Failure analysis of 304 stainless steel pipe in PBAT equipment

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Abstract This study conducted a comprehensive failure analysis of 304 stainless steel pipes used in PBAT (polybutylene adipate-co-terephthalate) production equipment. A leakage in the pipe prompted an investigation into the cause of failure. By comparing the physicochemical properties of the failed pipe with those of a functioning one, this study aimed to identify the reason for pipe failure. The analysis included chemical composition testing, macro and micro fracture observations, metallographic examination, hardness testing, and intergranular corrosion tests. The results indicated that the primary cause of failure was stress corrosion cracking (SCC), with chloride ions (Cl^-) acting as the main corrosive agent. Cracks initiated from the inner surface and propagated outward, eventually leading to leakage. This study not only provides insights into the failure mechanisms of stainless steel pipes in PBAT production environments but also suggests preventive measures to avoid similar failures in the future. The findings are significant for ensuring the reliability and safety of PBAT production facilities.

Keywords PBAT equipment, stainless steel pipes, stress corrosion cracking, failure analysis

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