

Your Engineered Solutions Partner

MSC Engineered Materials and Solutions Group

NRGDampTM

Helping Reduce Noise/Vibration On...

- HARD DRIVES
- CABINETS
- ENCLOSURES
- MOTOR HOUSINGS

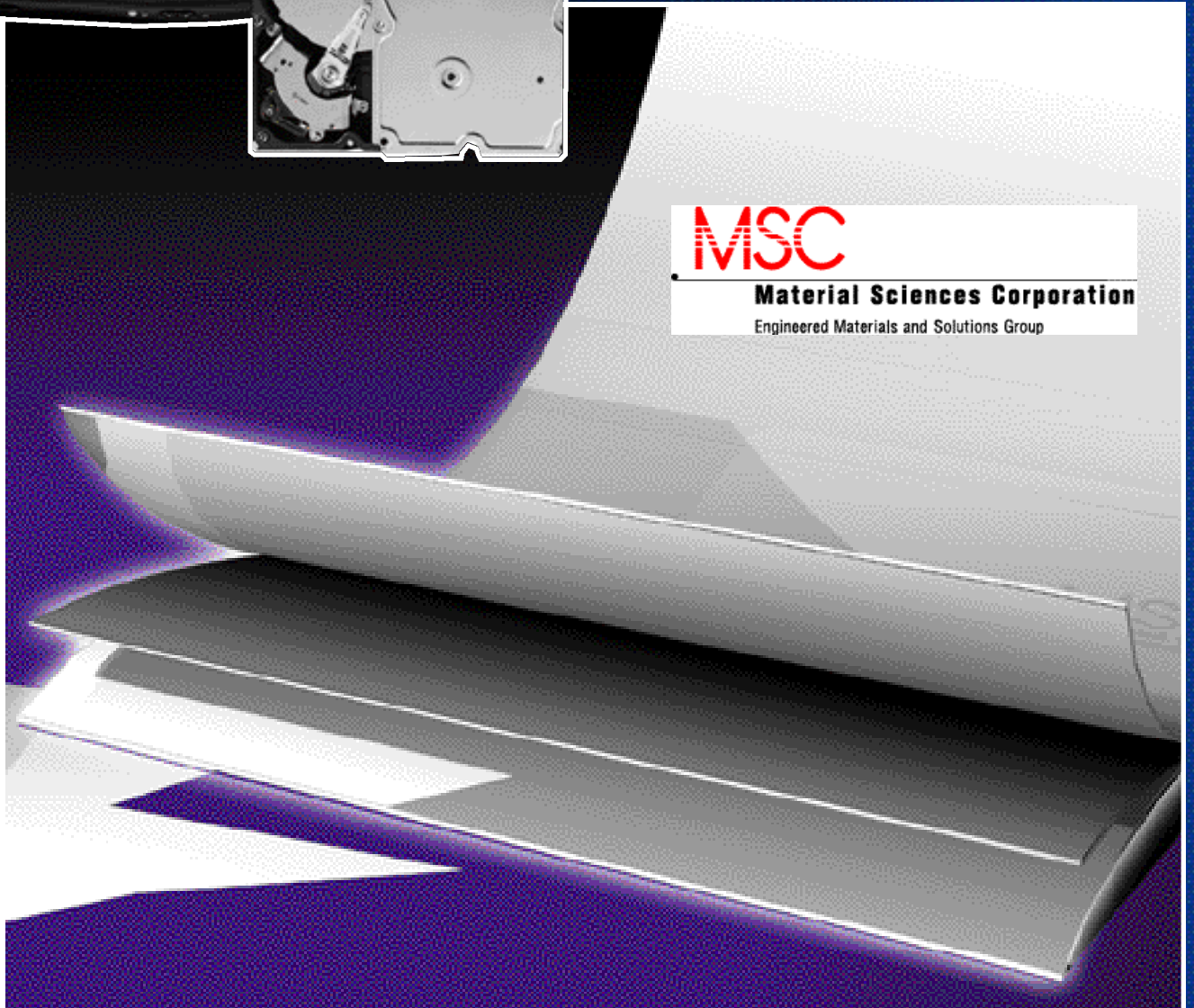
Plus Decorative and Functional Coating Solutions
for Electronic and Electrical Applications



MSC

Material Sciences Corporation

Engineered Materials and Solutions Group





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MSC Engineered Materials and Solutions Group is a global supplier of engineered material solutions. Our products are found throughout the electronics and electrical component industry, helping to solve critical noise, vibration and thermal control problems. We work closely with customers at every stage of their product development to optimize value and performance, as well as improve manufacturability.

