

Leak failure analysis on gate valve of gas tree

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Abstract Aiming at the stabbing leakage behaviour of a gas tree gate valve in a gas field, a combination of laboratorial evaluation experiments and finite element numerical simulation was used to analyze the causes of valve failure. The laboratorial evaluation results show that the non-destructive testing, chemical composition analysis, metallographic analysis, mechanical properties analysis on the gate valve of gas tree are in accordance with the API 6A standard requirements. The numerical simulation results show that the increase in the medium flow rate and the decrease in the degree of opening and closing of the valve gate make the flow rate at the gate increase. The long-term semi-closed state of gate valve leads to high-speed gas flow in the gate and makes high-speed gas flow direction change. The main reasons of valve leakage lie in the high-speed fluid erosion corrosion and CO₂ corrosion. It need to be mentioned that CO₂ corrosion accelerated the failure of the valve process to some extent. Therefore, it is recommended to choose high wear-resistant and corrosion-resistant coating. Valve operation process should be based on the gas production of gas extraction wells to adjust the degree of opening and closing of the gate, to avoid the impact of high-speed fluid on the surface of the valve body.

Keywords gate valve; failure analysis; scouring corrosion; CO₂ corrosion; finite element simulation

Reference

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