Advances in Shielding Materials

Presented by:
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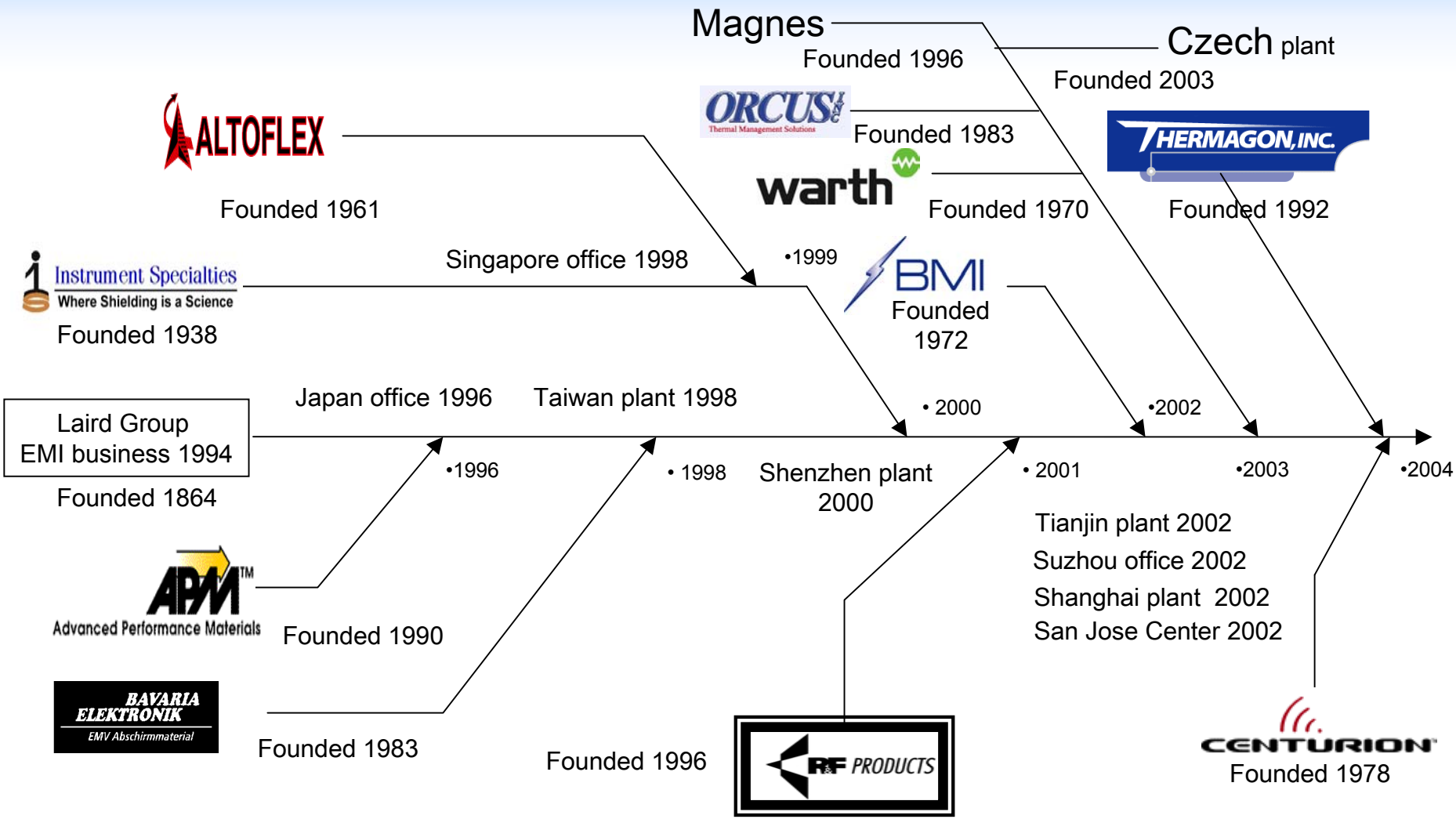
Laird TECHNOLOGIES

Laird Technologies History



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Global Facilities

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MaxAir

Polycarbonate Plastic Honeycomb:

- **Round Straws Glued Together**
- **Standard Cells Sizes 0.125” (3.2mm) and 0.250” (6.4mm)**
- **Standard Panel Thickness 0.25” (6.4mm) and 0.50” (12.7mm)**
  - **Other Panel Thickness Are Available Upon Request**

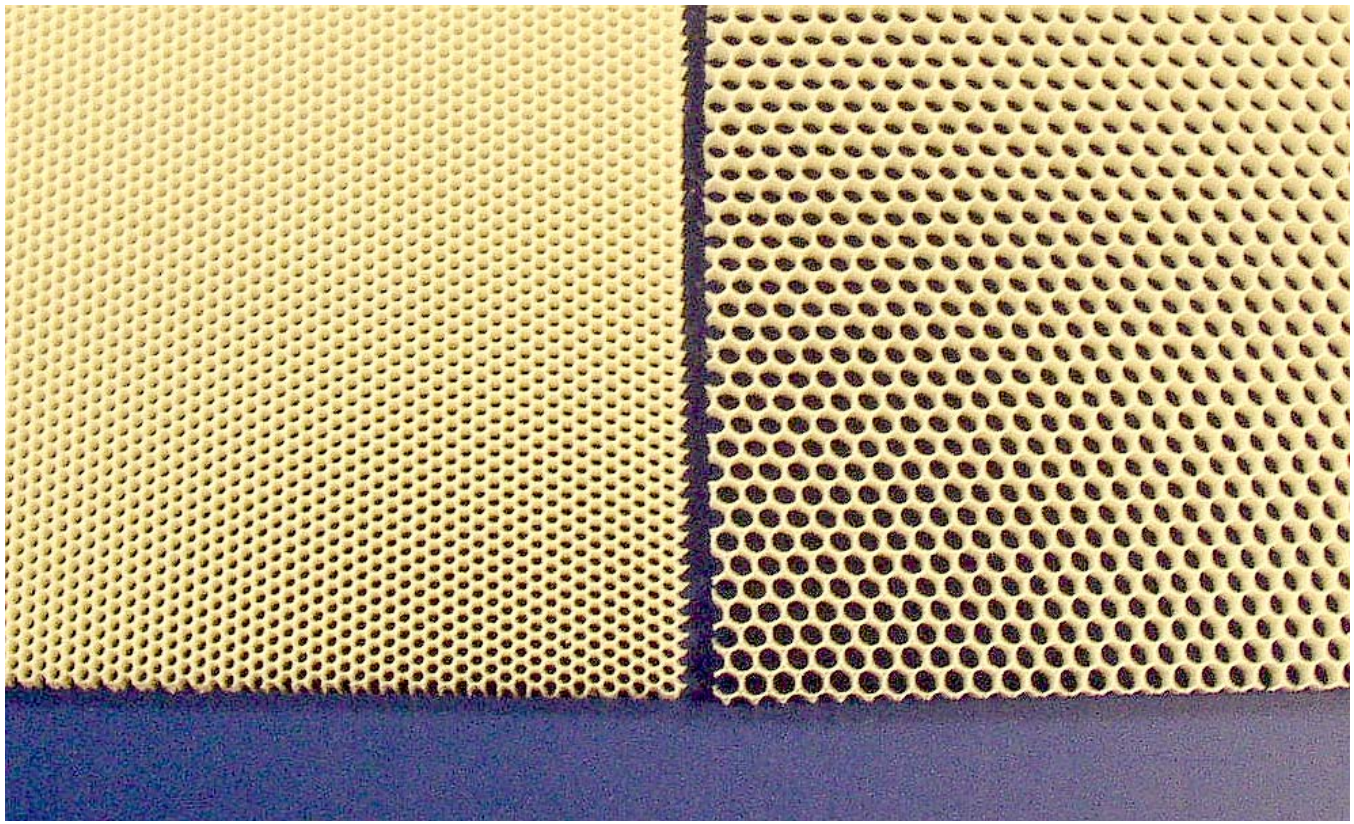
MaxAir

Metallization:

- Base Layer 30µin Electroless Cu - Conductivity
- Top Layer 10µin Electroless Ni – Corrosion Protection
- Available Flame Protection
  - V0 Coating
  - Intumescent Coating

MaxAir

Polycarbonate Plastic Honeycomb:



