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Analysis of the Effects of Vibrations on Tractor Drivers by Measurements With Wearable Sensors

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Abstract : The problem of vibrations in agriculture is very important due to the different types of machinery used for the different types of soil in which work is carried out. One of the most commonly used machines is the tractor, where the phenomenon has been studied for a long time by measuring the whole body and placing the sensor on the seat. However, this measurement system does not take into account the characteristics of the drivers, such as their body index (BMI), their gender (male, female) or the muscle fatigue they are subjected to, which is highly dependent on their age for example. The aim of the research was therefore to place sensors not only on the seat but along the spinal column to check the transmission of vibration on drivers with different BMI on different tractors and at different travel speeds and of different genders. The test was also done using wearable sensors such as a dynamometer applied to the muscles, the data of which was correlated with the vibrations produced by the tractor. Initial data show that even on new tractors with pneumatic seats, the vibrations attenuate little and are still correlated with the roughness of the track travelled and the forward speed. Another important piece of data are the root-mean square values referred to 8 hours (A(8)x,y,z) and the maximum transient vibration values (MTVVx,y,z) and, the latter, the MTVVz values were problematic (limiting factor in most cases) and always aggravated by the speed. The MTVVx values can be lowered by having a tyre-pressure adjustment system, able to properly adjust the tire pressure according to the specific situation (ground, speed) in which a tractor is operating.

Keywords : fatigue, effect vibration on health, tractor driver vibrations, vibration, muscle skeleton disorders
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