TEN ISSUES RELATED TO WORKER EXPOSURE TO HAND-ARM VIBRATIONS

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Abstract

The increasing use of machines and tools capable of transmitting vibrations to workers raised the need to regulate this exposure in order to guarantee the safety and health of workers. Due to this, in recent years an important effort to control and prevent this type of risk has been developed in the European Union, and in Spain in particular.

The evaluation of the human body's exposure to vibrations can be carried out in accordance with what is specified in the international standards ISO (International Organization for Standardization). The ISO 2631 standard [1] addresses the problem of whole body vibration while the vibration of the hand-arm system is addressed by the ISO 5349 standards. The ISO 5349-1 standard establishes the general requirements for this type of exposure [2] and ISO 5349-2 [3] provide guidance for the measurement and evaluation of hand-transmitted vibrations. The mechanical fixation of accelerometers is covered by the ISO 5348 standard [4].

Royal Decree 1311/2005, of November 4, [5] establishes the minimum provisions for the protection of workers against the risks derived from exposure to mechanical vibrations. This Royal Decree is the transposition into Spanish law of Directive 2002/44 / EC of the European Parliament and of the Council, of June 25, 2002, on the minimum health and safety provisions relating to the exposure of workers to derived risks of physical agents (vibrations) [6].

There are many reasons of a practical nature, such as the relative technical ease and consistency of the measurements made, so that the assessment of hand-arm vibration by measuring the accelerations produced has been the method used by most studies and is indicated by the regulations to quantify the severity of vibration and assess the risk of exposure [7].

However, since the 1960s there has been research that suggests that the measurement of vibration energy absorption (VEA) can provide more relevant information than the measurement of acceleration when deciding on the risk of suffering disorders by exposure to vibrations, there is some correlation between VEA and white finger

syndrome (VWF) [8]. Numerous studies have been carried out to relate VEA and VWF [9] but there is still an important task to be undertaken, such as the relationship between VEA and the frequency at which it occurs [10] or the part of the hand-arm system where it occurs. energy absorption [11]. As a result of previous studies, it has been found that the procedure outlined by the ISO 5349-1 standard can underestimate the effect produced by high-frequency vibrations on problems caused in the fingers [7].

In a report published by EU-OSHA [12] exposure to HAV was identified as an emerging risk due, among other factors, to the growth in the number of European workers exposed to this risk. It is estimated that in 2015 20% of workers in the European Union were exposed to this risk.

When the use of the tool is prolonged, it causes different disorders that can affect the blood circulation, nerves, bones, joints, muscles and connective tissues of the hand and forearm that are collectively known as Hand-Arm Vibration Syndrome (HAVS). HAV is often associated with workers in industries with vibration exposures such as construction, agriculture, welding, or forestry.

Hand-arm vibration syndrome (HAVS) can lead to a condition known as VWF or “Raynaud's syndrome” caused by a dysregulation in the peripheral vascular response to cold and “tingling and numbness of the fingers”, identified as disorders in the sense of touch [13]. It can also cause lack of sensation and mobility related to carpal tunnel syndrome, skeletal disorders, bone arthritis in the wrist and elbow or calcification of tendon attachments in the elbow and muscle disorders such as muscle weakness, loss of grip strength and pain in the hands and arms [14]. Injuries depend on several factors, including mainly the intensity and duration of exposure to vibration, the type of work performed, and the tool used [15]. Studies have shown that VWF is fundamentally related to the use of tools where the middle frequencies (25 - 250 Hz) dominate [16]. In the domain of low frequencies (≤ 25 Hz) there are very few cases that have produced VWF [17].

To reduce the exposure to vibrations, it is possible to act on the magnitude of the vibrations and on the exposure time. In addition, it is possible to intervene on the emitter focus, the propagation medium and the receiver.

This communication has been addressed to two complementary lines: i) a critical review has been made of the regulations that regulate this type of risk and ii) a study has been carried out of various existing works in the web of science related to activities that involve a risk hand-arm vibration. Comparison of the existing regulations with the data obtained in experimental work shows that there are still many issues that the current regulations have not been able to analyze.

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