Development of Acoustic Analysis Using Wigner Distribution for Pipeline Fault Detection in Power Plant

D. V. Tuan[1], **U.-P. Chong**[2], **and S.-J. Cho**[1]

Abstract: Monitoring the operation of pipelines and valves plays an important role in the prevention and protection of many industrial plants such as nuclear power, gasworks, composite materials, etc.

In this paper, an advanced method for time-frequency analysis, which is derived from the analysis of the Wigner distribution, is used to examine the acoustic emission signals detected during the operation of pipelines in the power plants. The acoustic emission signals, which depend on the behavior of materials deforming under the stress, will be changed when cracking or leaking happens in the pipelines. In general, cracking or leaking situation causes variation of the magnitudes of frequencies, which is from 300Khz to 600Khz for cracking and from 300Khz to 700Khz for leaking. The situation is totally different from the normal one. Based on these unusual characteristics of the signals in frequency domain and some features in time domain, therefore, the cracking or leaking problems can be detected. The proposed method for the time-frequency signal analysis is applied to analyze the analog signals getting advantage over the Wigner distribution. Subsequently, the analyses of the critical results will be discussed. Moreover, the fully analyzed results by using our proposed method and other methods are trustworthily compared.

In addition, an appropriate experimental and measuring setup for data acquisition has been developed and used to monitor the acoustic emission signals during the operation of the pipelines in the power plants.

[1] DSPNM laboratory
School of Computer Engineering and Information Technology
University of Ulsan
680-749 San 29, Mugeo 2- Dong, Nam-gu, Ulsan South Korea
dovantuancntt@yahoo.com, sjcho75@mail.ulsan.ac.kr

[2] School of Computer Engineering and Information Technology
University of Ulsan
680-749 San 29, Mugeo 2- Dong, Nam-gu, Ulsan South Korea
upchong@ulsan.ac.kr