NVSAGE

The Newsletter of Noise and Vibration

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January 2024
Volume 088

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"Music can name the unnamable and communicate the unknowable."
-Leonard Bernstein

Foreword

By Krishna Balamurali, Principal Engineer- krishna@nvdynamics.com

Kochi Metro Rail engaged us to carry out a detailed survey of ground borne vibrations in their proposed Phase 2 of operations.

This requirement is a compliance norm to conform with environmental requirements. The baseline ground borne vibration study will be used as the basis for future train operations and to account for mitigation plans, if any to the track and support structure.

Our team worked on a 24x7 test plan to conduct all site trials and submit technical report in the agreed timelines.

One of the large construction company M/s Suroj Buildcon assigned the task of conducting hard-arm and whole-body vibration study on their site equipment along with its associated operators. NV dynamics conducted the whole exercise compiling to international standards and submitted reports for safety audit team.

Our activities in the IoT based remote vibration monitoring is on the increase; these installations are happening at many one-off sites where our site testing and analysis is overlapped by the remote monitoring. Construction sites in particular are being fitted with these units for continuous monitoring; with our proprietary dashboard configuration and AI supported software platform, we are adding value to customer requirements.

I have more news on our expansion into ship and vessel N&V qualifications and will update on this in the upcoming issue.

Human Body Vibration

Chiranjeevi, Engineer - Technical Services

In the preceding version, we explored fixed and adaptive sampling. Now, in the present edition, we delve into the discussion of human exposure to vibration.

Introduction

Human vibration refers to the impact from environmental mechanical vibrations on the human body. In our day-to-day lives, we encounter various sources of vibration such as those experienced while traveling in buses, trains, cars etc. Additionally, individuals may be exposed to vibrations during their work activities such as those generated by hand tools, machinery, or heavy vehicles.

The nature of human vibration can range from pleasurable to unpleasant or even harmful. Low frequency vibrations, like those felt when sitting in a rocking chair, dancing, or running, are generally pleasant. However, more intense vibrations, such as those encountered while driving on uneven roads or operating power tools, can be uncomfortable or detrimental. The harmful impact of vibration depends on factors like intensity, frequency and duration of exposure.

Fig 1

Effects on Humans

Work environments where individuals are consistently exposed to vibrations present a notable threat of causing lasting harm to specific areas of the human body. Prolonged exposure to vibrations can contribute to conditions such as Raynaud's disease, shown in Fig 1, which manifests with fingers turning white and experiencing pain. Occupations involving the operation of heavy machinery or vehicles may lead to issues in the lumbar region, the same can be seen in Fig 2. The transmission of mechanical vibrations from tools and vibrating equipment to the body can directly influence tissues and blood vessels, generate vibrations within internal organs or body parts, and even impact cellular structures.

Fig 2

Measuring Human Vibration

Measuring human vibration is a crucial aspect of occupational health and safety, as well as in various research fields. Human exposure to vibration can occur in various environments, such as workplaces, transportation, and recreational activities. The purpose of measuring human vibration is to assess and mitigate the potential health risks associated with prolonged or intense exposure.

Vibration, in the context of human exposure, refers to the oscillatory motion of a person's body or body parts in response to mechanical stimuli. These stimuli can come from various sources, including machinery, vehicles, or other vibrating surfaces. The measurement and analysis of human vibration involve quantifying the frequency, amplitude, and duration of these vibrations to evaluate their potential impact on human health and performance.

There are two primary types of human vibration that are commonly measured.

1. Whole-Body Vibration (WBV):

This type of vibration affects the entire body and is typically experienced when sitting or standing on vibrating surfaces, such as vehicles or machinery, shown in Fig 3.

Fig 3

2. Hand-Arm Vibration (HAV):

Hand-Arm Vibration refers to vibrations transmitted to the hands and arms through the use of vibrating tools or machinery, shown in Fig 4.

