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Review Paper on Vibration Reduction in Hand Held Power Machinery

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Abstract

Hand-arm vibration (HAV) is vibration transmitted from a work processes into workers' hands and arms. It can be caused by operating hand-held power tools, hand-guided equipment, or by holding materials being processed by machines. Multiple studies have shown that regular and frequent exposure to HAV can lead to permanent adverse health effects, which are most likely to occur when contact with a vibrating tool or work process is a regular and significant part of a person's job. Hand-arm vibration can cause a range of conditions collectively known as hand-arm vibration syndrome (HAVS), as well as specific diseases such as white finger or Raynaud's syndrome, carpel tunnel syndrome and tendinitis. Vibration syndrome has adverse circulatory and neural effects in the fingers. The signs and symptoms include numbness, pain, and blanching (turning pale and ashen).

Keywords: Hand-held vibrating tools, Hand-transmitted vibration level, Hand Arm Vibration syndrome

Introduction

The increasing demands of high productivity and economical design led to higher operation speeds of machinery and efficient use of materials through lights weights structures. These makes the trend of resonance condition more frequent the periodic measurement of vibration characteristics of machinery and structures become essential to ensure adequate safety margins. Any observed shifts in the natural frequencies or other vibration characteristics will indicate either failure or a need for maintenance of the machine. The measurement of the natural frequencies of the structure or machine is useful in selecting the operational speed of nearby machinery to avoid resonant condition. The theoretically computed vibration characteristics of a machine or structure may be different from the actual value due to the assumptions made in the analysis. In many applications survivability of a structure or machine in a specified vibration environment is to be determined. If the structure or machine can perform the expected task even after completion of testing the specified environment, it is expected to survive the specified conditions. Hand-arm vibration (HAV) is vibration transmitted from a work processes into workers' hands and arms. It can be caused by operating hand-held power tools, hand-guided equipment, or by holding materials being processed by machines. Multiple studies have shown that regular and frequent exposure to HAV can lead to permanent adverse health effects, which are most likely to occur when contact with a vibrating tool or work process is a regular and significant part of a person's job.

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Literature review

Following are some of the important reviews of different researchers and scientists in the Vibration field.

M.F. Hassan et. al [1]This paper highlights a simulation study involving the application of an active force control (AFC) strategy to suppress vibration on the rear handle of a handheld tool. The research was carried out to investigate the performance in terms of vibration reduction capability of a feedback controller employing AFC-based schemes on a selected powered portable machine (Hedge Trimmer Maryama model Ht230D). Four types of control schemes were closely examined and compared involving the classic proportional-integral-derivative (PID) control scheme, the AFC with crude approximation (AFCCA) method, the AFC with iterative learning method (AFCILM) and AFC with fuzzy logic (AFCFL) method. Inherent

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vibration was measured from the real operation of the handheld tool through operational deflection shape (ODS) experiment. This data was later used in the simulation work together with other forms of modelled disturbances to test the robustness of the control scheme. Results show that the AFC scheme is able to suppress the vibration at the rear handle much better compared to the conventional PID control scheme. The combination of AFC with fuzzy logic scheme provides the best performance for the AFC-based controllers.

Lars Skogsberg [2] In this paper introduce to An industrial power tool can in most cases be regarded as a rigid body. The handles are not always part of this rigid body. Forces acting on this rigid body are the source of vibration. The forces are either forces from the process or process independent e.g. unbalances in rotating parts. There are three basic principles for vibration control. Control the magnitude of the vibrating forces. Make the tool less sensitive to the forces. Isolate the vibration in the tool body from the grip surfaces. All three principals are used in vibration control on power tools either one by one or combined on the same tool.

