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In-pipe fibre optic pressure sensor array for hydraulic transient measurement with application to leak detection

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Abstract

Controlled hydraulic transient pressure waves can be used to actively assess the condition of pressurised pipelines (e.g. leak detection). One practical challenge to the application of the technique to buried water pipelines is in the pressure measurement – fast-response pressure transducers are costly and the deployment is limited to one sensor per access point (e.g. at air valves or fire hydrants). The measurement from a single sensor is always the superposition of the waves travelling upstream and downstream along a pipe. It is often difficult to determine the direction of the propagating waves, unless there are suitable locations nearby where additional measurements can be made. The research reported here develops a fibre optic pressure sensor array for in-pipe transient pressure measurement. The sensor array consists of five Fibre Bragg Gratings (FBGs), each formed into a custom designed pressure transducer. The cable containing the array has a diameter of approximately 4 mm, making it easy to

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