

TRAINING PROGRAM ON FUNDAMENTALS OF NOISE & VIBRATION

Course code: NVH 17-2 (26th 27th & 28th October 2017)

Day 1 (26th October 2017)

Agenda:

0830 Hours – Registration

0900 – 1000

Introduction to physics of vibration, discussion and explanation on generation of vibration and its propagation. Detailed fundamental concepts of understanding the quantities from their physical and mathematical background.

Explanation on the causes and effects of Vibration. Understanding some of the useful Vibrations. Detailed discussion on Vibration control / mitigation methods.

1000 – 1015 Tea Break

1015 – 1215

Understanding Elements of Vibrating system, natural frequency and resonance; Concepts and discussion on Degrees of freedom.

Vibration units, definitions and formulae; conversions from Acceleration to Velocity and Displacement and vice-versa. Detailed concepts on Types of Vibration.

1215 - 1315

Structural Vibrations – What to understand, classifications, Norms and governing standards: Application areas, how to assess and quantify, what to consider at design stage, mitigation plans.

RCC and Built-up Fabrications, Pier and Via-ducts, Earth & Seismic vibrations, Human and Whole body vibrations

1315 – 1400 Lunch Break

1400 – 1500

Vibration measurements, transducer selection, mounting methods, bandwidth, aliasing, digital sampling. Advantages of Digital signal processing and limitations.

Terminologies, measurement parameters, historical evolution of measurement methodologies

Detailed discussions of data acquisition, use of various types of data acquisition systems, recording methods, file types, throughput rates and various means of real time data recording

1500 – 1515 Tea Break

1515 – 1630

**Demonstration of Various Vibration Sensors & Analysers (Data acquisition systems),
Understanding the functions of Fourier Transform – Windowing, Sampling rate,
Averaging method, Frequency analysis**

Hands on session – Setting up functions for vibration measurements, conducting
measurements, data processing and basic interpretation

Q & A and interactive session

Learning objectives:

On successful completion of the day's agenda, the trainee will be conversant with

1. Basics of vibration, Terminologies and clarity on source, transmission & reception
2. Natural Frequency & Resonance, what & why
3. Vibration Transducers & their usage, understanding data for further processing & analysis
4. Structural Vibration concepts & its significance

Objective Test on the day's course contents -15 minutes

End of Day 1

Day 2 (27th October 2017)

Agenda:

0900 – 1000

Discussion on historical background and major contributors in the field of Noise, Basic understanding of Noise, its generation, Effects and methods Noise Control.

Difference between Sound & Noise. Discussion on sound propagation in different media, Understanding Sound pressure levels (SPL) and discussion on addition & subtraction of SPL.

1000 – 1015 Tea Break

1015 – 1315

Understanding the concepts of background Noise. Explanation of Frequency weighting curves & octave bands. Sound measurement parameters - Sound Pressure, Power and intensity.

Detailed concepts on subjective analysis of Sound through Sound Quality and Jury testing. Discussion on how sound quality analysis is carried out and parameters considered during Analysis.

1315 – 1400 Lunch Break

1400-1500

Noise measurement instrumentation and detailed discussion on microphones, types of microphones and other accessories. Explanation of Noise calibration and requirement of calibration at different places.

Discussion on few case studies of Noise & Vibration assessment, investigation and control plans for vibration mitigation.

1500 – 1515 Tea Break

1515-1630

Demonstration of various instrumentation for Noise measurements.

Measurements, recording and reviewing data. How sound measurements are different from vibration measurements. Demo on Sound quality analysis.

Q & A and interactive session

Learning objectives:

On successful completion of the day's agenda, the trainee will be able to:

1. Classify the general processes by which sound is produced.
2. Identify frequency, wavelength and speed of measured noise/sound.
3. Relate Sound power, intensity and pressure and utilize as appropriate.
4. Measure of sound and identify possible measurement uncertainties.
5. Perform frequency analysis and classification of sound.
6. Understand the physical principles underlying the propagation of sound waves in fluids and solids.

Objective Test on the day's course contents -15 minutes

End of Day 2

Day 3 (28th October 2017)

Agenda:

1000 – 1315

(1100 – 1115) Tea Break

Detailed Case Study Discussion on following topics:

1. Type of Customer: Process / Power

Case: Coal Crusher House vibration analysis

Typical crusher house configuration has a 4 floor setup with machineries located in each floor, the flow starts from feeder conveyor downwards, moves to sieving and crushing & finally achieves the required size of coal for further processing. Through the above steps of process, large dynamic forces and loads are transferred through the structural members; failures of the machines, structures and associated members are investigated.

Q & A and interactive session

2. Type of Customer : Machine Tool / Engineering

Case: Tool Life Analysis

The tool life expectancy in a production line is directly connected to the quantity of production, inventory and overall process time; **Reaming** is an essential step of operation and reduced tool life has many consequential effects. The present case is focused around the approach to include multiple parameters such a Vibration, Noise, coolant quality and use of microscopic inspection to assess the tool life cycle.

Q & A and interactive session

1315 – 1400 Lunch Break

1400 – 1700

(1500 – 1515) Tea Break

3. Type of Customer : Hydro Turbines / Large Machines

Case: Vibration Analysis of re-conditioned generator

Continuous operation of the power generators is essential to keep the grid power consistency; however, technology upgrades and parametric modifications bring in new challenges of dynamic performance of the equipment; the generator investigated is in operation for a long time and with the modifications done is creating a number of vibration issues, the approach to address the problem is multi-faceted that includes investigation the guide bearings, labyrinth and checking the stability in vertical configuration.

Q & A and interactive session

4. Type of Customer : Automotive / OEM

Case: Root cause analysis and identifying the source of Noise / Vibration

Sub-systems that integrate with the main system of engine in automotive products needs to meet the NVH requirements as a standard process; clutch, gears, sprockets and chain drives form essential train of components that contribute noise & vibration; a reputed bike manufacturer was facing the problem of de-generation in the NVH parameters once the end product is in actual use, a trace back approach is implemented to analyze the root cause and to address the issues.

Q & A and interactive session

1900 – 2130 Gala Dinner & Networking

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