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1-D Profiling Guided Wave Profiling Using Travel Time and Amplitude Loss

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Corrosion is one of the industries major issues regarding the integrity of assets. Currently inspections are conducted at regular intervals to ensure a sufficient integrity level of these assets. There are many situations where the actual defect location is not accessible, e.g., a pipe support or a partially buried pipe. Last year an approach was presented using a phase inversion of guided waves that propagated around the circumference of a pipe. This approach works well for larger corrosion spots, but shows significant under-sizing of small spots due to lack of sufficient phase rotation. In this paper the use of arrival time and amplitude loss of higher order circumferential passes is evaluated. Using higher order passes increases sensitivity for sizing smaller defects. Gaussian shaped defect profiles are assumed and the change in arrival time and amplitude loss are calculated using a wave equation based approach for different defect widths and depths. This produces a differential travel time and amplitude change map as function of defect depth and defect width. The actually measured travel time change and amplitude change produces two contours in these maps. Calculating the intersection point gives the defect dimensions. The contours for amplitude loss and travel time change are quite orthogonal, this yields a good discrimination between deep and shallow defects. The approach is evaluated using experimental data from different pipes contain artificial and real defects.