

**COST AND EFFECTIVENESS OF NOISE CONTROL OF SPRING PIN REMOVAL-
COMPARISON BETWEEN THE PIN PUNCH CAPPED WITH THERMOPLASTIC
POLYURETHANE AND HYDRAULIC EQUIPMENT**

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ABSTRACT

According to the noise measurement in a truck maintenance center in 2014, the workers' TWA (Time Weighted Average) was 93.8 dBA, which exceeded the standards of the Ministry of Labour, and the workers' hearing ability have been reduced by 3% compared to that in the year 2013. The major sources of noise was spring pin removals, i.e. 95.6-141.5 dBA. The equipment used for the pin removal is a pin punch tool and a 12 pounds hammer (Equipment #1). This was a Quasi-Experimental research aim at having an appropriate spring pin removal tool to reduce the noise level and to study their cost effectiveness compared to equipment #1.

The new tools were designed, i.e. a pin punch tool capped with a selected absorber material (Equipment #2) and a hydraulic equipment tool (Equipment #3). The cost of making the new equipment, including the design, were collected. Ten workers with at least 1 year experience in spring pin removal were selected; each one removed 6 pins using all three pieces of equipment. Noise levels were measured during the removal work and satisfaction in using the equipment of the workers were collected at the end of the work.

The results showed that thermoplastic polyurethane 15 mm.-thick was the most appropriate material thus, it was selected to make a cap for the pin punch tool and the hydraulic equipment with a force of 5 tons was designed. The noise levels generated during pin removal using equipment #3 and equipment #2 were 77.7 dBA and 88.1 dBA respectively, while the equipment #1 generated 112.3 dBA. Thus the new tools can significantly reduce the noise levels. However, only equipment #3 can reduce the noise below the target level, 85 dBA, significantly ($p < 0.001$). The analysis of the cost and effectiveness of the three pieces of equipment showed that equipment #3 has the highest cost and effectiveness with a score of +2.5, equipment #2 and #1 were 1.5 and 1 respectively. While the satisfaction with equipment #3 being higher than those of the equipment #1 and #2.

Thus the appropriate spring pin removal equipment is hydraulic. For SMEs, the cost of such equipment may be quite high, so equipment #2 may be selected. Since it can reduce the noise level to below the standard but not to the action level.

**KEY WORDS: NOISE REDUCTION/ SPRING PIN/ TRUCK/ THERMOPLASTIC
POLYURETHANE/ HYDRAULIC/ COST AND EFFECTIVENESS**

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