Our goal is to provide the best total solution for noise, vibration and thermal control issues by delivering the following services to our partners:

- **Materials Engineering**—damping, forming, strength, stiffness, thermal properties
- **Value Engineering**—by optimization of component design which balances performance, cost and ease of manufacturing—this includes CAE and testing (acoustic, modal, thermal) support
- **Comprehensive engineering support**—design, performance validation, production
- **Integration into supply chain**—global infrastructure and partnerships to supply materials through finished components



Highlighting our approach to innovative product delivery, we constantly strive to:

- **form partnerships with OEM's and their supply chains**
- **balance cost and performance issues**
- **actively engage in component design and validation procedures**
- **provide fast response on a global scale**
- **supply product from strategically located facilities to meet any production requirement**

From our Tech Center in Chicago to our global network of manufacturing facilities, your partnership with **MSC Engineered Materials and Solutions Group** pays off...on your bottom line!

NRGDamp™

Our **NRGDamp™** is a noise and vibration damping, constrained layer composite material comprising two or more metallic substrate layers surrounding an engineered viscoelastic core.



Features include:

- **Mechanical properties are engineered to meet component requirements through selection of metallic skins and core system**
- **The 0.0254mm (0.001") core is designed to eliminate core compression and provides better shape control during forming**
- **Cores engineered to optimize noise and vibration performance for the targeted application. Over 30 core systems are available for applications from -18°C (0°F) to over 150°C (302°F)**
- **Material is compatible with forming (stamping, drawing, bending, roll forming), attachment methods (welds, rivets, adhesives, mechanical locking), and secondary processes (degreasing, cleaning, painting etc.)**
- **Available in coil, sheet or finished parts**
- **Available with various coatings, films and finishes**

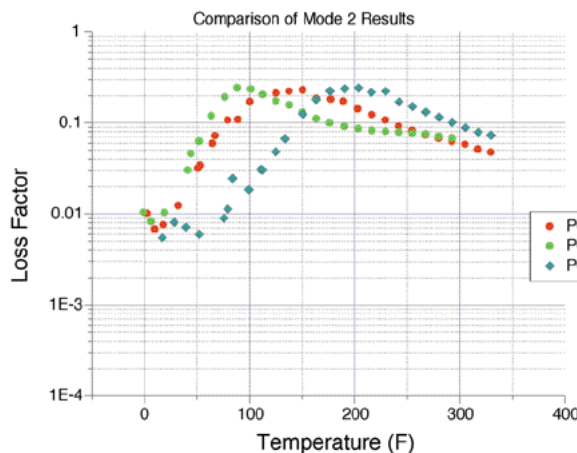
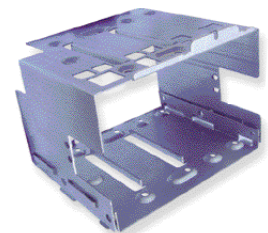


Illustration shows material loss factor, a measure of damping, for various NRGDamp grades.



HARD DISK DRIVE NOISE AND VIBRATION DAMPING PERFORMANCE

The viscoelastic core of **NRGDamp™** can be engineered to provide sound damping over a wide temperature range. **MSC Engineered Materials and Solutions Group** products are designed to significantly reduce hard disk drive and mechanical noise in set top and computer applications.

The **NRGDamp™** value proposition for Hard Disk Drive (HDD) covers... Acoustic testing of **NRGDamp™** HDD covers shows they provide a 9 dBa improvement over solid covers and a 2 to 3 dBa improvement over add-on treatments. Further, **NRGDamp™** HDD covers eliminate 16 steps from the manufacturing versus an add-on treatment. The **NRGDamp™** covers improve performance and simplify manufacturing.

