COVER STORY

VIBRATION IS A HIDDEN PERIL IN HUMAN LIFE

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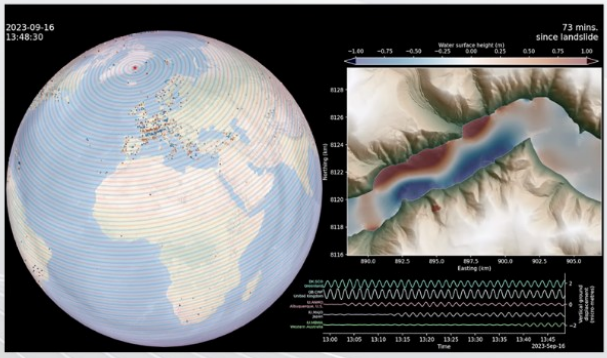
Does anyone know that on 16th September 2023, the entire earth vibrated for nine days? The incident was triggered by the collapse of a glacier that occurred in Greenland, which has thinned in recent years as a result of climate change. The impact from the incident caused the ocean’s water to slosh back and forth every 90 seconds across 20,000 km for nine days. The incident has been categorised among powerful vibration incidents that triggered beyond existing human knowledge of tsunami models. What does vibration mean for humans in our everyday lives? Is vibration a kind of waste energy and should be avoided? From my perspective and experience dealing with everything from the microscopic level of atoms to the level of planets like the earth, the sky, wind, fire, water, machines, trees and humans, they all vibrate at their own unique frequencies. I have mixed feelings about vibrations; some of the vibrations are useful, we need them in life, but some of them should be eliminated and avoided.



Looking at the context of the human body such as the heart, nerve, organs, blood including feeling, they are all vibrate, and we need them for our lives. The feelings that vibrate connect to the brain that syncs to a specific vibration frequency and can evoke strong emotions, leading to physical reactions like tears and laughs. So, what is vibration in the perspective of a mechanical engineer like me in our real life? From the scientific point of view, vibration is an energy that refers to the kinetic energy associated with the oscillatory motion of an object that is capable of being renewed, transformed or distributed to become another form of energy. It makes sense for an engineer, but what is it? A simple analogy we can take from a "buzz" sound from an insect, such as a bee, wasp, or fly, is created by the rapid flapping of its wings, which generates vibration energy in the air that is actually a pressure wave that we perceive as sound. Sound is always referred to the wave of particles in the air that swing back and forth in a regular rhythm, creating a pressure wave and transmitting the pressure wave to the human’s ears. In simple terms, sound is always referred to the effect of vibration. Like the above analogy, sound is a pressure wave for the “buzz”, and vibration is the energy created by the flapping of wings.

Here, we recognised that sound was the result of a vibration event. The sound is measured by its pressure wave, quantifying the pressure variations in a sound wave and comparing it to a reference pressure with expressions in decibels (dB). The higher the vibration energy, the higher the sound pressure wave created from the event. A lower reference sound pressure of 0 dB represents the faintest sound a human can hear, 40 dB is as quiet as in a library, 60 dB is ordinary spoken conversation, while a higher sound pressure wave at 120 dB, like a rock concert, can cause pain, and ultimately 200 dB is almost certainly lethal to humans, causing instantaneous and catastrophic internal injuries such as ruptured lungs and blood vessels, potentially leading to death. Some references that we can refer to state that sperm whales are being recognised as the loudest mammals on Earth. Sperm whales produce sound pressure waves that can reach up to 230 dB and instantly can kill humans within their vicinity. The harmfulness of sound from sperm whales in the water is reduced to the ground because of density of water is higher than air. “Sperm whales are so loud they could potentially "vibrate" you to death—a title found in an online article written by Samantha Hartery (Hartery, n.d.).

The unpleasant sound created from the high pressure of a sound pressure wave is labelled as a noise, often defined in the public as an unwanted sound that is harmful, annoying, or interferes unreasonably with the convenience, peace, or comfort of a person or the public. Many developed countries, such as the European Union, Great Britain, China, the United States of America, Japan, and Korea, recognise that both vibration and noise have their own risks of harming society.

They are implementing laws on vibration and noise, focusing on specific areas for occupational health and safety in the workplace, structure, equipment and environment. But most of the countries in the world, including Malaysia, recognised noise as a threat, implementing laws to maintain social order, regulate behaviour and protection to the societies.

Noise is regulated under the Environmental Quality Act 1974 and Guidelines for Environmental Noise Limit and Control 2019 by the Department of Environment (DOE) and Occupational Safety and Health (Noise Exposure) Regulations 2019 and Guidance on Occupational Noise Control 2024 by Department of Occupational Safety and Health (DOSH).