Dhananjay Singh Bisht et. al. [3] we got about the segment of industrial products, hand held products occupy a major section. An important issue in design of these products is to identify the factors that lead to human comfort and those leading to discomfort. The aim of this paper is to discuss some approaches for product evaluation and to discuss their significance in designing better products. Usability testing is increasingly being realized as an important tool for evaluating products. Comfort and discomfort assessment has been a topic of major concern when comparing and evaluating products. The understanding of the two terms in the context of product evaluation and the methods for evaluating comfort and discomfort experience have also been discussed. The work reviewed provides a solid foundation on which any future research for product development and assessment can be performed and analyzed.

Thomas J. et. al [4] This study reports results of an investigation into the short-term effects of power hand tool vibration on deep sense tactile sensitivity. Five subjects operated a simulated hand tool using a 30 s / 30 s work rest duty cycle. The handle vibrated at 1S0 5349 weighted acceleration of 8 m/s 2, for frequencies of 20 Hz, 80 Hz, and 160 Hz, in three orthogonal directions. A no-vibration condition was also included for a control Tactile sensitivity of the distal index finger was measured after 30 minutes using a ridge detection threshold detection task. The average falling ridge threshold increased five times from 0.01 mm for the no-vibration condition to 0.05 mm at 160 Hz, however no rising ridge threshold shifts were observed. Implications for job design and work practices are discussed.

Robeert G.Radwin et. al [5] In this paper A practical method for assessing vibration exposure for workers operating vibrating hand tools on an automobile assembly line is presented. Vibration exposure is difficult to assess directly using many fast Fourier transform (FFT) spectral analyzers because of long task cycle times. Exposure time cannot be accurately estimated using time standards because of the high variability between operators and work methods. Furthermore, because workers frequently move about and get into inaccessible spaces, it is difficult to record vibration without interfering with the operation. A work sampling method was used for determining vibration exposure time by attaching accelerometers to the tools and suspending a battery-operated digital data logger from the air hose. Vibration acceleration and frequency spectra for each tool were obtained off-line replicating actual working conditions and analyzed together with exposure time data for determining individual worker vibration exposure. Eight pneumatic vibrating power hand tools, representing tools commonly used in an automobile assembly plant, were studied. Spectra for the rotary and reciprocating power tools had large distinct dominant fundamental frequencies occurring in a narrow frequency range between 35 Hz and 150 Hz. These frequencies corresponded closely to tool free-running speeds, suggesting that major spectral component frequencies may be predicted on the basis of speed for some tools.

In **HSE Information Document[6]** we get important information regarding reducing risk of hand-arm vibration injury from hand-held power tools. They give suggestion to use suitable for the purpose for and working conditions in which they are to be used; used only for purposes for which they are suited and used only under conditions for which they are suitable.

In **Hand-Arm Vibration[7]** In this Paper we know that What is hand–arm vibration? Hand–arm vibration (HAV) is vibration transmitted to the hand and arm during the operation of hand-held power tools and hand-guided equipment, or holding materials being processed by machines. Hand–arm vibration is commonly experienced by workers who regularly use tools such as jackhammers, chainsaws, grinders, drills, riveters and impact wrenches. Factors influencing the effects of exposure to HAV The

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longer a worker using tools is exposed to HAV, the greater the risk of developing HAVS. Exposure to hand–arm vibration can be increased by factors such as.

In **Vibration solutions[8]** we get information about how to reduce at managers in industry who experience problems with vibration tools, which can cause hand-arm vibration syndrome and vibration white finger. It features case studies to demonstrate how vibration levels can be reduced and by how much. It describes solutions which have been adopted by industry and how much they cost using charts, illustrations and photographs to accompany a description of the methods used.

Conclusion

While Studying Literature, we observe that Hand Arm Vibrations developed in the hand operating machines. Hand-arm vibration (HAV) caused by operating hand-held power tools, hand-guided equipment, or by holding materials being processed by machines. Multiple studies have shown that regular and frequent exposure to HAV can lead to permanent adverse health effects, which are most likely to occur when contact with a vibrating tool or work process is a regular and significant part of a person's job. We decided minimize these Hand Arm Vibrations By using, Experimental Set up of Rockwell Viscous damper for reducing Vibration of hand held power machinery.

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