

# 连续退火炉气氛平衡

## 控制系统的研究

### 摘要

连续退火炉快速冷却段的降温效果，直接影响着带钢的组织、力学性能。已成为影响能耗，限制产品性能的重要因素。本文以首钢冷轧公司镀锌机组连续退火炉的应用背景为基础，通过国外公司的引进与合作，结合国内技术特点，对能源进行了研究。节能控制方法，实现了退火炉气氛平衡控制系统。通过提高急冷部中的氢浓度，可以提高退火炉的急冷部的热交换效率和冷却能力，有效实现节能降耗和安全生产。

论文的主要内容与研究成果如下：

(1) 在分析镀锌退火炉快速冷却段的冷却过程的基础上，研究了带钢快速冷却过程中的能耗与冷却能力的最佳平衡问题。根据实际工况，提出了通过增加快速冷却段氢浓度，提高换热效率来提升对流换热系数的方案，并确定了快冷段的技术指标。

(2) 提出改善退火炉气氛平衡控制系统的方案。根据公司在生产安全方面的要求，在退火炉气氛平衡控制的工作原理上进行了研究，采用模块化设计思想，配合保护气氛注入和退火炉内压力平衡系统，开发了新型炉膛基于在快速冷却区直接注入氢的设计。压力平衡控制系统，气氛分析系统和氢气监测系统。

论文针对退火炉快速冷却段能耗高，降温能力低的问题，提出了一种将氢气直接注入该段的高氢溶液，不仅达到了节能控制的目的，而且满足安全生产的要求，也提高了产品质量。

**关键词：**连续退火炉，冷却技术，气氛平衡控制，节能

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## ABSTRACT

The cooling effect of Rapid Cooling section of continuous annealing furnace directly affects the microstructure and mechanical properties of Strip. It has become an important factor to affect energy consumption and limit product performance. Based on the application background of continuous annealing furnace for galvanizing line in Shougang Cold Rolling Company, this paper studies energy companies and the domestic technical characteristics through the introduction and cooperation of foreign companies. The heat exchange efficiency and cooling capacity of annealing furnace can be improved by increasing the hydrogen concentration in quenching section. Effective realization of energy conservation and consumption reduction and safety in production.

The main contents are as follows:

(1) Based on the analysis of the cooling process in the fast cooling section of the zinc-plating annealing furnace, the balance of cooling capacity and energy consumption in strip rapid cooling was studied. According to the actual working condition, the method of increasing the hydrogen concentration in the rapid cooling section is put forward, a scheme to improve the convective heat transfer coefficient by increasing the heat transfer efficiency, the technical index of the Fast Cooling Section is determined.

(2) According to the requirements of the company for safe production, the working principle of the atmosphere balance control of the annealing furnace is studied, which adopts the idea of Modular design and combines the protective atmosphere injection and pressure balance system of the annealing furnace, a new type of hydrogen injection furnace based on rapid cooling zone was developed. Pressure Balance Control System, atmosphere analysis system and hydrogen monitoring system.

In view of the high energy consumption in the rapid cooling section of annealing furnace, a method of injecting hydrogen directly into the high hydrogen solution in the section is proposed in this paper, and improved the quality of the product.

**Keywords:** Continuous annealing furnace, Cooling Technology, Atmosphere Balance Control, Energy saving

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