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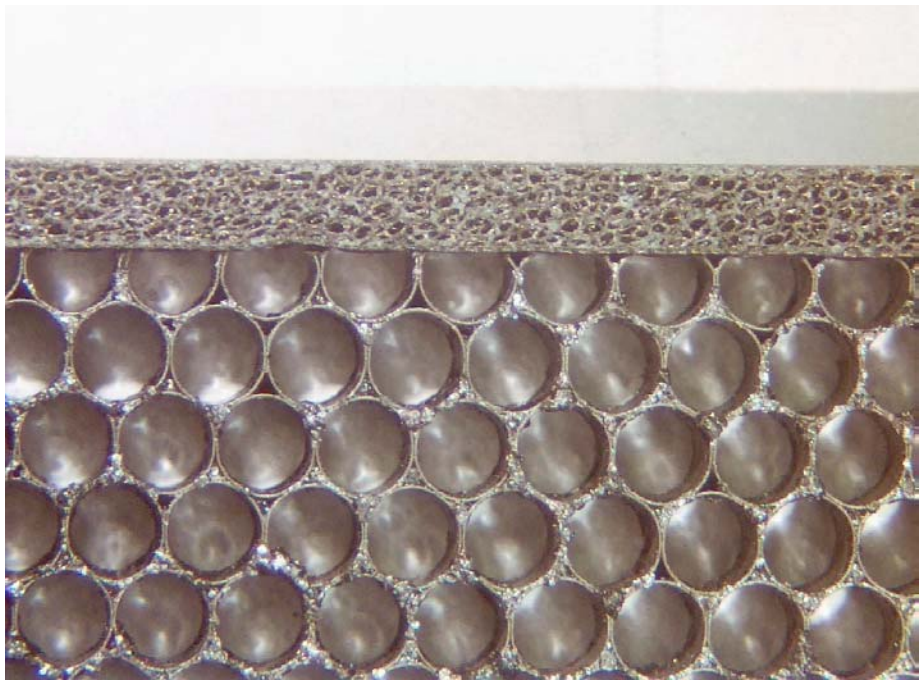
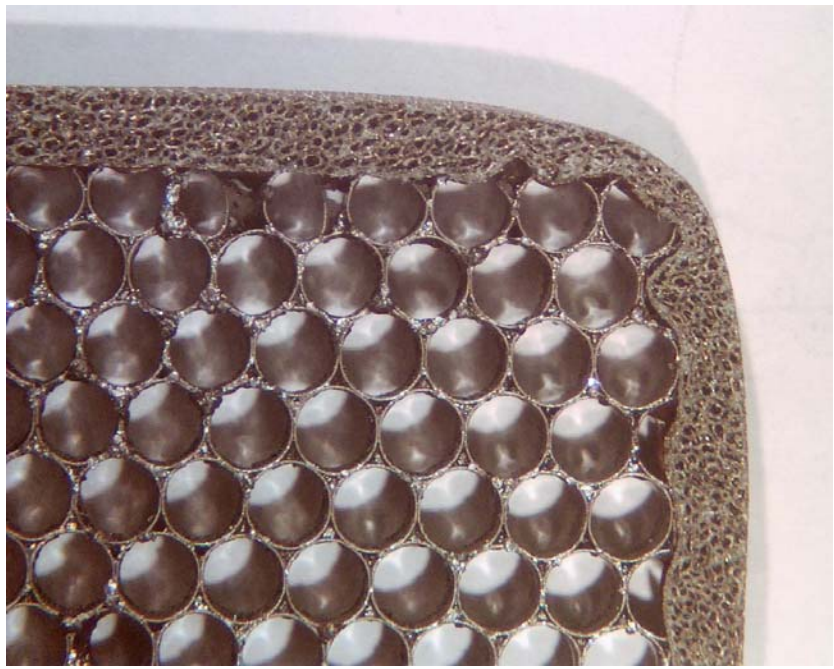
MaxAir

Edge Construction:





Conductive Foam

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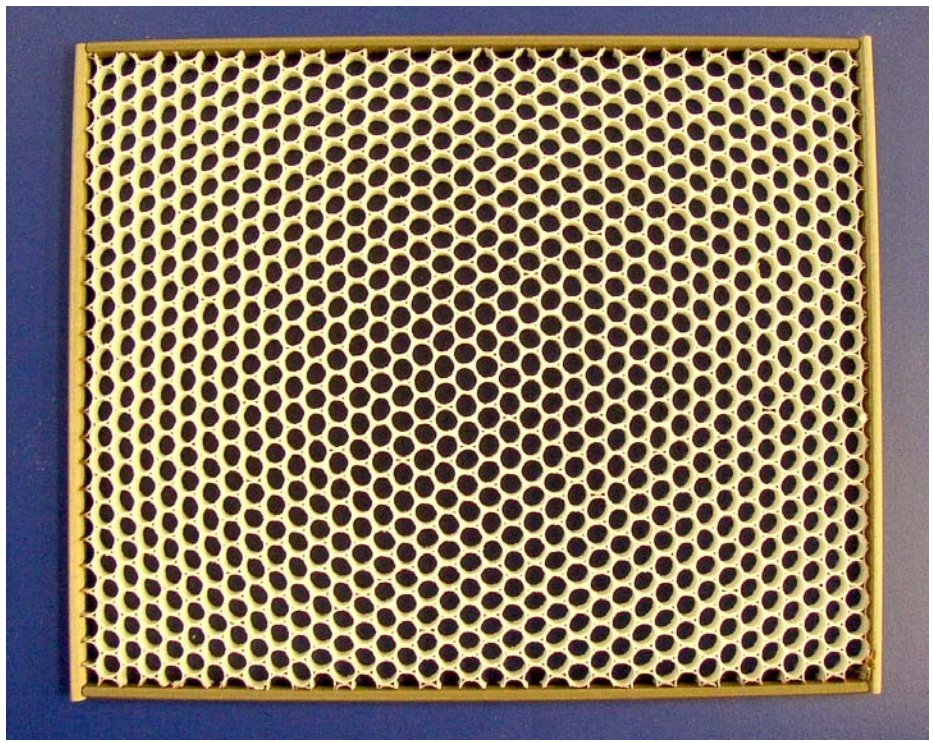
MaxAir

Metallization:

MaxAir w/V0 Coating



MaxAir w/Intumescent Coating

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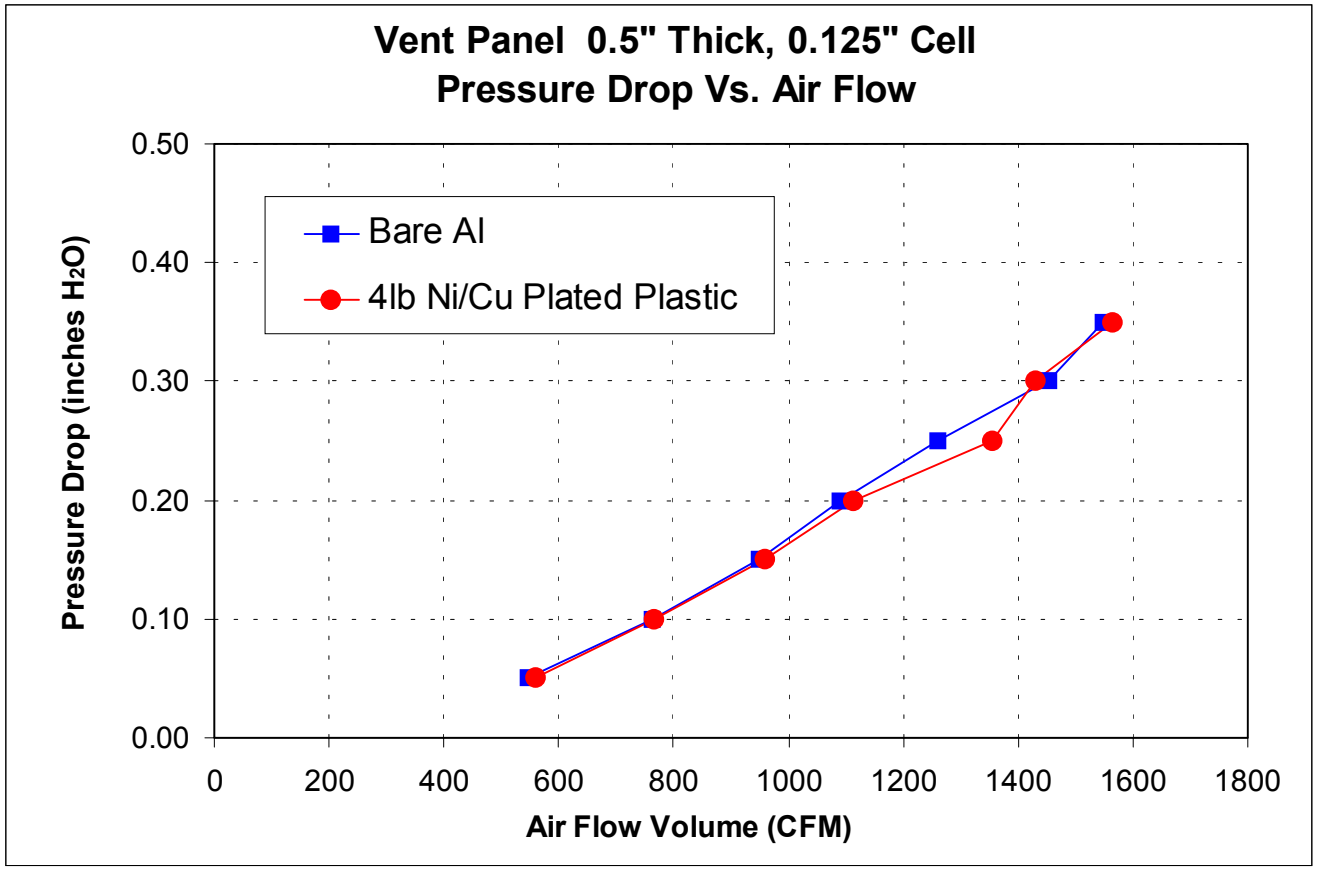
MaxAir - Product Performance

