

# **Circumferential guided wave system using EMAT for detecting defects of water supply pipelines**

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To inspect water supply pipelines having large diameter with ultrasonic waves, a guided wave approach is useful because it efficiently covers a wide range of pipe structures with a small number of guided wave transducers. The use of circumferential guided wave system, which can be moved along the axial direction, is especially preferred because of a very long axial length of the structures. Therefore, in this research, a circumferential guided wave system is proposed to be installed on the exterior of the water supply pipes. For the scanning process of the system along the axial direction, the noncontact transduction of guided waves is needed so that we developed an electromagnetic acoustic transducer generating circumferential shear-horizontal (SH) guided waves. The EMAT was designed to generate and measure the fundamental SH wave mode (SH<sub>0</sub>) only because SH<sub>0</sub> mode is nondispersive. To confirm the EMAT performance, we conducted experiments in the specimen of water supply pipelines with various artificial defects. The results showed that the defect signals can be measured with the developed EMATs for relatively long circumferential propagating distance compared to the previously reported studies on the circumferential EMATs for pipes in small diameter. Furthermore, a customized ultrasonic pulser-receiver device was fabricated to efficiently operate the EMATs at the target actuating frequency. The integrated system will be equipped with the other essential components such as a data acquisition set, a scanner, electronics, and overall instrumentation. After that, as a field study, the system will be applied to the test platform installed on the actual site of water supply pipelines.