficiency of oilfield natural gas compressor / Xiaoshun Wei

Design of a certain valve body flange hole system machining variable hole number fixed radius multi-axial head

Weina Tian^{1,2,3} Chunlei Cao^{1,2,3*}

1. Department of Mechanical and Electrical Engineering, Hebei University of Science and Technology Engineering, Xingtai, Hebei, 054000, China

2. Valve Intelligent Manufacturing Equipment Engineering Research Center, Xingtai, Hebei, 054000, China

3. Hebei Province Small and Medium-sized Non-standard Equipment Technology Innovation Center, Xingtai, Hebei, 054000, China

Abstract

In design of the technical of of the the of the the in is paper. The system adopts the modular design concept, which integrates servo drive, intelligent control and precision transmission, and realizes the flexible upgrade of multi-axis processing. The programmable flexible machining system is used to support dynamic parameter adjustment, propose the “S-type movable disk” control technology, and realize the number of processing holes through the spline universal joint coupling. Innovative design with modular components. Improve the multi-axis synergistic efficiency and reduce the energy consumption.

Keywords

multi-axial head; hole system machining; multi-axis collaboration

某型阀体法兰孔系加工可变孔数定半径多轴头设计

田伟娜^{1,2,3} 曹春雷^{1,2,3*}

1. 河北科技工程职业技术大学机电工程系, 中国·河北 邢台 054000

2. 阀门智能制造装备工程研究中心, 中国·河北 邢台 054000

3. 河北省中小型非标装备技术创新中心, 中国·河北 邢台 054000

摘 要

本文针对传统多轴器在阀体法兰孔系加工中的技术瓶颈, 提出了一种可变孔数定半径多轴头创新设计方案。系统采用模块化设计理念, 集伺服驱动、智能控制与精密传动于一体, 实现了多轴加工的柔性化升级。利用可编程柔性加工系统, 支持动态参数调整, 提出“S型活动盘”控制技术, 通过花键万向节联轴器实现加工孔数切换。采用分体式壳体创新设计, 结合模块化组件。使多轴协同效率提高, 能耗降低。

关键词

多轴头; 孔系加工; 多轴协作

1 多轴器功能机构简介

1.1 设计多轴器的目的

设计此多轴器机构的目的是实现数字化、自动化的多轴头运动, 提高设备在工作中的效率, 缩短工作周期。自动化多轴头的设计核心是在效率、精度、柔性之间实现最佳平衡。

【作者简介】田伟娜(2002-), 女, 中国河北石家庄人, 本科, 从事机械设计研究。

【通讯作者】曹春雷(1974-), 男, 满族, 中国辽宁北镇人, 硕士, 讲师, 从事机械工程研究。

1.2 传统多轴头应用缺陷

调整耗时, 加工不同规格工件时, 需手动调整各工作轴的间距、角度和刀具配置, 耗时较长。限制加工复杂零件的能力, 需要其他设备配合。调整起来麻烦更换其他工作进程时则需要更换夹具或者重新编辑程序。例如, 从加工一种法兰盘切换至另一种尺寸时, 可能需要数小时停机调整。且通常采用固定轴(如4轴传动、6轴传动)。小批量多品种生产时, 换线需要停机调整, 影响效益。而使用自动化多轴器可以一键切换程序, 通过更换数控程序或调用预设参数, 在几分钟内就能实现不同产品的加工切换。支持在线补偿(如刀具磨损补偿、温度补偿), 无需停机调试。利用多轴联动数控系统支持任意轴数的独立或协同运动。

仅适合标准化、结构简单的工件(如多孔板、壳体类