Airflow – Pressure Drop Same As Equivalent Al Honeycomb



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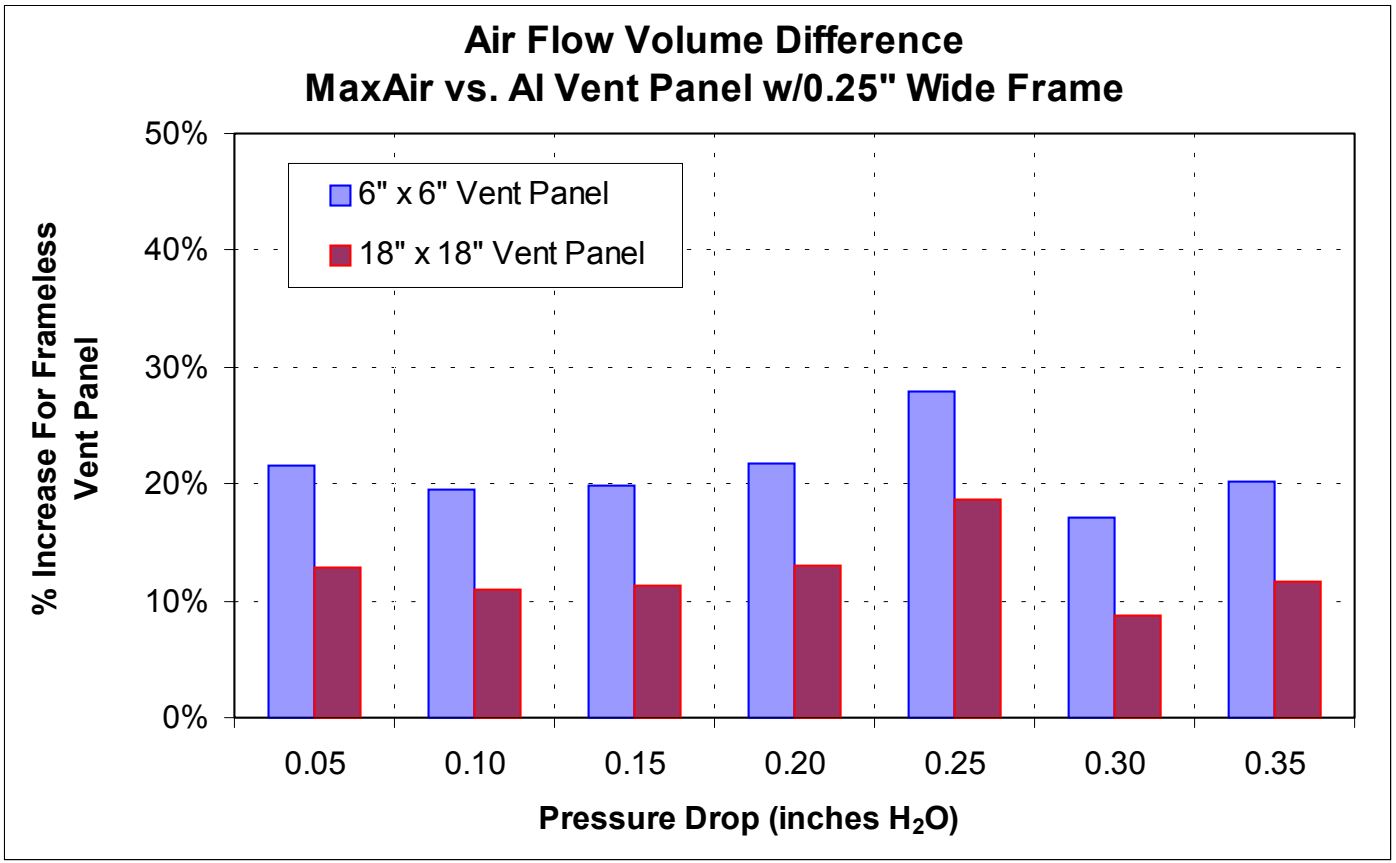
MaxAir - Product Performance

Airflow – Usable Cooling Area Greater Than Equivalent Framed Al Vent Panel



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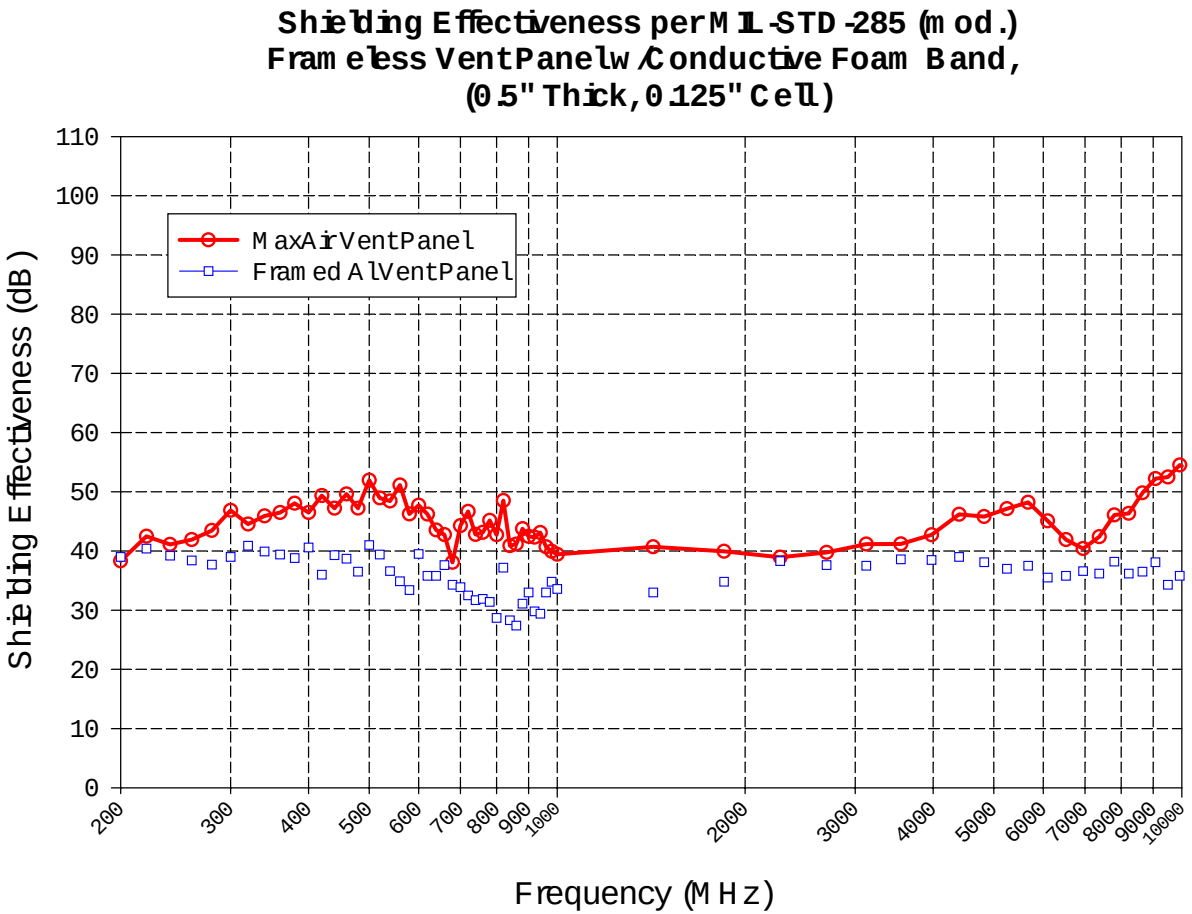
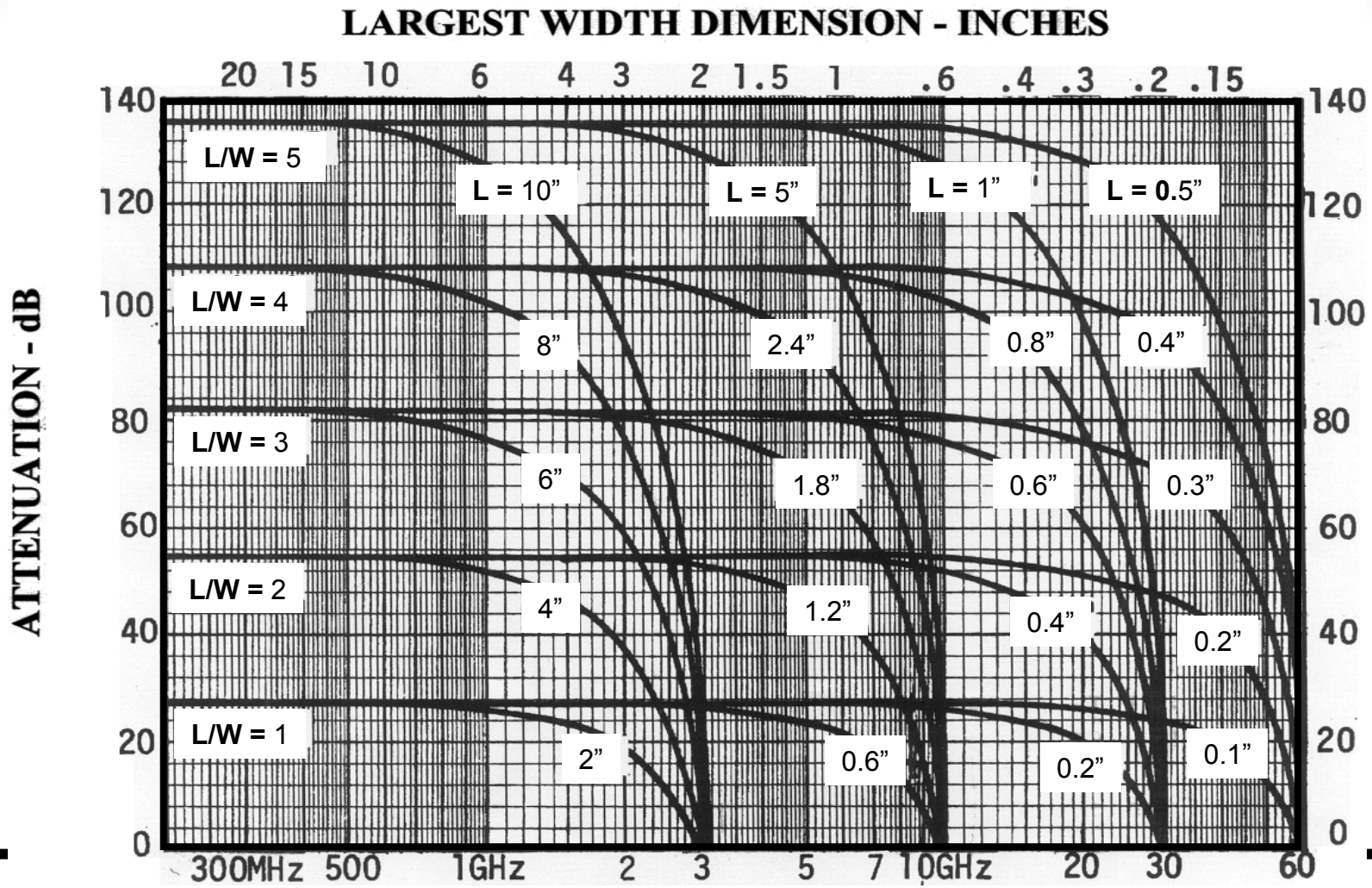
MaxAir - Product Performance

