

## Get a quieter, cooler ride with 3M™ Thinsulate™ Insulation.

Thinsulate is a low-density mat insulation. Its internal web contains a mix of fine and thick polyester and polypropylene microfibers specifically engineered to absorb vibration and trap radiant heat – reducing noise and keeping things cool or warm. To help ensure optimal performance in medium- and heavy-duty commercial vehicles, E-A-R engineers conduct a variety of tests on the thermal and acoustic insulation.

### Problem

Commercial vehicles produce a great deal of noise, affecting driver comfort. At the same time, poor thermal management increases AC battery loads, which inversely affect fuel efficiency and may lead to noncompliance with no-idle regulations.

### Simulations and Testing

E-A-R technicians utilize simulation and testing to determine vehicle cabin needs and design the best arrangement of insulation.

### Acoustic Performance

The vehicle cabin cavity is divided into multiple regions for accurate SEA (Statistical Energy Analysis) simulation of sound pressure levels with and without Thinsulate insulation.

Acoustic system level tests are conducted on a dynameter in Aearo's Technology's Acoustic Technology Center (ATC). Sound pressure and intensity are measured at various locations in the cabin; noise from individual components like engine, gearbox or tires is also mapped. Subsystem tests are conducted in a certified reverberation chamber.

### Thermal Efficiency

Thermal package properties and cabin shape are defined using advanced thermal analysis software (Cool Calc) for accurate thermal loading analysis.

Heat transfer tests are conducted based on the TMC RP 422A standard for thermal transmission rates; thermal images are taken for quick identification of heat leakage.

### Recommendations

Thinsulate insulation is recommended because of its superior acoustic performance and thermal insulation properties. A variety of Thinsulate insulation can be used, with different thicknesses, densities, absorption performance rates and thermal resistivity levels.

### Results

In both simulation and testing, applying Thinsulate insulation to a vehicle cabin results in the potential to improve noise levels near the driver's head by 3-5 dB. Thermal resistance in terms of R-value can be improved by up to 47% from the base package.

### Conclusion

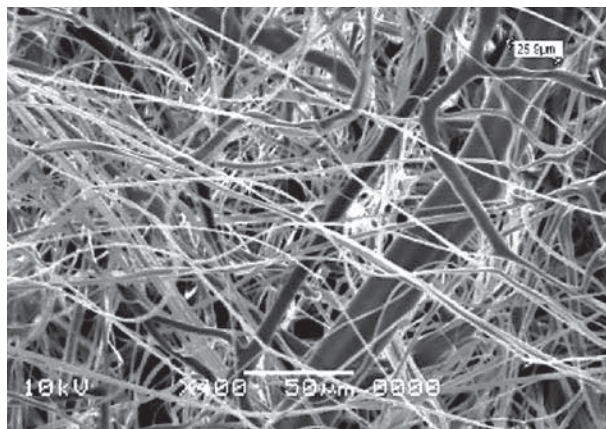
An optimized Thinsulate insulation package is an effective solution to both acoustic and thermal issues in medium- to heavy-duty commercial vehicles. It helps improve driver comfort, enhance efficiency and enable vehicles to meet TMC regulations.

### A SAMPLING OF THINSULATE ACOUSTIC INSULATION



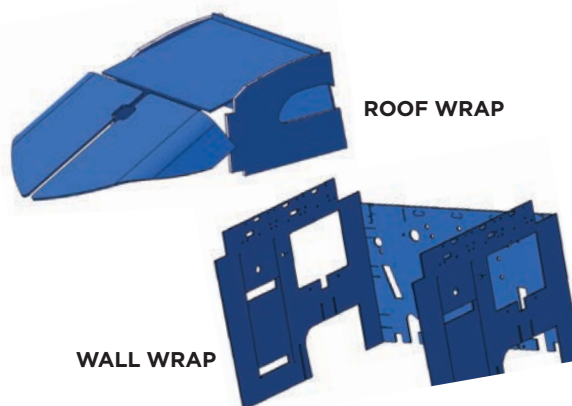
From moisture absorption to flame resistance, Thinsulate is available in a range of styles that can be tailored to suit application needs.

