Application of Time History Frame Method for Extraction of Artificial AE Sources under Harsh Background Noise

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Acoustic emission (AE) can be generated by a number of different damage sources in underground pipelines such as growing cracks, corrosion progress, connection part movement, third party impact and leakage etc.. Ultimately, the pipeline failure owing to these kinds of damage lead to economic loss and huge accidents such as a ground collapse by a sinkhole, an eruption by leakage. Hence, it is extremely important to detect and localize such damages at the very early stage in order to prevent catastrophic failures. However, most of water supply pipelines are located in very noisy urban areas, and these harsh conditions inflicted on practical difficulties in measuring meaningful acoustic emission. Especially, several kinds of background noise such as traffic, water flow and sound pollution causes difficulty in signal analysis. In this study, artificial impact source was used to analyze source identification by discriminating background noise in the harsh environment. Experiment was performed on an in-service underground waterworks pipeline with a diameter and distance of 1,200 mm and 564 m, respectively. Several types of impact hammer and accelerometer were used as the artificial impact source and sensors. First, we defined a ‘time history frame’ as each separated intrinsic parameter of time signal. Then we obtained a couple of parameters such as frequency and intensity from time signal. Finally, the deep learning processing for each parameter was carried out for a plenty of background noise signals. This new approach method shows a promising result for identifying meaningful source signals from a variety of background noises.