Shielding – Same As Equivalent Al Honeycomb



WAVEGUIDE ATTENUATION



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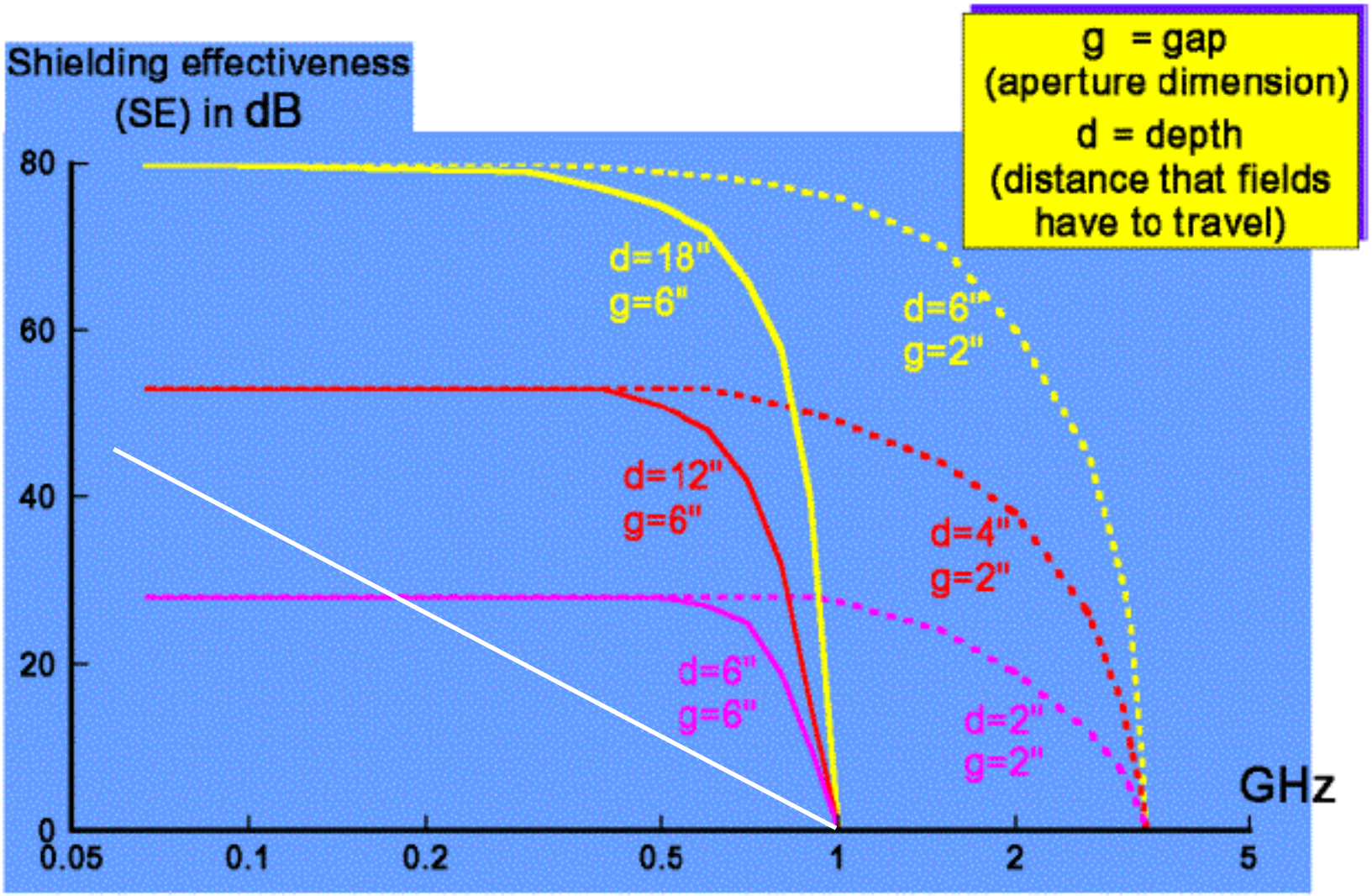
Some waveguides below cut-off



