

NAME OF THE SCHOLAR
NAME OF SUPERVISOR
DEPARTMENT
TITLE OF THE THESIS

Ahmed Hameed Kaleel
Prof. Z. Mallick
Mechanical Engineering Department
Some Studies on Noise and its Effects on Industrial/
Cognitive Task Performance and Modeling

ABSTRACT

Present industrial environment is quite different than past. Globalization and market driven forces has made the working environment quite competitive. It is quite obvious that these factors when combined with environmental factors, lead to poor operators/workers performance. Therefore, ergonomists has new challenges in terms of predicting workers efficiency as well as workers health protection and well being.

High noise level exposure leads to psychological as well physiological problems. It results in deteriorated cognitive task efficiency, although the exact nature of work which leads to deteriorated cognitive task performance is still unknown. To predict cognitive task efficiency deterioration, neuro-fuzzy tools were used. It has been established that a neuro-fuzzy computing system helps in identification and analysis of fuzzy models. The last decade has seen substantial growth in development of various neuro-fuzzy systems. Among them, adaptive neuro-fuzzy inference system provides a systematic and directed approach for model building and gives the best possible design parameters in minimum possible time.

In the present research, input variables were noise level, cognitive task type, and age of workers. While out-put variable predicted in terms of reduction in cognitive task efficiency. The cause-effect relationships of these parameters are complex, uncertain, and non-linear in nature, therefore; it is quite difficult to

properly examine it by conventional methods. Hence, an attempt is made in present study to develop a neuro-fuzzy model to predict the effects of noise pollution on human work efficiency as a function of noise level, cognitive task type, and age of the workers engaged in cognitive type of task at (I.T.O power plant station, centrifugal pump industry WPIL India Limited, and Shriram Piston and Rings limited) industries. Categorization of noise and its levels (high, medium, and low) was based on a survey conducted for this purpose.

A total of 155 questionnaires were distributed among the workers of industries under reference. Likert scale has been used to evaluate the answer densities which range between “strongly disagree” to “strongly agree”. performance of workers engaged in cognitive nature of work were evaluated based on self administrated questionnaire survey, which consisted of 55-questions, covering all possible reported effects of cognitive task on cognitive task performance.

The model was implemented on neural fuzzy logic toolbox of MATLAB using Sugeno technique. The modeling technique was based on the concept of neural fuzzy logic, which offers a convenient means of representing the relationship between the inputs and outputs of a system in the form of IF-THEN rules. Model has been built under the recommended exposure limit (REL) of 90 dB(A) for 8 hr duration by occupational safety and health administration (OSHA), for workers engaged in occupations such as: engineering controls, administrative controls, and/or work practices. In order to validate the model, 20% data sets were used for testing purpose.