

We have one goal — improving the noise and vibration quality of our customers' products. Roush delivers innovative, effective noise and vibration control solutions. By combining advanced analysis capabilities, comprehensive engineering services, and state-of-the-art facilities, Roush has become a proven partner in identifying and resolving challenging noise and vibration issues. Backed by the diverse capabilities of the Roush family of companies, we are uniquely equipped to provide turnkey noise and vibration solutions.

Roush... your silent partner in developing smoother, quieter products.

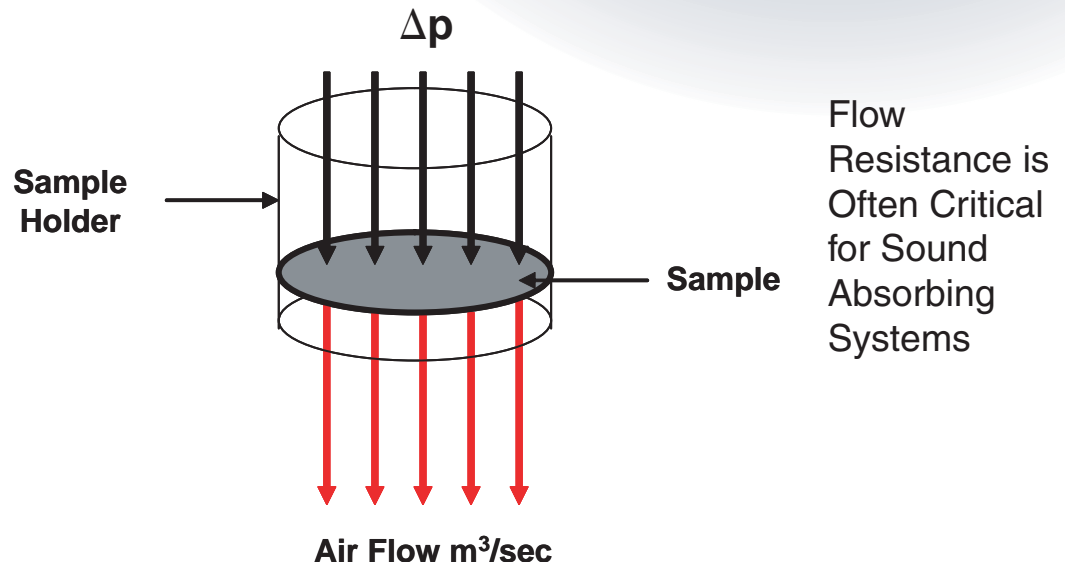
Acoustic Materials Development

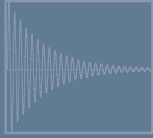
This includes testing and development of designs for transmission loss and acoustic absorption, Roush Noise and Vibration Engineering has helped our customers optimize their materials to have the best acoustical performance for a specific application.

The following tools may be used:

- Laboratory measurements to characterize the porous material properties:
 - Flow resistance
 - Young's modulus
 - Structural Loss Factor
 - Porosity
 - Bulk Density
 - Tortuosity
- Software models to translate the above material properties into acoustical performance such as sound absorption and transmission loss
- Software models (SEA) to translate acoustical performance into vehicle noise performance

Typical programs vary widely in scope. Simple programs have included **one day studies to help customers optimize material systems** such as carpet and headliners through a combination of flow resistance testing and impedance tube testing. In larger programs, proposed material systems would be **optimized for vehicle designs**.





NOISE AND VIBRATION ENGINEERING

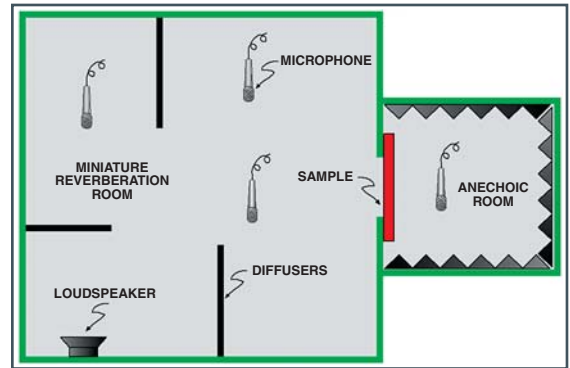
Acoustic Materials Capabilities

Roush Noise and Vibration Engineering has extensive experience and state-of-the-art equipment to measure the acoustic properties of sample treatments. Roush can identify commercially available sources for materials that meet your specifications.

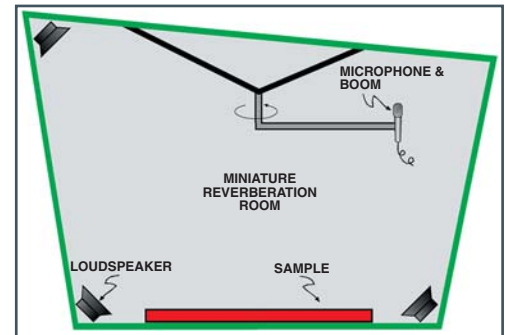
Material Measurements

- Alpha Cabin — random incidence acoustic absorption
- Impedance Tube — normal incidence absorption as well as porosity, tortuosity and flow resistance estimates
- TL Chamber — transmission loss
- APAMAT II — insertion loss of carpet and barrier treatments
- Air Flow Resistance Measurement — measures flow resistance of porous materials
- Cepstrum — reflection and absorption of samples

Roush acoustic material measurements are ideal for use as input for trimmed sound package CAE models (FEA/BEA/SEA). Roush's expert sound package designers can design multi-layer porous elastic treatments to optimize acoustic absorption and TL of your sound package parts.



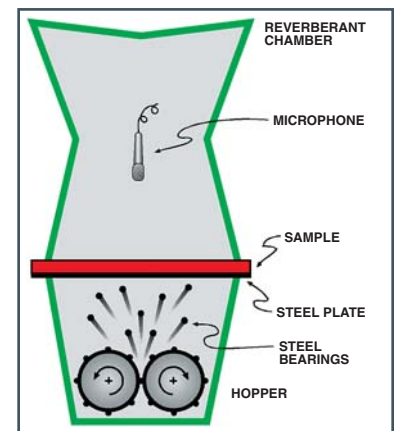
Sound Transmission Loss Per SAE J1400



Random Incidence Sound Absorption



Impedance Tube Apparatus (per ASTM E-1050)



Insertion Loss Apparatus

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