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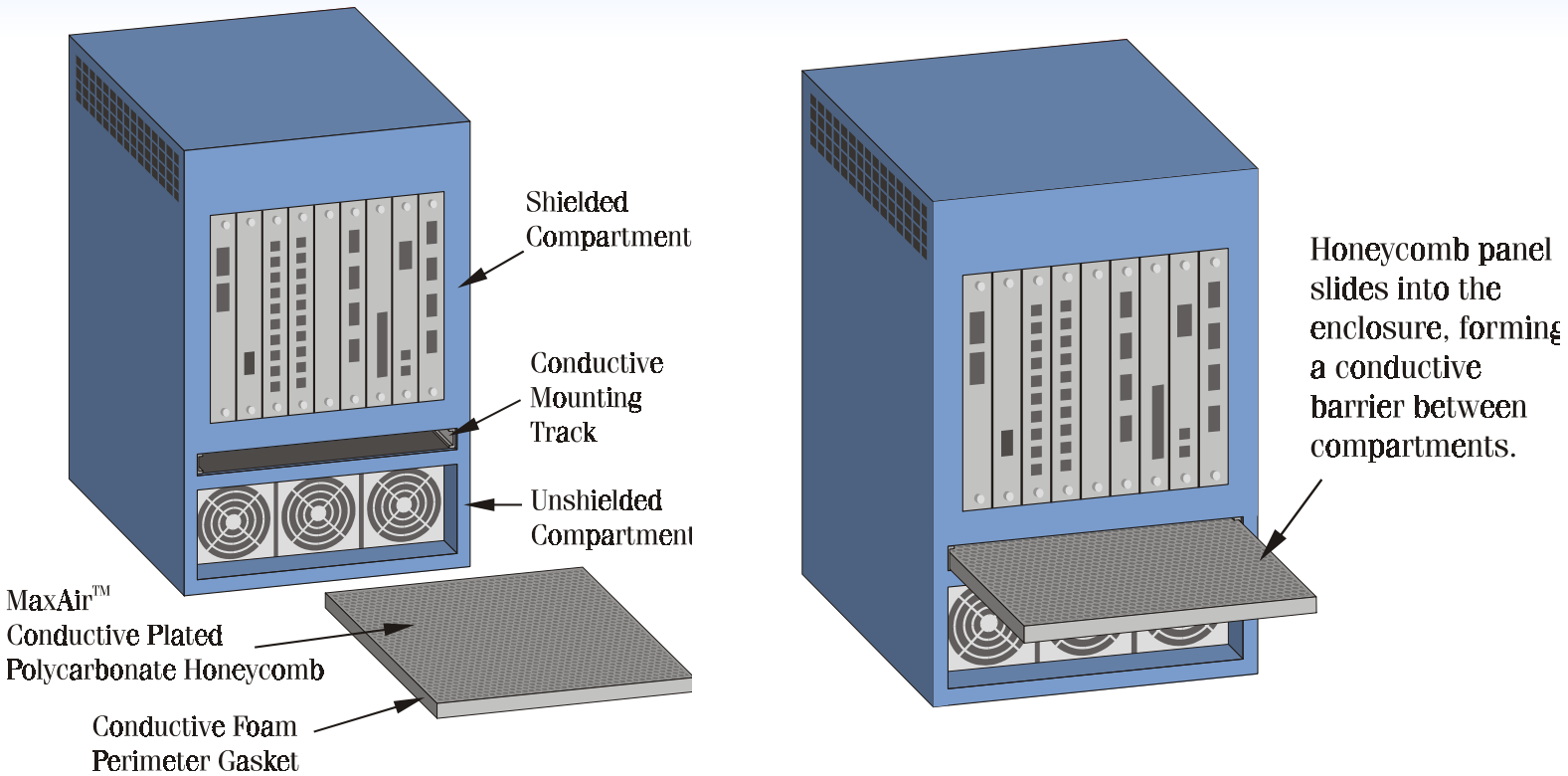
MaxAir - Installation



Horizontal Installation

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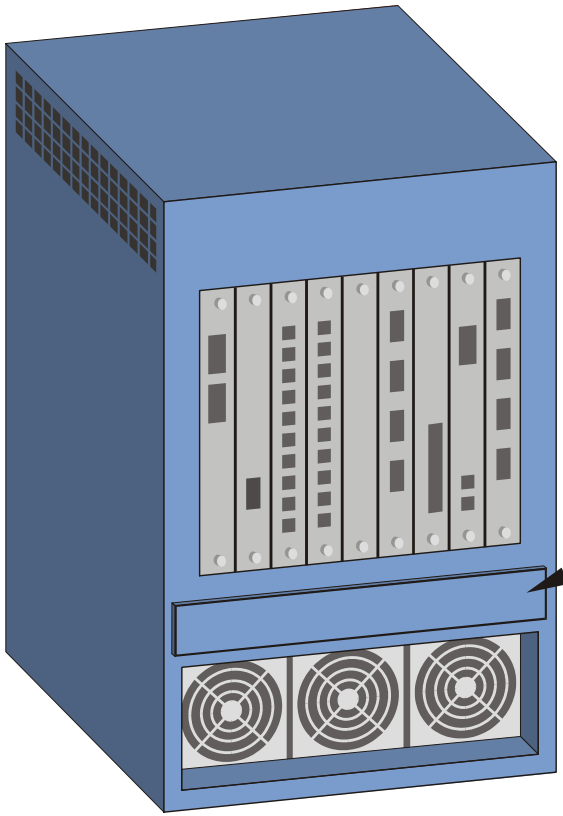
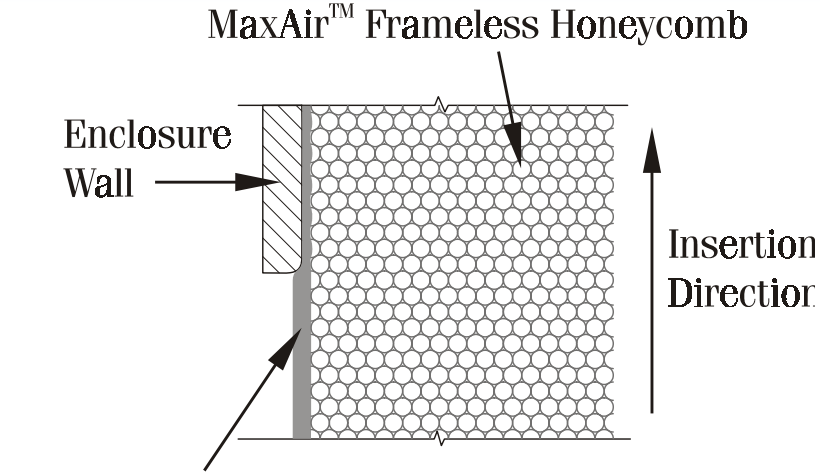
MaxAir - Installation



Cover plate with EMI gaskets grounds front of honeycomb to the enclosure.



Horizontal Installation

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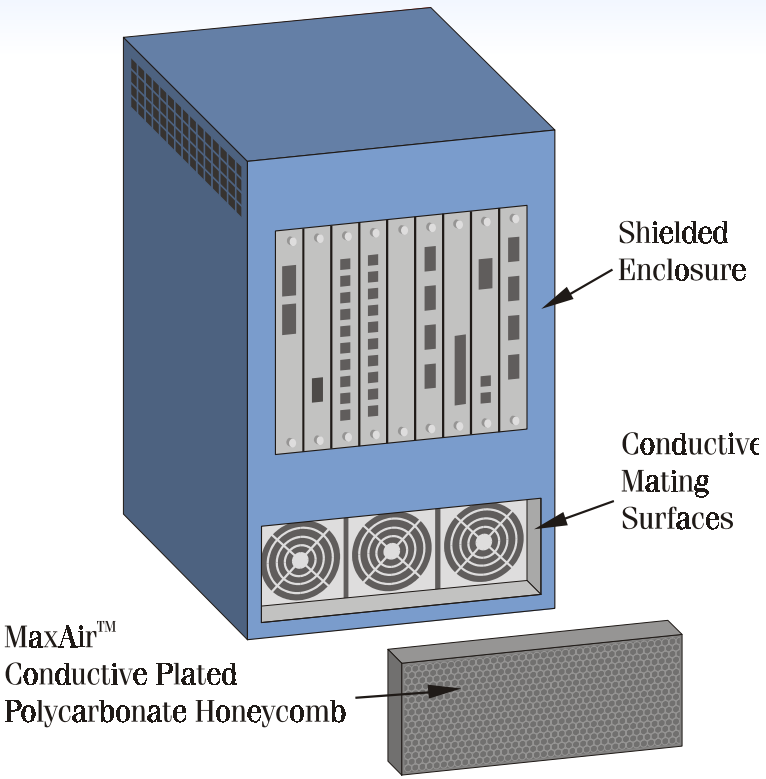
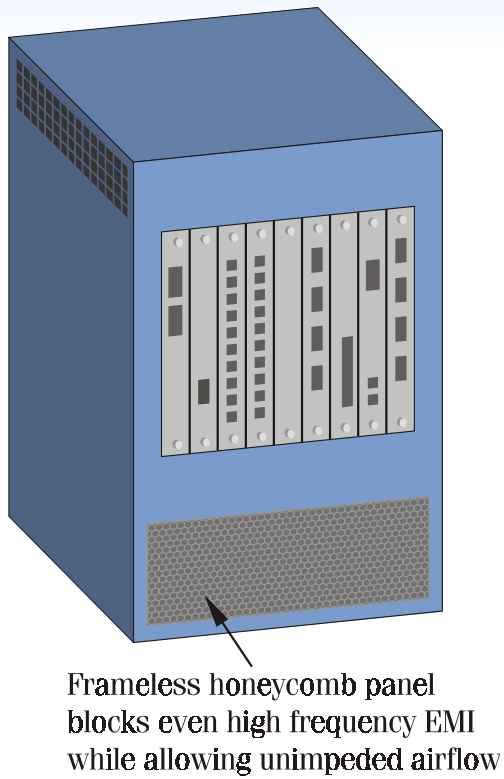
MaxAir - Installation





