

Acoustic Training - Automotive and Building Acoustics

Time : 1 - 5 Days

Training Details

Basics of Acoustics – Total Time 3-4 Hrs	▪ Introduction to Acoustics ▪ Sound waves ▪ Sound wave properties ▪ Sound Propagation in different materials ▪ Wavelength, frequency & amplitude ▪ Pitch, Loudness & Timbre ▪ Sound pressure, sound intensity and sound power ▪ Sound - like and dislike ▪ dB Level, its perception & measurement ▪ Sound Level Meter ▪ Addition of dB and subtraction ▪ Human Audible Frequency range ▪ Frequency Weighing ▪ Sound perception ▪ Sound Sources- Monopole, Dipole, Quadrupole and Linear ▪ Inverse Square Law, Directivity ▪ Sound Fields – Nearfield, Farfield, Free and Reverberant ▪ Sound absorption, reflection, refraction, diffraction and transmission ▪ Octave Bands ▪ Principals of Noise Control ▪ Noise Sources ▪ Noise control Techniques-Active and Passive ▪ Noise control materials-Absorption, Transmission and vibration damping
Noise and Vibration Measurements - Total Time 2-3 Hrs	▪ Acoustic measurement-Why is it important? ▪ Sound terminology ▪ Noise and Vibration sensors ▪ Microphone Types – Condenser, Dynamic and Ceramic ▪ Microphone Specifications ▪ Vibration Measurement ▪ Impedance Head, Impact hammer ▪ Loudspeaker and Vibration Shaker ▪ Sound intensity Probe ▪ Data Acquisition System (DAQ)- Signal Conditioner, ADC, Bus ▪ Time Frequency Domains ▪ Filters and Filter Types ▪ Acoustic Camera and Its Applications

Acoustic Materials – Total Time 7 - 9 Hrs	▪ What are acoustic materials ▪ Acoustic material – Types and Classification ▪ What is sound absorption and sound insulation ▪ Sound absorption coefficient and sound transmission loss ▪ Testing of Acoustic Materials & Testing Standards ▪ Fact and Figures about Test Methods ▪ Sound absorption – Normal and random incidence ▪ Sound transmission loss – Normal and random incidence ▪ Sound insertion loss ▪ Sample Cutting, Preparation ▪ Impedance Tubes and Reverberation Chamber, Difference ▪ Acoustic materials - Biot Parameters ▪ Effect of Biot Parameters on SAC and STL ▪ Effect of sample size, area and thickness ▪ Effect of leakages – Sound Transmission Loss ▪ What NRC, SAA, STC, R_w, α_w ▪ Significance of Acoustic Ratings ▪ Effect of Density, Thickness, Films, Fabrics on Acoustic performance ▪ Physical Significance of films/ foils, fabrics, multilayer composites ▪ Interpretation & analysis of TDS for acoustic samples ▪ Design of acoustic treatments for Noise Problems ▪ Applications of acoustic materials at vehicle level ▪ Design of dash, carpet, seats, headliners, etc. ▪ Effect of leakages/holes on Sound insulation and their control ▪ Cavity filler materials- properties, applications ▪ Cavity filler materials- test methods and standards ▪ Multilayer acoustic treatments, selection of layers and their performance evaluation ▪ New testing techniques for acoustic treatments-vehicle component level ▪ Sample Selection for different noise problems / acoustic treatments ▪ Market Requirements for NRC, SAA & STC ▪ Simulation softwares for Acoustic performance prediction ▪ Acoustic material applications- Aerospace, Automobile, DG Set, Marine & Trains
Damping Materials – Total Time 2 Hrs	▪ Vibration and panel structural response ▪ Abatement of vibrations ▪ Damping materials and types ▪ Viscoelastic materials ▪ Testing methods for Damping materials ▪ Test Standards ▪ Effect of damping materials ▪ Effect of Temperature on damping materials ▪ Different types of Damping Treatment ▪ Reduced frequency nomograms (RFN) ▪ Applications of Damping materials

Psycho-Acoustics – Total Time 2-3 Hrs	▪ Introduction ▪ Human Ear ▪ Hearing- Working of Human Ear ▪ Threshold of Quietness ▪ Masking ▪ Sound quality ▪ Pitch and Pitch Strength ▪ Loudness ▪ Sharpness ▪ Roughness ▪ Binaural Hearing ▪ Jury Testing ▪ Test Standards
Noise Sources – Total Time 3-4 Hrs	▪ NVH Basics ▪ Wanted, Unwanted and Brand sound ▪ Market Requirement -NVH ▪ Automotive Noise Sources ▪ Powertrain Noise ▪ Exhaust System ▪ Road/Tyre Noise and Generation Phenomenon ▪ Tyre Cavity Noise and its mitigation ▪ Wind Noise and Generation Phenomenon ▪ Buzz, Squeak and Rattle ▪ Advanced Simulation Software
Active Noise Control & Signal Processing Total Time 2-3 Hrs	▪ Noise Pollution Problem ▪ ANC History ▪ Physical Concepts ▪ ANC Systems Classification ▪ ANC Adaptive Algorithms ▪ Signals ▪ Properties of the FFT ▪ Sampling and digitizing ▪ Aliasing and filters ▪ Leakage and windows ▪ Averaging techniques Autopower, crosspower and coherence ▪ What is an order? ▪ FIR, IIR and re-sampling filters ▪ Time Frequency Methods ▪ Gibbs Phenomenon

Building Acoustics Total Time 4-5 Hrs	▪ Reverberation Time ▪ Effect of Reverberation time ▪ Acoustic Performance Criteria : Market Terms ▪ Acoustic Materials : Market Requirements ▪ Acoustic Materials – Classical and Modern Materials ▪ Sound Absorption, Sabine's absorption ▪ Sound Insulation - Factors affecting transmission - partition area, receive room absorption, mass, stiffness, damping, separation and isolation, effects of holes and gaps. ▪ Single and double-leaf constructions, floating floors and suspended ceilings ▪ Impact isolation class (IIC), limitations of single number ratings, laboratory vs field performance, ▪ Effect of Sound insulation ▪ Mass law & coincidence dip of the sound insulation performance curve ▪ Design of Building acoustic products for interior and exterior ▪ In Lab and Onsite Testing of Reverberation and insulation ▪ Acoustic Ratings – Test Standards ▪ Interpretation of SAC, STL, NRC, SAA, STC, R_w, α_w, $L_n T_w$, D, DnT ▪ Test standards – ISO / ASTM / IS standards ▪ STC Target setting and composites ▪ Classical and Modern acoustical materials ▪ Glass windows and Doors Design ▪ Sound insulation drywall partitions and affecting parameters ▪ NC Curves and their significance ▪ Custom applications of Customer Products ▪ NIC Demo ▪ Demo of RT Measurement, Background Noise Measurement, NIC Measurement ▪ Applications of Customer Products
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Deliverables –

After complete training, Engineers will have complete understanding of sound package materials, they will be able to perform following activities

- Understand different sound package materials along with their properties
- Selection of appropriate acoustic material/s for noise control applications
- Design and analysis of acoustic treatments
- Finalizing the test requirements as per international or national standards
- Control of vehicle noise at different locations inside a vehicle
- Understanding of complete material input requisites for vehicle level simulation

Customer can choose any topic/s for the training as per their interest and timeline. Training can be provided onsite or online also. We recommend onsite training as it is more beneficial for the Engineers.

Travelling charges will be extra.