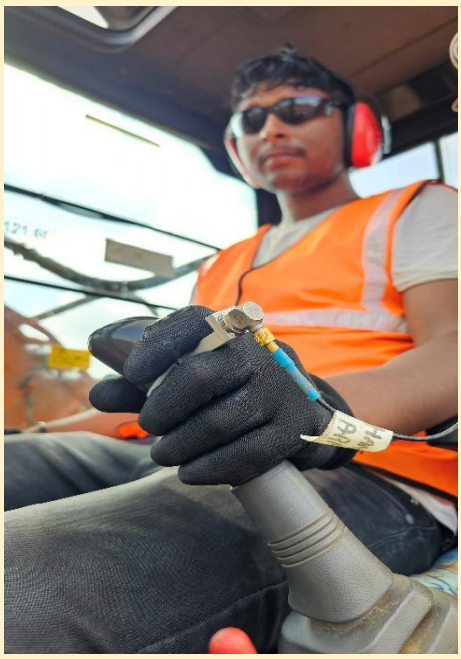


Fig 4

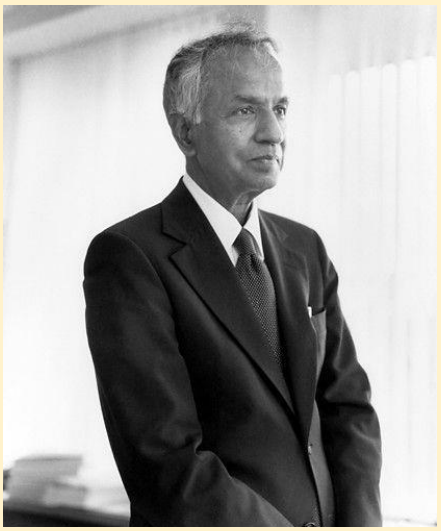
The evaluation of human vibration necessitates strict compliance with globally recognized standards and guidelines, notably ISO 2631 addressing whole body vibration and ISO 5349 addressing hand-arm vibration. These standards meticulously outline measurement methodologies, instrumentation prerequisites, and limits of exposure. Their meticulous specifications are designed to guarantee a uniform and dependable assessment of human vibration, ensuring that evaluations are consistent and reliable across diverse contexts and applications. This adherence to standards contributes to the establishment of comprehensive criteria for assessing and managing the potential impact of vibration on individuals.

Great minds & their contribution to the world of science

Subrahmanyan Chandrasekhar, an Indian American theoretical physicist renowned for his pioneering contributions to astrophysics and stellar structure, was born on October 19, 1910, in Lahore (now in Pakistan). He played a pivotal role in advancing our comprehension of stellar behavior and the ultimate destinies of stars.

Chandrasekhar's significant research revolved around the theoretical limit for the mass of white dwarf stars, commonly known as the Chandrasekhar limit. His groundbreaking investigations, initiated during his early years as a graduate student, established the groundwork for comprehending the intricate processes governing the evolution and collapse of massive stars.

In 1983, Subrahmanyan Chandrasekhar was honored with the Nobel Prize in Physics for his exceptional contributions to the understanding of the essential physical processes shaping the structure and evolution of stars.



Chandrasekhar's influence transcends his scientific accomplishments; he was also a revered author and lecturer, generously sharing his expertise with students and fellow scientists. His passing on August 21, 1995, marked the conclusion of a life that bequeathed a profound legacy in astrophysics, significantly impacting our comprehension of the universe.

Physics to Know

Loudest creature on earth

In the animal kingdom, the loudest sound is produced by the sperm whale. These marine mammals are renowned for their powerful clicks, which they emit to navigate and communicate in the ocean depths. The clicks can reach astonishing volumes of around 230 decibels, making them the loudest biological sounds known. Sperm whales generate these intense clicks through specialized structures in their heads called spermaceti organs. The sound can travel for miles underwater and is crucial for echolocation, allowing these magnificent creatures to locate prey and navigate their vast, dark oceanic habitats. The unparalleled intensity of the sperm whale's clicks highlights the remarkable adaptations that have evolved in the animal kingdom for survival and communication.