Vertical Installation

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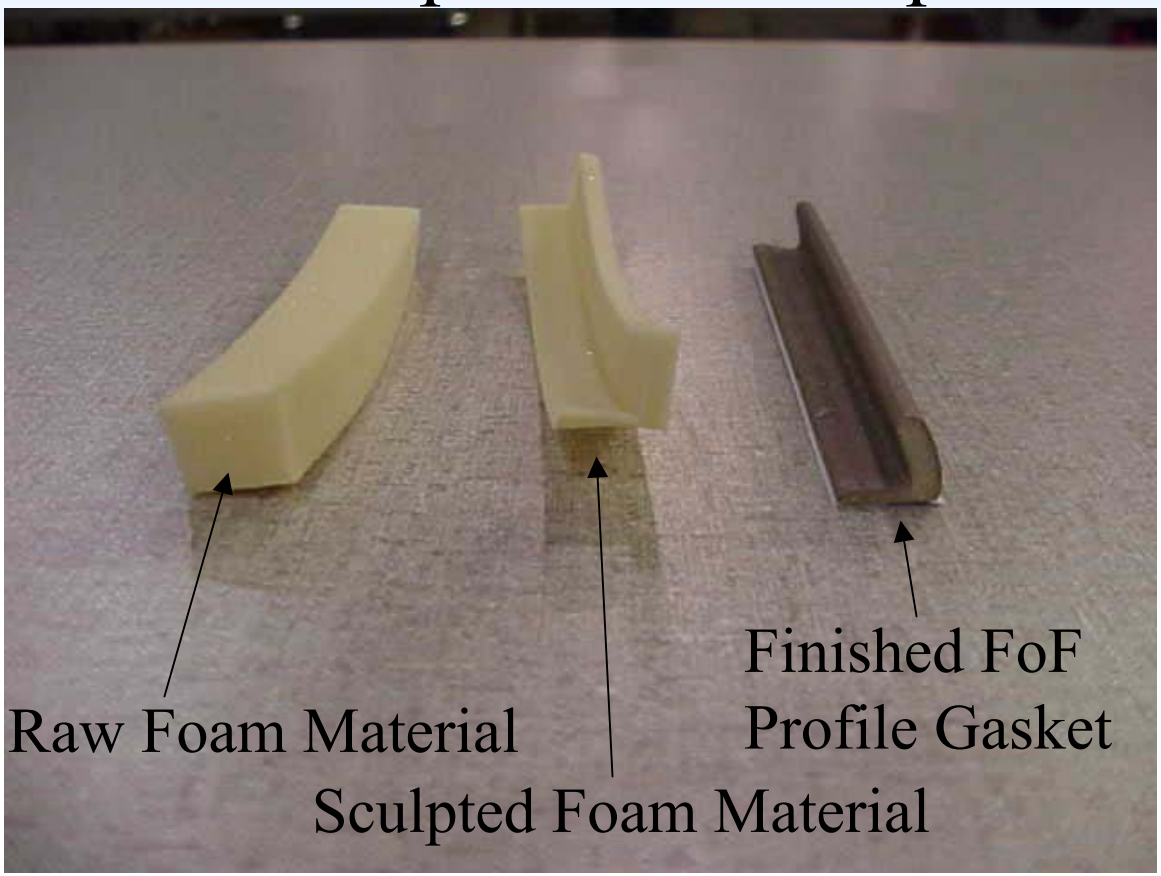
Sculpted Foam

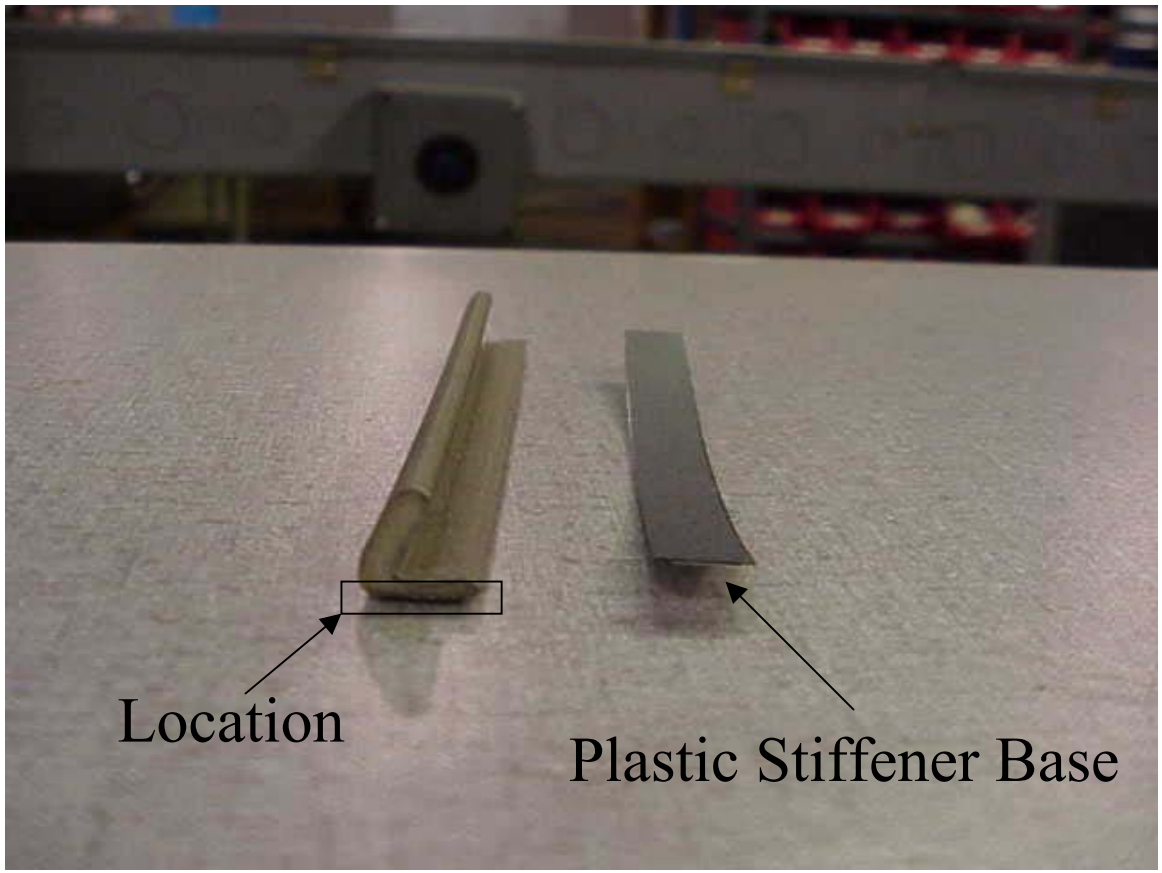
The foam is “sculpted” into the profile shape.



Only the foam core has changed. No plastic stiffener base is required for application or for the manufacturing process

What is the plastic stiffener base?

The plastic stiffener base acts as a manufacturing aid in the Continuous Urethane Extrusion (CUE) process.



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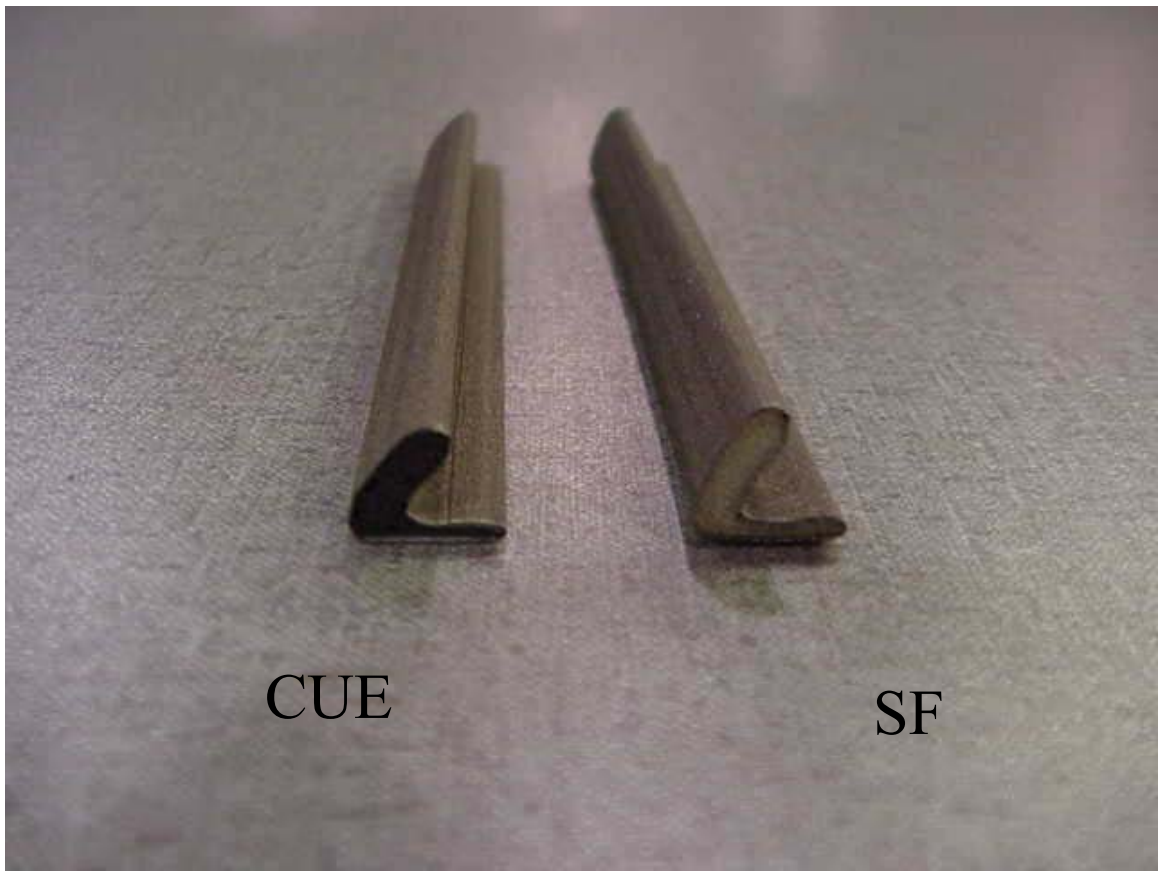
Visual Differences

