

# 一种高频焊管焊接温度控制系统

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**摘要** 介绍了攀钢集团昆明钢管公司自行研发的焊接钢管温度控制系统,该系统主要由 810 型工业控制计算机、PLC-812PG 多功能数据采集卡、接口板 880 及输入输出板等组成。实现了焊管制造过程中焊接温度的计算机控制,提高了焊管的成材率。

**关键词** 高频焊管 焊接 温度控制系统

## 1 问题的提出

目前焊管制造过程中的焊接温度控制多采用操作者经验加观察的办法,即根据钢管速度调整焊接电压或根据焊接电压调整钢管速度,调整依据是观察焊接区熔化金属的颜色,一般认为焊接区的颜色为淡黄色即可确保焊接质量。该方法简单直观,缺点是经验和方法因人而异,特别是在钢管速度或焊接电压变动的情况下,由于速度、电压不能及时很好地匹配,往往导致“过烧”或“假焊”现象,影响焊管成材率。经分析论证,认为用计算机可很好地实现速度同电压之间的连锁。系统设计制造费用 5 万元左右。经过近 4 个月的使用,证明此系统基本能达到预期目的。现将该系统介绍给同行参考。

## 2 硬件说明

温度控制系统由 810 型工业控制计算机、PLC-812PG 多功能数据采集卡、接口板 880 及输入输出板组成,基本框图如图 1 所示。

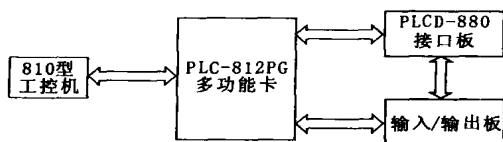


图 1 温度控制系统硬件框图

### 2.1 功能说明

首先输入阳极电流、阳极电压和钢管速度,然

后根据一定的控制算法计算出高频焊机所需要的给定电压,将该电压施加于高频焊机的电压给定端,从而控制焊机的输出功率。

### 2.2 系统接线

(1) 阳极电流(输入信号) 从高频焊机的 131 号线引入“输入/输出板”的 P1.2,再经限幅和降压后到 P2.3,P2.3 接 880 接口板的 C-2 端子输入计算机(A11),见图 2 和图 3。

(2) 阳极电压(输入信号) 从高频焊机的 136 号线引入“输入/输出板”的 P1.1,再经限幅和降压后到 P2.1,P2.1 接 880 接口板的 C-1 端子输入计算机(A10),见图 2 和图 3。

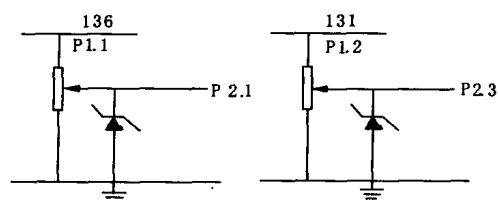


图 2 阳流阳压输入电路

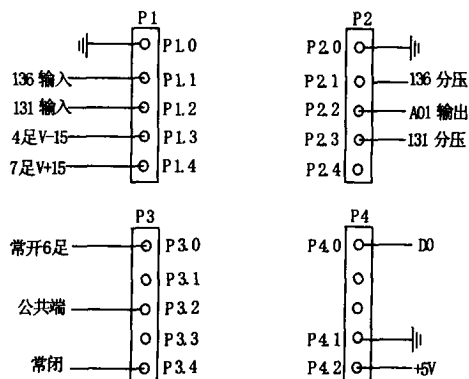


图 3 输入/输出板接线插座

(3) 钢管速度(输入信号) 从飞锯编码器上取得的信号(飞锯编码器的 10 和 13 端子)接入 880 接口板的 C - 37 端子输入计算机(ExtClk)。

(4) 给定电压(输出信号) 该信号由计算机算出后施加于多功能接口卡的 AO1 端,通过 880 接口板的 C - 30 到达输入/输出板的 P2. 2,经过反向运算放大后出现在 P3. 0 上,当需要时加在高频焊机的 127 号线上(取决于手动还是自动),见图 3~图 5。

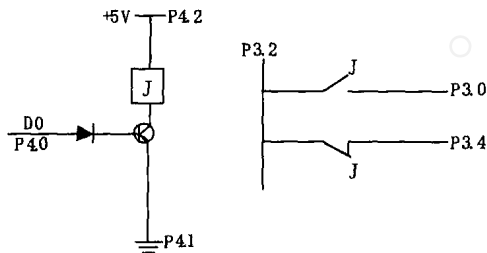


图 4 手动自动切换电路

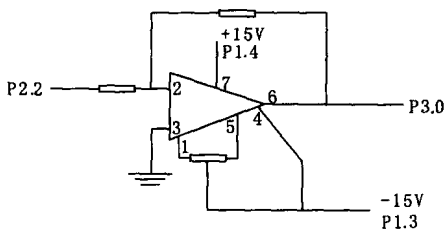


图 5 给定电压反向放大电路

### 3 软件说明

软件由 VB 加上厂家提供的动态连接库(DLL)编制,其工作过程分为手动和自动两种状态。当系统为手动状态时系统功能为记录并实时显示阳极电压、阳极电流、钢管速度、钢管壁厚、钢管规格的数值;当系统为自动状态时,除了可显示并记录上述参数外,还可根据钢管速度输出相应的高频焊机给定电压并实时显示和记录,显示界面如图 6 所示。



图 6 焊管焊接温度控制系统显示界面

软件界面显示如下:

- (1) 实时输入输出框显示当时的焊接参数。
- (2) 设定输入框显示当时所焊接的钢管规格、钢管壁厚和给定热量常数,在系统开始工作前必须选定钢管规格和壁厚,否则系统将不工作。
- (3) 曲线显示框显示当时的实际热量参数,横线表示给定热量。
- (4) 在焊接状态比较稳定的情况下可以按下“保存当前参数”按钮,把阳极电压、阳极电流、钢管速度、给定电压、钢管规格、钢管壁厚、给定热量常数、当时时间等参数保存入 EXCEL 电子表格。

### 4 使用效果

本控制系统从 2003 年 9 月开始设计制造,于 2003 年 12 月完工。2004 年开始使用至今,焊管成材率提高了 5%~7%,基本达到了设计目的。

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### · 专利 ·

专利名称:强力弹簧挤压辊机架 专利申请号:01219667 公开号:2476359 申请人:林德勤

本发明为一种可在高频焊管机组中使用的强力弹簧挤压辊机架。该机架的滑座呈箱体式结构,带有燕尾的前、后滑块分别通过其燕尾装配在该滑座内。两滑块和立轴上分别装有横向拉杆和拉板,在拉杆和拉板之间,通过固定支架装有压紧丝杠,强力弹簧通过该压紧丝杠装于弹簧座上。弹簧座下端与前滑块固定,上端与装在该滑块中的立轴固定。滑块在强力弹簧作用下在滑座内自由滑动,相应地调整了弹簧的压紧程度,可使生产出的高频焊管质量最佳。

杭情 供稿

short pipe technology on the pipeline connection and make the welding is possible.

**Key words** pipe plastic coating epoxy coating LLDPE expand end added with short pipe new plastic

### A High Frequency Welded Pipe Welding Temperature Control System

Zou Junliang (61)

**Abstract** :The welded pipe temperature control system developed and manufactured by Kunming Steel Pipe Co. of Pangang Steel Group itself is introduced. The control system make up of Model 810 industrial control computer , PLC - 812PG multi function data collection card , 880 interface board and input and output board , etc. . It realizes the computer control of welding temperature during welded pipe manufacture and increases the qualified rate of finished welded pipe.

**Key words** high frequency welded pipe welding temperature control system

### Reason Analyses and Countermeasure of J55 Casing Thread Leaking

Zhang Yong (63)

**Abstract** :It considers that viscosity thread is the main reason that causes the water leakage on the connection of thread through analyzing screwing on and screwing out coupling test to manganese phosphate and zinc phosphate coupling faced to J55 casing appeared water leakage on the connection of thread. It analyses the thread on torque , coupling phosphate , thread compound , thread parameter and thread surface quality , etc , in detail and raises reasonable optimized thread parameter of thread on torque , excellent phosphate process and option of superior thread compound to solve the water leakage problem on the casing with coupling end thoroughly.

**Key words** casing coupling thread connection water leakage screw up torque viscosity thread

### Soft Startup Unit Application on Air Compressor System of Welded Pipe Manufacturing

Tang Jun , Yan Lixue (67)

**Abstract** :To work in soft startup technology to improve on electric part and obtain startup smoothness , reduce startup current , increase startup torque and realize each parameter smooth regulation and the purpose of saving energy , facing to the limitation of traditional startup method of air compressor in pneumatic system of welded pipe unit.

**Key words** air compressor soft startup guide angle smooth smooth and steady startup

### 8051 SCM Application on The Control of X Ray Radiography Unit

Yuan Zongchuan (69)

**Abstract** :To use 8051 SCM can easily realizes the control of

voltage , current , filming time , big and small focuses , etc. and function of trouble automatic diagnose , crystal character display and communication with high pressure generator , etc. of industrial X ray radiography unit with the feature of good machine conversation , easy adjusting , higher control accuracy and low trouble rate , etc. . It makes the original complex control to simplify , intelligentize and increase the satiability and humanity of the unit.

**Key words** 8051SCM radiography unit voltage current focus control

### Discuss of UT Procedure for Butt Welding of Small Diameter Pipe

Wang Jinsheng , Zheng Chungang , Chen Lizhong (73)

**Abstract** :It introduces the specialty and existed problem of UT process of butt welding to small diameter pipe such as water cooling wall thickness , heater , coal saver and regenerator , etc. . of heated surface pipe in power plant , analyses the defect cause produced by butt welding and raises the process measure to avoiding defect.

**Key words** small diameter pipe welding procedure UT Application of MX4 Multi Axes Numerical Control System on Forming Stand of Longitudinal Welded Pipe

Zhou Xiufeng , Luo Hongfu , Cai Xiaoqing (76)

**Abstract** :It briefs the working principle of LSAW pipe forming stand imported from SMS MEER Co. , Germany by Shashi Pipe Mill , presents basic function of MX4 multi axes numerical control system and its application on LSAW pipe forming stand developed by Rexroth Co. and analyses the specialty of the system to give reference for the design of domestic same kind unit.

**Key words** LSAW pipe forming stand MX4 multi axes numerical control synchronization control application

### Review on 2004 China International Pipe Seminar

Peng Zaimei (81)

### Influence Factor of High Frequency Thick Wall Tube Welding

John Inge Asperheim , Bjrnar Grande

Translated by Zhao Yatao , Liu Xin (84)

**Abstract** :The heat affected zone (HAZ) in a medium and thick wall tube is shaped like an hourglass. This can give overheated corners and a cold center in the tube wall , which limits weld speed. A parameter study of the influence of Vee angle , spring back , weld speed and frequency is carried out. Two - dimensional , coupled electromagnetic and thermal FEM analyses give the temperature distributions in the cross-section of the weld point. The results are presented as isothermal lines at the weld point.

**Key words** V angle elasticity variable welding speed frequency