

动力机械与工程

新型耐热钢T23的特性与早期失效分析

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摘要:

T23钢是T22钢经降C和强化而开发的新型锅炉用钢, 与我国开发的钢102(12Cr2MoWVTiB)有近似的合金系统和含量, 其常温力学性能和高温蠕变断裂强度明显优于T22钢, 冷裂纹敏感性比T22钢低, 再热裂纹敏感性远高于T22钢, 抗蒸汽氧化性能与T22钢相当。但T23钢在超临界锅炉应用中先后出现了过热器管内壁氧化皮剥落导致爆管事件, 在超超临界锅炉中又出现了水冷壁焊缝裂纹、泄漏等早期失效问题。基于T23钢的力学性能、蒸汽氧化性能和焊接性能分析及故障件的表面剥落物、爆口或断口的金相分析, 找出故障原因, 提出改进建议, 对未来的超(超)临界锅炉设计和焊接工艺改进均有参考价值。

关键词: T23钢 蒸汽氧化 氧化皮剥落 再热裂纹 结构应力 焊接残余应力

New Heat-resistant Steel T23's Performance Characteristics and Early Failure

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Abstract:

The T23 steel is based on the T22 steel developed a new type of boiler steel by reducing C and strengthening, it the steel which develops with our country 102 (12Cr2MoWVTiB) has the approximate alloy system and the content, its normal temperature mechanical properties and the high temperature creep fracture intensity surpasses the T22 steel obviously, the cold crack sensitivity is lower than the T22 steel, the heat crack sensitivity is higher than the T22 steel far again, anti-steam oxidation susceptibility and T22 steel quite. But the T23 steel in the application of supercritical boiler superheater tube appears oxide spalling events led to burst pipes, in the application of ultra-supercritical boiler water cooling wall appeared the welding cracks, leaks and so on early failure problems. Based on the T23 steel's mechanical properties, the steam oxidation susceptibility and the welding performance analysis and the breakdown surface scaling, exploded mouth or the fracture metallography analysis, the cause of the malfunction was found out, the improvement suggestion was proposed that, the future ultra (ultra) supercritical boiler design and welding process improvement have reference value.

Keywords: T23 steel steam oxidation falling off of oxide skin reheat crack structure stress welding residual stress

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