The SF core is a tan/yellow color while the CUE foam is a charcoal color.



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The Plastic Stiffener Base Is Not Required In Sculpted Foam

- The new manufacturing process allows the flexibility to use or not use the plastic stiffener base during production.
- The new foam core also allows the gaskets to be applied without the plastic stiffener base.

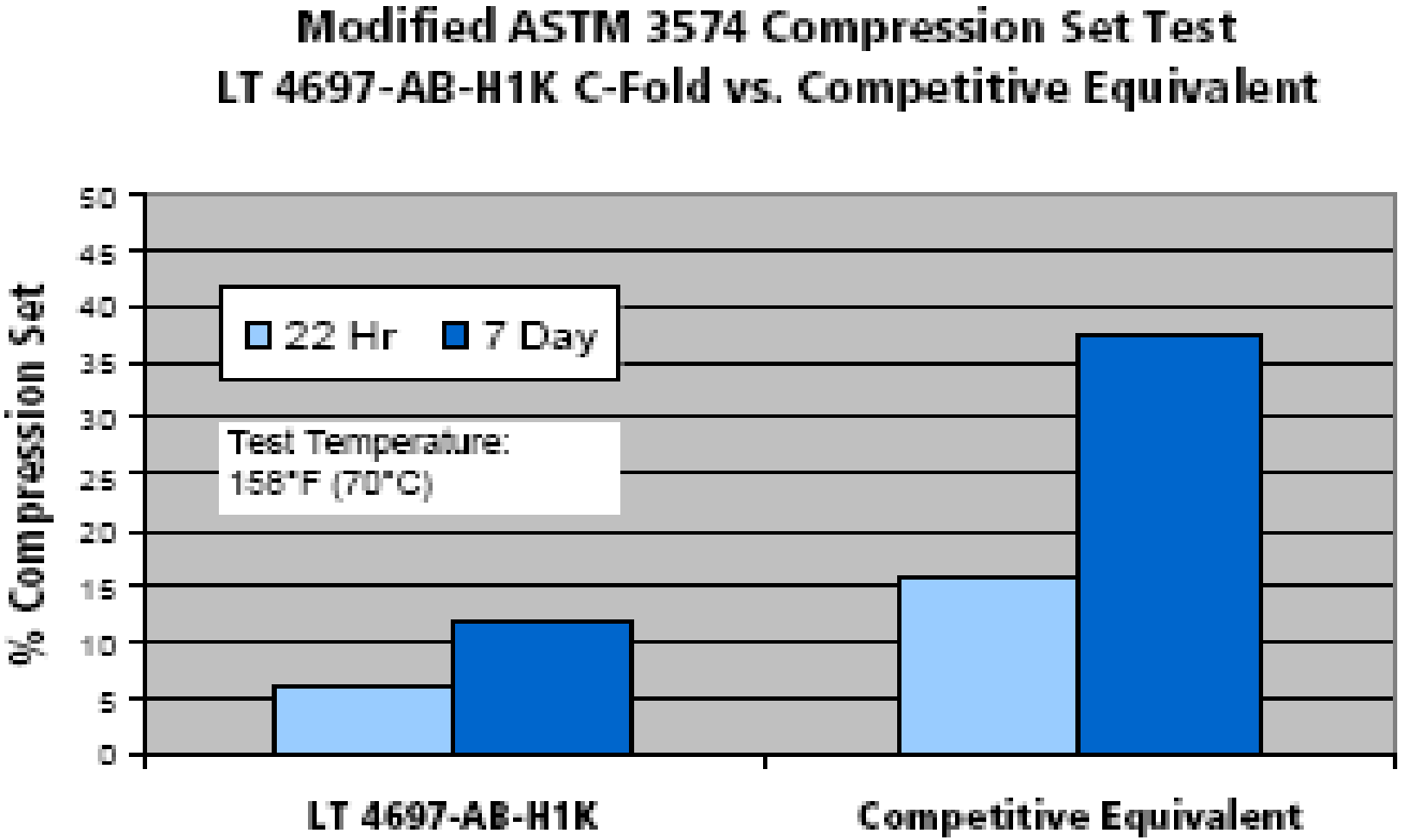
Gaskets Without A Plastic Stiffener Base May Be Preferred

- The plastic stiffener base is a rigid body, which will not compress; a 100% foam gasket allows the gasket to be “softer”, requiring less force to deflect.
- Gives improved performance with at a reduction in cost.

Better Application Performance

- Superior compression set values; in many cases the Sculpted Foam Product is 50% better.
- Improved compression force; when the gasket is compressed greater than the recommended 50%, compression force is reduced by ~half.

Compression Set



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Conductive Foam

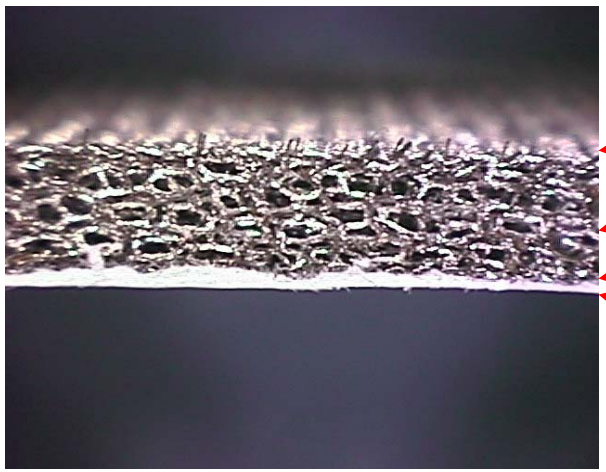
Polyester Mesh Bonded to Top and Bottom Surfaces of Urethane Foam.

Silver/Copper/Nickel Metallization.

Metallized Foam Laminated to Full Width Release Liner with Random Coat Adhesive.

Conductive Foam Structure

100% of Substrate is Metallized



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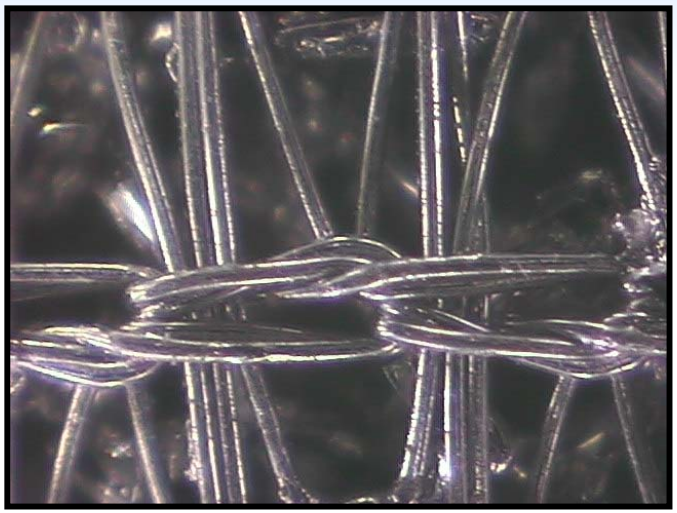
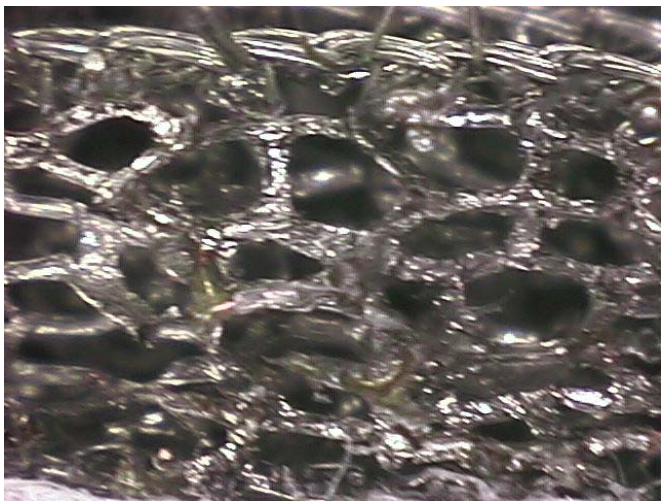
Conductive Foam Structure



