

# **Estimation of Fracture Parameter for Steel Pipeline Material in Pressure Wave Propagation Field by using 3D Image analysis**

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The pressure wave is one of the most important hydraulic phenomena for safety management of pipeline system. For effective maintenance and management of pipeline system, it is necessary to precisely detect pressure waves nondestructively. Because it is installed underground and the damage cannot be checked visually in service. The accident of pipeline system is appeared by leak phenomena which is mainly caused by pressure wave. In this study, quantitative evaluation of fracture mechanics parameter of pipe material in pressure wave propagation field by 3D image analysis. In the measurement model pipeline, this system is composed a water tank ~ single pipe ~ valve system. This system is about 900m in total length, pipe diameter  $\phi$  24.2 mm. The pipe material is consists of a SUS304. Design internal water pressure was set to 0.25 MPa. The initial flow rate was set to 0.20 to 0.50 m/s. Thus, the fracture mechanics parameter is correlated with water hammer phenomena in valve closing conditions. Using stress-strain analysis, a relationship different inner water pressure conditions and detected hysteresis curve of pipe material deformation is correlated. By monitoring pressure waves in service pipeline based on these results, the pipe mechanical characteristics in unsteady flow process is successfully evaluated by 3D image parameters.