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RATING

SITTHICHOK PUANGTHONGTHUB : A STUDY OF NOISE  
ATTENUATION EFFICIENCY IN EARPLUGS MODIFIED BY INSERTING  
LEAD CAPSULES INTO THEIR STEMS. THESIS ADVISORS : CHALERMCHAI  
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For the exposure to very high noise levels, especially when the 8-hour time-weighted averages are greater than 105 dBA, the noise attenuation of commonly designed earplugs may be inadequate. For such exposure, appropriate technological development should be used to augment earplugs in an attempt to increase the attenuation. Therefore, in this study, researcher modified commercially available expandable foam earplugs to improve their quality by inserting lead capsules in the plug stems in an attempt to increase the attenuation efficiency. In this experiment, comparisons of noise attenuation efficiency between the common foam earplugs and the modified earplugs were made by using audiometer at frequencies of 125, 250, 500, 1000, 2000, 3000, 4000, 6000 and 8000 hertz (Hz). The sample group for the experiment consisted of 55 normal hearing subjects. Subjects were tested for binaural pure tone hearing threshold. The tests were carried out 3 times per experiment without and with earplugs (common as well as modified). Attenuation value at each frequency was obtained from the difference between hearing threshold level of subjects with and without earplugs.

It was found, from the result of the experiment, that modified earplugs were able to attenuate over 15 decibels (dB) at frequencies of 500, 1000, 2000, 3000, 4000, 6000 and 8000 Hz with over 95% confidence interval ( $p$ -value  $< 0.05$ ). Besides, the attenuation efficiency of the modified earplugs is significantly different from the common one ( $p$ -value  $< 0.05$ ). Furthermore, relationship of attenuation between the modified earplugs and common earplugs was also linear having correlation coefficient of 0.42-0.83 with over 95% confidence level ( $p$ -value  $< 0.05$ ).

The attenuation value of modified earplugs which was calculated according to the specifications of the US Environmental Protection Agency (EPA), yields a noise reduction rate (R) of 16.6 dB when exposed to high frequency noise and a noise reduction rate (NRR) of 16.5 dB when exposed to low frequency noise, whereas the common foam earplugs yield R and NRR values of 11.3 and 11.2 respectively.