Vibration is addressed by The Planning Guidelines for Vibration Limits and Control in the Environment, 2021 by Department of Environment (DOE) and Guidelines on Occupational Vibration, 2003 by Department of Occupational Safety and Health (DOSH). DOE manages environmental vibration while DOSH oversees occupational vibration and related industry codes, addressing human exposure to vibration from machinery in the workplace.

The key different between noise and vibration control in Malaysia is that noise have legally binding rules that are enforced, and carry penalties for non-compliance by the legal authority that also provides guidance and interpretations of the law while vibration carries guidelines for voluntary recommendations or suggestions that provide direction or clarification but do not carry legal obligations. Both the intentions of the noise regulations and vibration guidelines carry advantages for the country’s economic growth.

We noted that noise is the result of a vibration event, but in some of the events, noise does not always reflect the magnitude of the vibration. Noise and vibration are measured by amplitude and frequency, but with different focuses on the pressure wave and motion. In modern days, mechanical manufacturing, production machinery, transportation and tools are considerably noisy to the environment. Different legislative acts and guidelines that followed limited the noise emission, especially in the public domain, driving a real deal for engineering to eliminate noise from manufacturing processes, tools, machinery and transportation to the environment. Noise separation systems have been introduced as a supportive system to reduce and eliminate noise, such as soundproofing materials, acoustic treatments, and barriers designed to absorb or insulate against noise. It is fair to say that most of the new generation of machinery, tools, cars are quieter than before. But reducing noise by a noise separation system will not reduce the actual vibrations from the machine. For example, a thick casing machine will reduce noise than a thin casing even they experience the same vibration values or a new generation of magnesium-aluminium-cgi alloys for engine block with ribbing are quieter than traditional cast iron and aluminium engines. It has been obviously shown that sometimes noise and vibration are two different risks, and they are not reflecting on each other. These are the gaps that had proven the reason why vibration analysis is important and plays a crucial role in manufacturing, production and society. Vibration analysis is a technique that involves measuring and analysing the vibration patterns of machinery to detect early signs of mechanical problems and predict potential failures.

Some quote says, “The disadvantage of driving a luxury car today is not because of its comforts, but because of its running without noise”.

Several providers in Malaysia offer vibration analysis training, adhering to international standards ISO 18436-2. These courses are designed to equip participants with the essential knowledge and skills required to identify potential machine failures through vibration analysis, thereby improving reliability and minimising downtime. Available training options include certification, public courses, virtual instructor-led sessions, and on-site training.

Organisations such as the Institute of Materials, Malaysia (IMM)-MTE, Mobius Institute, SPM Instrument, the Japan Society of Mechanical Engineers (JSME), Global Horizon Training Center, and Asset Reliability Practitioner provide training services aimed at enhancing knowledge in vibration analysis. They offer structured training programmes and assessments for vibration certification that globally recognised by industries. Some of the training organization provides a unique training program to enhance understanding of vibration such the Institute of Materials, Malaysia (IMM)-MTE covers practical learning experience in a workshop through enhancing their knowledge in balancing, alignment, collecting data and performing vibration analysis in real-time.

Furthermore, the Society of Vibration and Acoustics Malaysia (SVAM) is an organisation dedicated to raising awareness about vibration and acoustics. It actively stimulates research and development while facilitating the exchange of information within the fields.

In conclusion, the impact of vibration energy to human is unpredictable, even the vibration creates noise, but in many cases, noise does not reflect on the actual vibration in the real world. Malaysia well-governs the noise and vibration emission to the environment with regulation and guideline for the public and industries, but the level of awareness needs to be supported by the public and industries. Many organizations support to enrich knowledge of vibration in the Malaysia society and it appears to be increasing, particularly through training. Gaps in knowledge management still need to be assessed for the necessary enhancement in educational programs, robust enforcement of regulations and adequately informed

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HIGHLIGHTS

- Vibration is a Hidden Peril in Human Life
- Permanent Magnetic Bearing for an Overhung System
- Materials Lecture Competition 2025, Semi-Final
- IMM Miri Regional Chapter – One-Day Corrosion and Corrosion Control Awareness Course for Oil & Gas Industry
- Oil & Gas Asia 2025

TABLE OF CONTENTS

ANNOUNCEMENT

NEW FORMAT FOR MEMBERSHIP EXPIRY DATE

Effective 1 November 2024, all membership applications shall use the expiry date format as follows:

Initial Date register as member: 5 November 2023

Expiry Date: 4 November 2024

The membership expiration date is the day before the initial date of becoming a member

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