Medium range Ultrasonic inspection technique for detecting micro-biologically induced corrosion in automatic fire sprinkler systems / SprinkTest

the objective of the project

Development of a medium range ultrasonic test system, using ultrasonic guided waves for inspection of pipe works in automatic fire sprinkler systems. The smaller flexible transducers rings enable to gain access to confined spaces, lower power electronics to allow hand-held portability and sophisticated software to process signals.

motivation

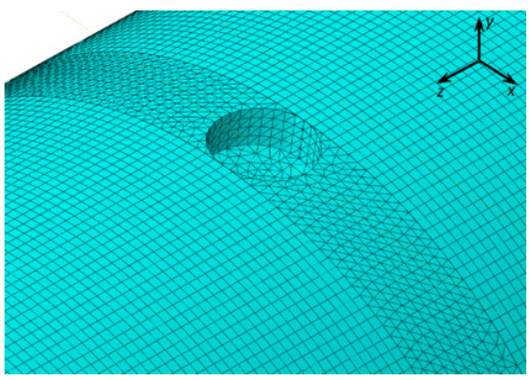
The installation of sprinklers can result in substantial reductions in insurance premiums and so insurance companies are becoming increasingly interested in their proper installation and function. The proper functioning of fire sprinkler systems can be catastrophically undermined by microbiological induced corrosion.

technical problems

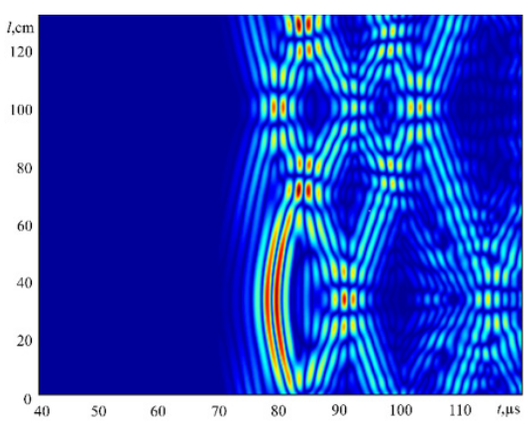
Small dimensions of pipes in fire sprinkler systems do not enables application of existing ultrasonic guided waves systems due to unacceptable dead zones. Additionally the existing systems are more screening tools and do not possess sufficient spatial resolution and do not enable detection of the concentrated defects which are very important in fire sprinkler systems.

ultrasound institute

Unique ultrasonic inspection technique that enables to detect multiple concentrated defects and determine their positions in the segments of pipes in the fire sprinkler system with required and sufficiently high longitudinal and lateral accuracy (in the range of ±5mm) has been developed. The technique was verified experimentally on the segments of DN100 pipe with single and multiple defects (5mm diameter, 80% through pipe wall thickness holes). In order to develop this technique the numerical modelling has been carried out what enabled to determine the optimal set of parameters leading to achievement of the project goals.



The fragment of the finite element model of the pipe with 5mm diameter hole



The simulated B-scan image of tangential component of the particle velocity around the pipe at distance of 150mm