### MAGNIFIED FIBER STRUCTURE OF THINSULATE INSULATION



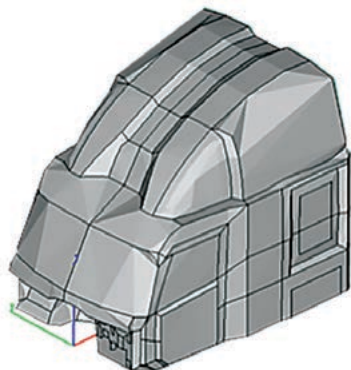
The thicker polyester fibers add loft, strength and stability, while the extremely fine polypropylene fibers allow for high-energy absorption without adding weight.

### We've got you covered.



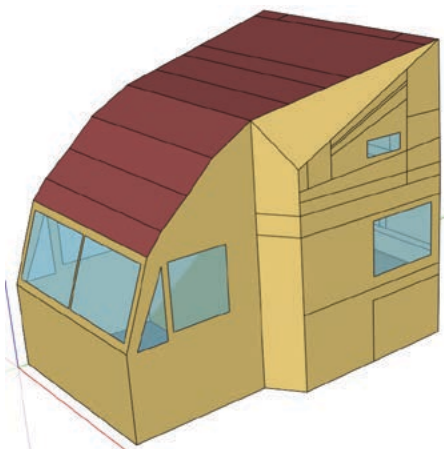
## ▶ Simulations

### A SIMULATION OF SOUND



- ▶ Vibroacoustics Simulation Software (VA One) is used to predict in-cabin sound pressure levels using Statistical Energy Analysis (SEA).

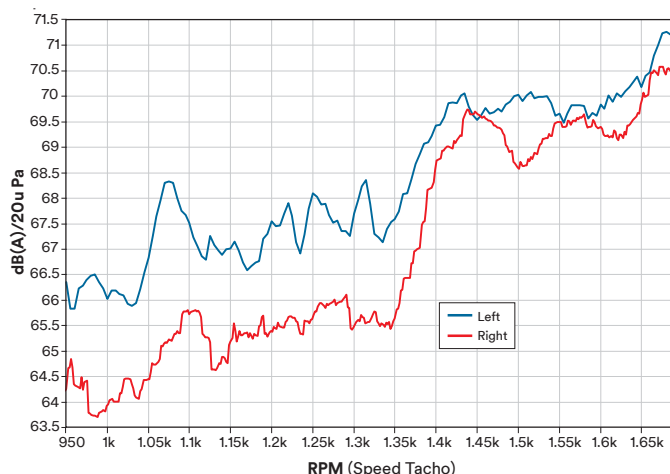
### GEOMETRY AND HEAT



- ▶ Cool Calc advanced thermal simulation software is used to calculate and predict cabin thermal distribution under varying conditions and HVAC load estimation.

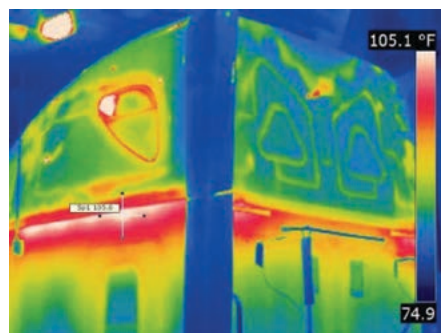
## ▶ Acoustic/Thermal Tests

### SOUND PRESSURE LEVEL (SPL) TEST AT DRIVER'S EAR LOCATION DURING 10-GEAR RUN UP



- ▶ In acoustic system level testing, sound pressure is measured against speed to determine how engine load change impacts the driver. This test can help pinpoint which components are producing sound at which speeds, to better understand the overall acoustic issues of the vehicle.

### INFRARED IMAGE OF HEAT TRANSFER/LEAKAGE DURING TESTING



- ▶ Thermal imaging tests allow our technicians to find the weak points in a cabin when exposed to different conditions. They can then find where heat leaks may occur and construct a plan for insulation.

## Technical Information

The data listed in this data sheet are typical or average values based on tests conducted by independent laboratories or by the manufacturer. They are indicative only of the results obtained in such tests and should not be considered as guaranteed maximums or minimums. Materials must be tested under actual service to determine their suitability for a particular purpose.

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