Pattern Recognition of the Cutting Sound of Circular Saws and its Application to the In-situ Diagnosis of Cutting Conditions

—Optimization of Pattern Vectors Using the FE-method—

Using FE-Method, the effects of the geometry of a circular saw on its natural frequencies were analyzed. By comparing the results of an FE-analysis with frequency spectra of the cutting sound, and particularly those at the entry of the saw teeth into the wood specimen, peak sound pressure levels were selected that could be associated with saw blade vibrations which change characteristically according to the cutting conditions. Pattern vectors of these levels were formed, and using a modified RCE-network algorithm, a pattern recognition system was established, which gives a more reliable diagnosis of the cutting conditions based on the cutting sound.

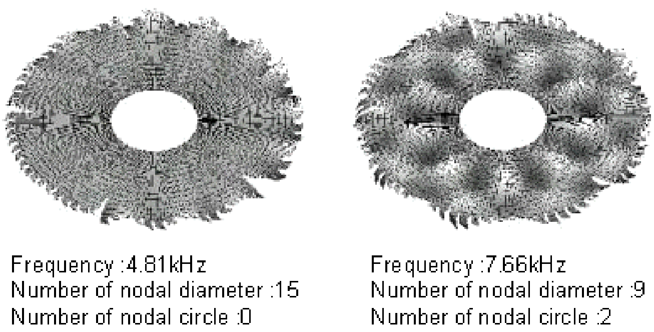

Fig.2 Vibration modes calculated by FE-analysis

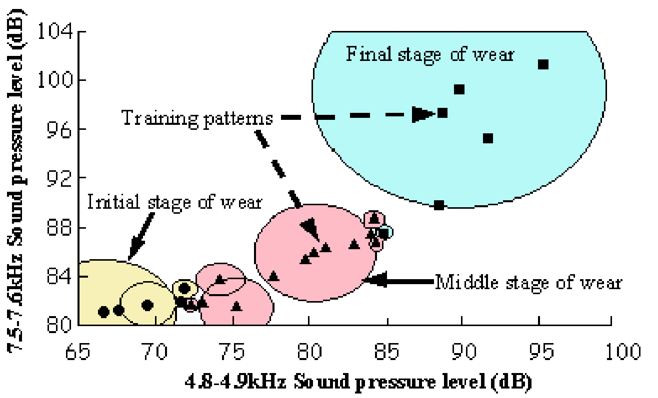

Fig.5 RCE-network constructed learning training pattern (1).

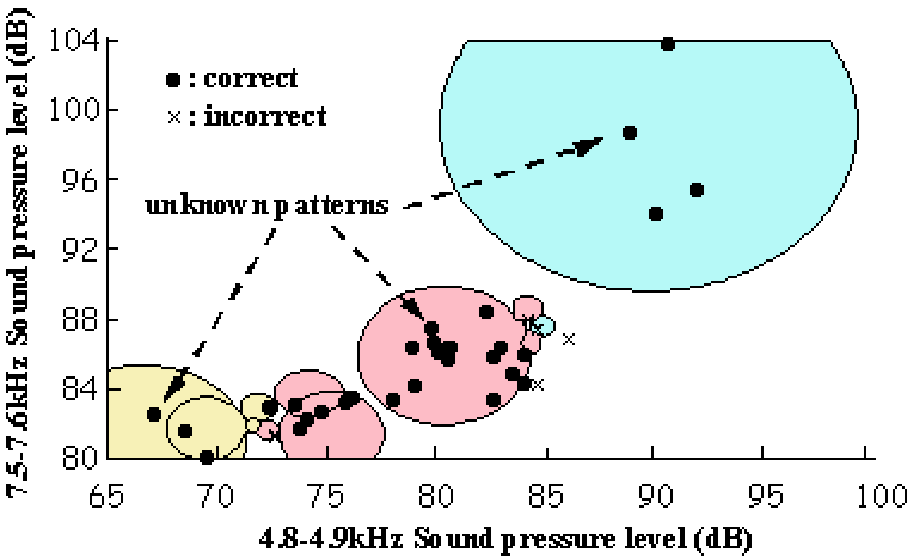

Fig.6 Recognition of unknown patterns of cutting sound using RCE-network (1).