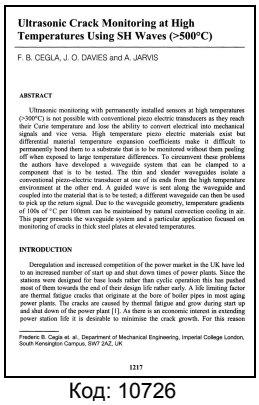
Ultrasonic Crack Monitoring at High Temperatures Using SH Waves (>500°C)

F. B. CEGLA, J. O. DAVIES and A. JARVIS

ABSTRACT

Ultrasonic monitoring with permanently installed sensors at high temperatures (>300°C) is not possible with conventional piezo electric transducers as they reach their Curie temperature and lose the ability to convert electrical into mechanical signals and vice versa. High temperature piezo electric materials exist but differential material temperature expansion coefficients make it difficult to permanently bond them to a substrate that is to be monitored without them peeling off when exposed to large temperature differences. To circumvent these problems the authors have developed a waveguide system that can be clamped to a component that is to be tested. The thin and slender waveguides isolate a conventional piezo-electric transducer at one of its ends from the high temperature environment at the other end. A guided wave is sent along the waveguide and coupled into the material that is to be tested; a different waveguide can then be used to pick up the return signal. Due to the waveguide geometry, temperature gradients of 100s of °C per 100mm can be maintained by natural convection cooling in air. This paper presents the waveguide system and a particular application focused on monitoring of cracks in thick steel plates at elevated temperatures.

INTRODUCTION

Deregulation and increased competition of the power market in the UK have led to an increased number of start up and shut down times of power plants. Since the stations were designed for base loads rather than cyclic operation this has pushed most of them towards the end of their design life rather early. A life limiting factor are thermal fatigue cracks that originate at the bore of boiler pipes in most aging power plants. The cracks are caused by thermal fatigue and grow during start up and shut down of the power plant [1]. As there is an economic interest in extending power station life it is desirable to minimise the crack growth. For this reason

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Ключевые слова:

Содержание.