

Three-Dimensional Shape Monitoring of Pipeline by using Fiber Bragg Grating Sensors

Dae-Hyun Kim¹, Jin-Hyuk Lee²

¹Dept. of Mechanical and Automotive Engineering, Seoul National University of Science and Technology, Republic of Korea, ¹Research Institute , PILETA Co., Republic of Korea

In general, pipelines are long compared to their cross-sectional areas and often consist of many pipes joined together. Therefore, a deflection and deformation could easily occur in the structures. In order to evaluate the integrity of such structures, shape-monitoring could be effective. Fiber Bragg grating (FBG) sensors, which have the advantage of multiplexing, could be used along long-length structures. In this study, a three-dimensional shape-estimation-technique based on strain information is applied to a plastic pipeline of which length is 1m to evaluate the integrity of the pipeline. In detail, three lines of optical fibers including FBG sensors were used to measure strains at multiple points of the pipeline. Additionally, a wireless module was developed to monitor a large scale pipe structure effectively. Then a couple of experiments were carried out to verify the performance of the wireless monitoring technique. The experimental results from the estimation-technique successfully showed a shape that represented a deformation of a specimen of pipe. Furthermore, a deflection in the pipe was verified by comparing the estimated result from the technique with that of a real deflection. As a result, it is confirmed that the shape-estimation-technique with a wireless module is effective to monitor the status of a pipeline.