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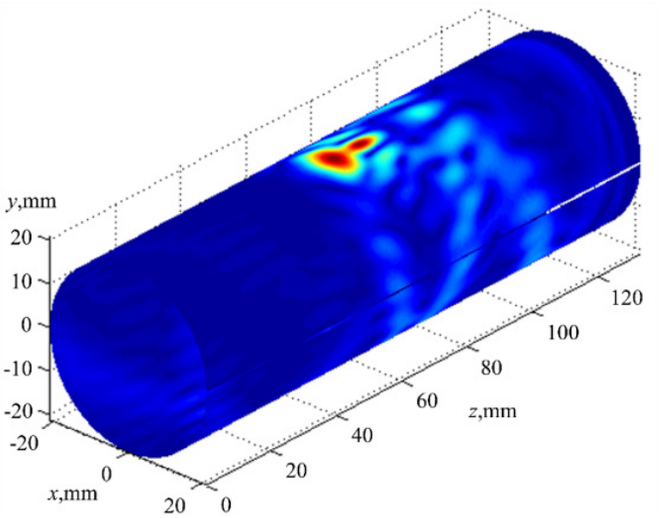
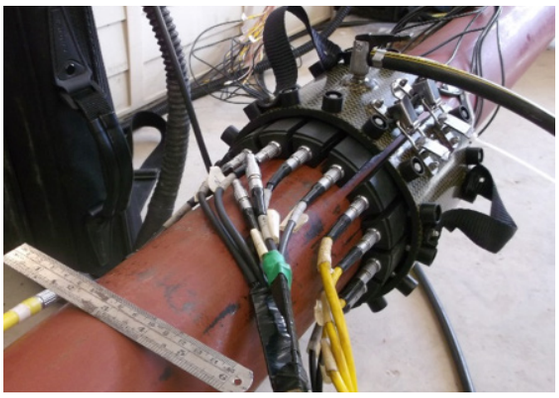
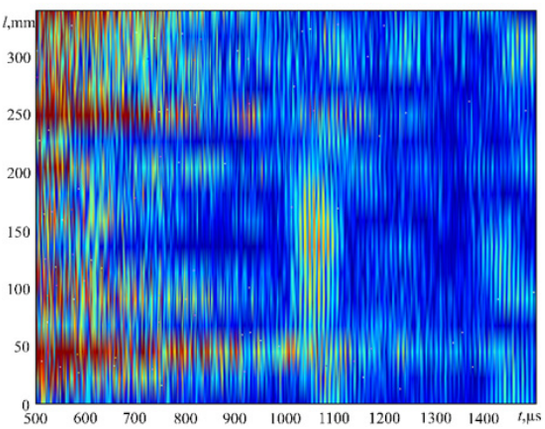
http://ultrasound.ktu.edu



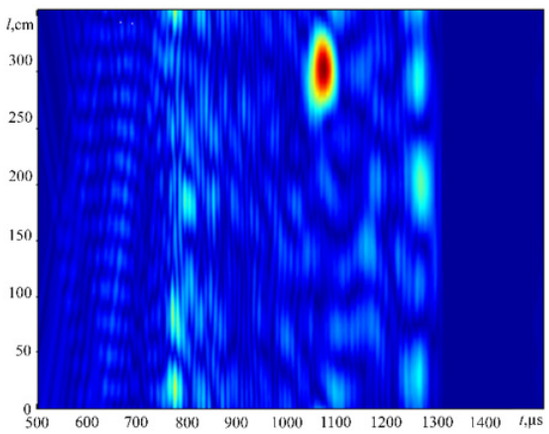
The B-scan image after SAFT reconstruction overlapped on the surface of the simulated pipe



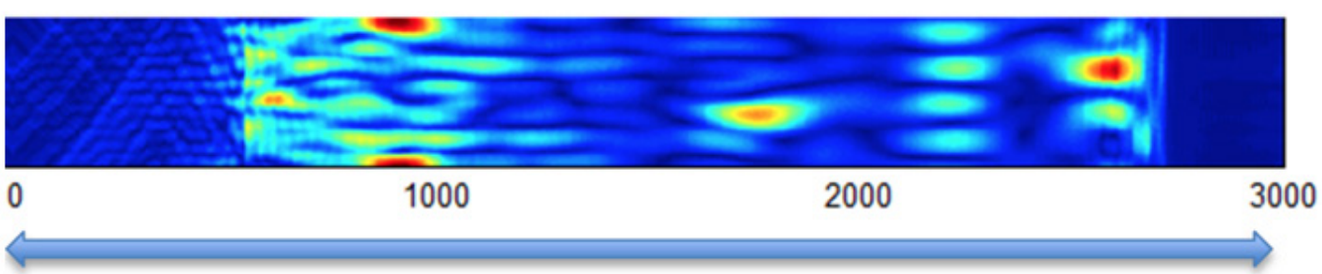
16 element ultrasonic array for GW inspection of fire sprinkler pipe



Raw experimental B-scan image acquired on pipe with hole at 55kHz frequency



Reconstructed B-scan image of the defected pipe using modified SAFT approach



The reconstructed image of the unwrapped surface 3m length pipe segment with indications (red) of multiple defects

project partners

Plant Integrity LTD (United Kingdom), WLB limited (Cyprus), Smart material GmbH (Germany), TesTex (United Kingdom), DVC NV (Belgium), Innora (Greece), European Fire Sprinkler Network (United Kingdom), Kaunas University of Technology (Lithuania).

project homepage

http://www.sprinktestproject.eu/