The axial crack testing model for long distance oil - gas pipeline based on magnetic flux leakage internal inspection method

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The axial crack testing model for long distance oil - gas pipeline based on magnetic flux leakage internal inspection method

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Abstract: Traditional pipeline magnetic flux leakage (MFL) internal technology mainly uses axial excitation method, which could not recognize the narrow crack defects in the axial direction of the pipe. In this paper, by using a linear magnetic dipole model to study the circumferential excitation method, the detection model of axial crack in pipeline is established, and the relationship between MFL signals and the geometry characteristics of axial cracks is calculated. Finally, the detection accuracy and identification method of axial cracks is analyzed. Research results show that: non-uniform magnetic field generated by circumferential excitation can effectively detect the narrow cracks in the axial direction of the pipeline and distinguish the depth and the width characteristics of cracks. However, the background magnetic fields near the magnetic poles have great influence on the detection accuracy, and the smooth interpolation method of the cubic-spline interpolation can be used to reduce the influence effectively.

Keywords: pipeline, MFL, internal detection, axial excitation, magnetic dipole

1 Introduction

Pipeline MFL internal inspection technology is the mainstream technology to maintain the safe operation of long-distance oil - gas pipeline [1-4]. This technology belongs to the monopoly technology in the world, for it is only mastered by a few