Micro-shear deformation of the viscoelastomer dissipates vibrational energy, thus providing a material with exceptional noise and vibration damping performance. This damping performance can be measured by the composite loss factor. Typically, the higher the loss factor, the greater the material's ability to damp vibration.

THERMAL SOLUTIONS

MSC Engineered Materials and Solutions Group can provide tailored products to help address thermal control problems for electronics including:

- Elimination of foam noise absorbers
- High conductivity laminates of AL, Cu or Brass
- Innovative designs to provide intrinsic heat sinks
- Elimination of shields/barriers

TESTING AND EVALUATION

MSC Engineered Materials and Solutions Group has extensive in-house noise and vibration testing capabilities. We offer these services to assist customers in optimiz-

ing their designs. Additionally, we have the ability to characterize the physical and mechanical properties of our materials. Some of our test capabilities include:

- Acoustic sound power and intensity measurement
- Modal analysis
- Oberst Beam
- Out-gassing assessment
- Adhesive peel and shear strength tests
- Thermal and Environmental aging chamber tests

CAD/CAE

MSC Engineered Materials and Solutions Group has developed our proprietary **DAMP®** software, which uses exclusive code to convert the FEA (Finite Element Analysis) mesh of a solid metal component into a multi-layered composite. This process calculates the differing material properties of our **NRGDamp™**. With our CAE tools, we can predict:

- Natural frequency of the components
- Effects damping will have on vibration
- Stiffness of laminated materials
- Mechanical properties for input to structural modeling programs

APPLICATIONS ENGINEERING

Our team of Applications Engineers works closely with customer R&D, design, engineering and manufacturing personnel to provide:

- Proper material selection
- Design and fabrication optimization for overall value
- Testing and validation protocol
- Instruction and on-site support for fabrication of **NRGDamp™** materials, including tool design
- Secondary process support work-up and pilot plant for paint, powder and e-coating

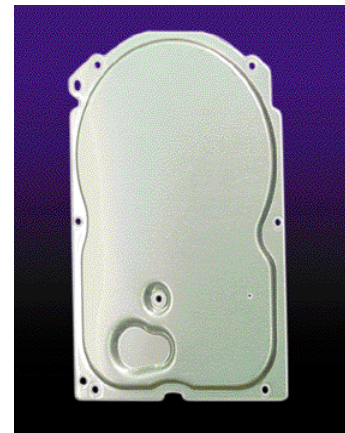
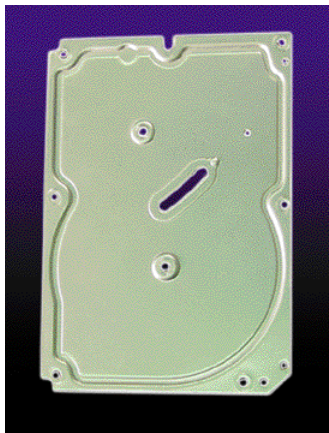
PROTOTYPE AND PRODUCTION COMPONENTS

MSC Engineered Materials and Solutions Group understands there are unique challenges and, frankly, residual myths associated with fabricating parts from laminated, constrained layer materials. In response to these challenges, we have developed our own capabilities for manufacturing finished product at the prototype and production levels. Most pieces can be produced with very short lead times and at very competitive costs.

OTHER APPLICATIONS

MSC Engineered Materials and Solutions Group NRGDamp™ products have also provided value for a range of other electronics applications including:

- Motor mounts
- Fan shrouds/enclosures
- Attachment clips
- DASD cages
- Add-on treatments for enclosures
- Servers
- Telecommunication racks



