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NEURO BASED CLASSIFICATION OF FACILITY SOUNDS WITH BACKGROUND NOISES

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Abstract. *The detection of abnormality in a facility is vital for plant operation. Humans feel the change of surroundings by various sensing such as eyes, nose, and ears. The diagnosis by the sound has the advantage of being able to detect the wide-ranging abnormalities. The purpose of this study is the recognition of various facility sounds with background noises. Also realization of the preventive maintenance of pipelines is studied. There are great needs for the diagnosis of gas leakage. Sounds of 9 facilities in the plant are recorded. Adding to this, gas leakage simulator used to generate gas leakage sounds is made for various crack sizes and pressures. The recorded sounds of facilities are preprocessed by applying Fast Fourier Transformation. The features of sounds are extracted and classified by a Neural Network. As a result of the test, sounds of 9 facilities are recognized with over a certainty of about 94[%]. Moreover, the equipment in the factory is diagnosed by applying the recognition system. Classification and discrimination of cracks are carried out using a Neural Network. Through the acoustic experiments, it is proved that the method of the acoustic diagnosis can classify a leakage sound of a pipeline.*
Keywords: Acoustic analysis, Diagnosis, Neural network, Classification of sounds

1. **Introduction.** In Japan, needs are growing up for the fault diagnosis of the facilities. The facility of a plant has been monitored with sensors such as cameras, X-rays, and magnetic flux and infrared rays [1-3]. As the fault diagnosis, the signal analysis has been studied for a long time [4-6]. There are many types of facilities such as turbines, motors, pumps and compressors in the plant, and fault diagnostic methods have been studied [7-9]. A plant has a large area, so it is difficult that the facility trouble is detected only by using a X-rays and the infrared rays method. For the diagnosis by sound, difficulties lie in the following situations that a surrounding sound is generated for whole hours and disturbs the facility sound diagnosis. When the surrounding noise is large, an abnormal sound is overwhelmed with the noise and it is likely to be ignored. In the pipeline, it is very dangerous when the breakdown happens in case of a poisonous gas and a gas with high volatility go through the pipeline of the plant. Therefore, needs for the fault diagnostic technology such as the detecting technologies of the leakage from pipes are growing up. It is researched by the sound about the piping diagnosis [10]. Actually, in the oil refinery plant, facilities are examined by operator's inspection and gas sensors. However, sensors can not recognize the abnormality until there is a substantial change detected with the sensor. The only operators with much experience can detect the abnormality with eyes, acoustic sense and nose. The expert estimates the abnormality of the facility by sensing