NOISE REDUCTION IN A SET TOP BOX

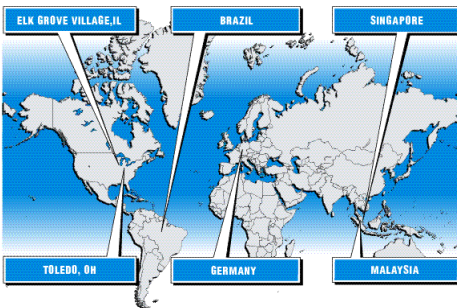
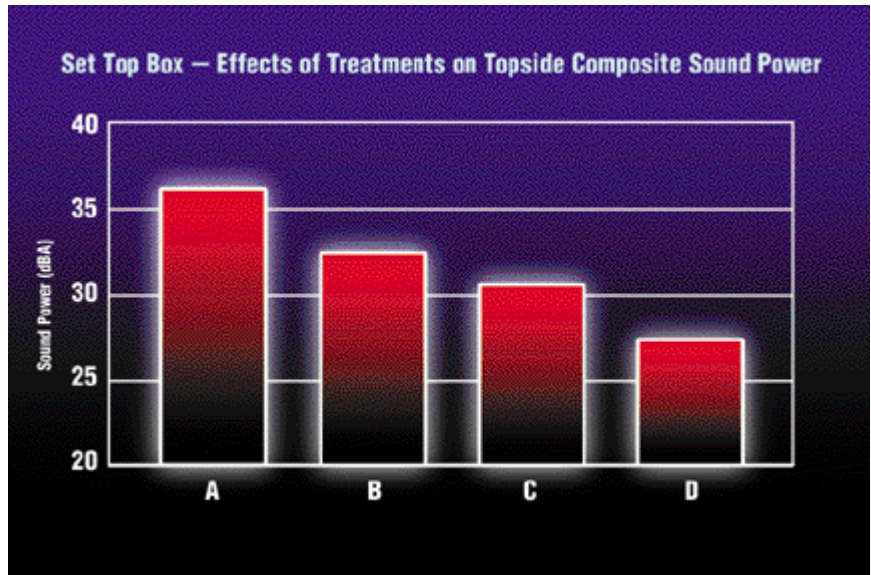
A study was performed on a digital video recorder, containing a hard disk drive. This study focused on minimizing the operating noise of the overall system through the use of an **NRGDamp™** drive bracket and MSC-designed isolating grommets.

Sound intensity was measured above the top surface of the box and used to calculate the composite sound power of the system. Four drive mounting variations were examined as part of this study:

- **Assembly A (Baseline):** Drive was hard-mounted into a steel bracket
- **Assembly B (Laminate Bracket):** Drive was hard-mounted into a bracket made with **NRGDamp™**
- **Assembly C (Laminate Bracket & Isolators):** Drive was mounted into an **NRGDamp™** bracket with MSC- designed isolating grommets
- **Assembly D (Optimized Laminate Bracket & Isolation):** Bracket design modified to take full advantage of **NRGDamp™** material properties

Drive noise was significantly reduced through the use of **NRGDamp™** material and isolation. The sound power values resulting from the different assemblies are shown in the table below. **MSC Engineered Materials and Solutions Group** strives to

support the performance and cost goals of our customers, through the use of our material manufacturing resources, engineering and test capabilities, as well as unmatched service and product delivery system.



We deliver value, every day, to our electronic and electrical partners. This is the real MSC trademark.

MSC Engineered Materials and Solutions Group has facilities in the U.S., Germany, Brazil, Singapore and Malaysia, plus a network of joint venture partners and factory representatives to serve you.

We welcome your inquiry.

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OTHER MSC ENGINEERED MATERIALS AND SOLUTIONS GROUP PRODUCTS

MSC Engineered Materials and Solutions Group delivers an array of decorative and functional coating solutions for electronics and electrical applications including:

- **Electrogalvanizing**—provides corrosion resistance and aesthetics
- **Fingerprint coatings**—protects appearance of surfaces during assembly and handling
- **Prepainting of metal**—eliminates processes associated with post-painting

- **Decorative laminates**—visual appearance, texture and durability for exposed surfaces
- **Powder Cloud®**—unique appearance and durability for exposed surfaces

Significant cost savings can be obtained through applying coatings and decorative treatments to metal substrates before forming. Our integrated manufacturing (in-line galvanizing and coating) offers the potential for further efficiency on high-volume applications. MSC provides the expertise to assess the unique benefits of each of these solutions.



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