Standard Plated Polyester Mesh



Reticulated Urethane Foam (60ppi)
Allows For Uniform Plating Throughout Product While Providing A More Direct Conductive Path And Strong Compression Set Resistance

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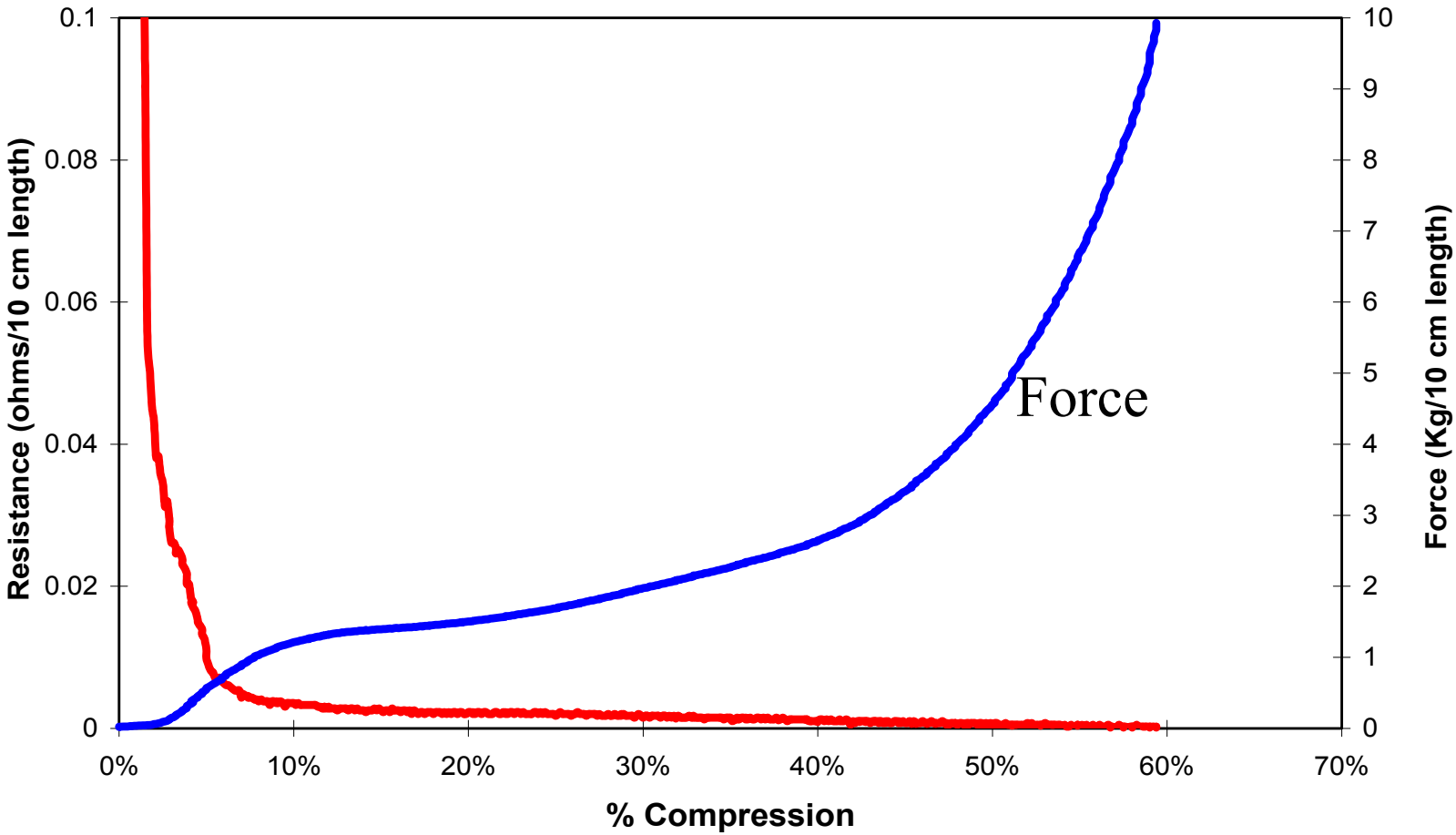
Force Resistance Graph of APM Ni/Cu Conductive Foam- 5161 Profile



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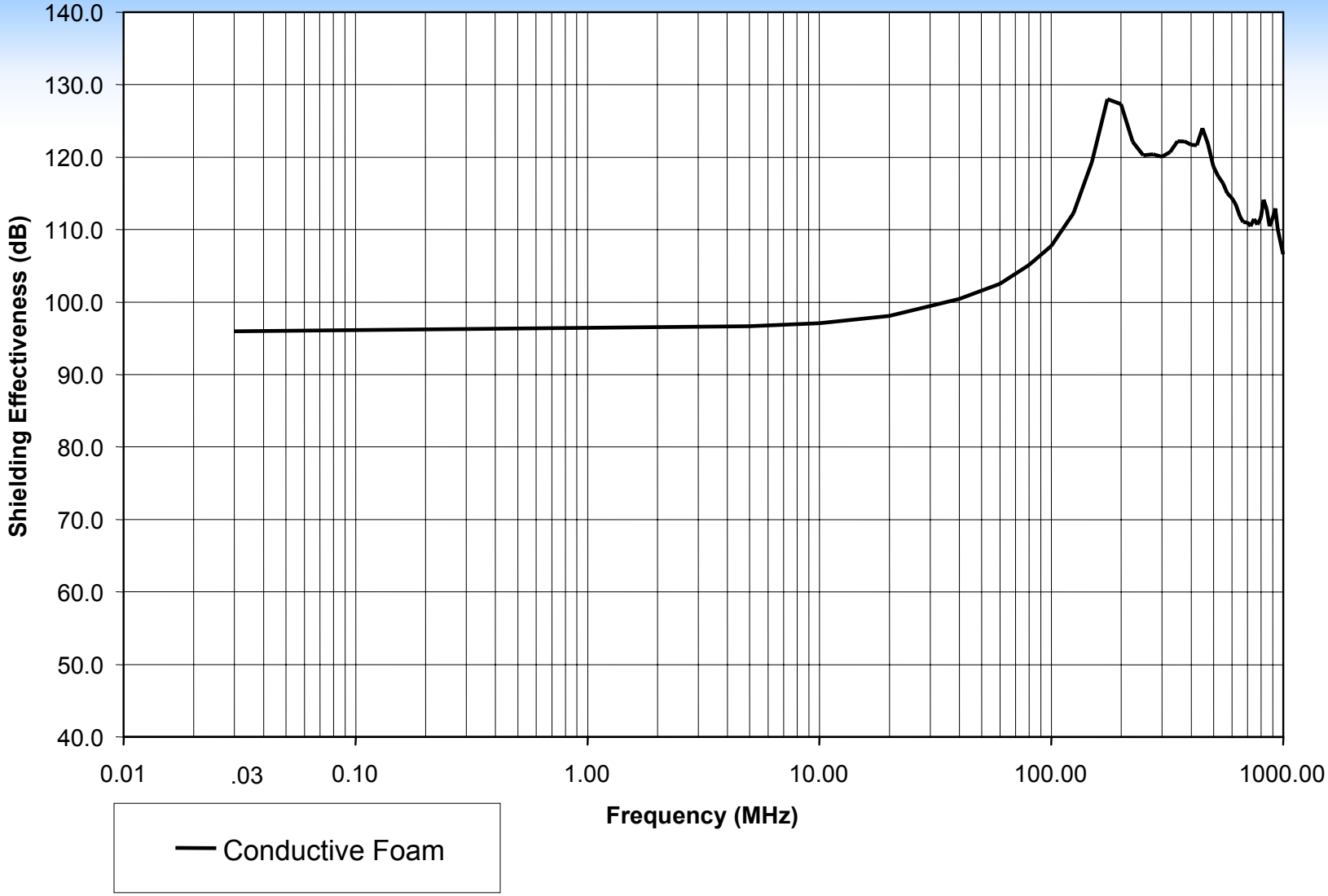
Transfer Impedance Test Per SAE ARP 1705

Conductive Foam - 0.06” H x 0.5” W - Compressed to 40%



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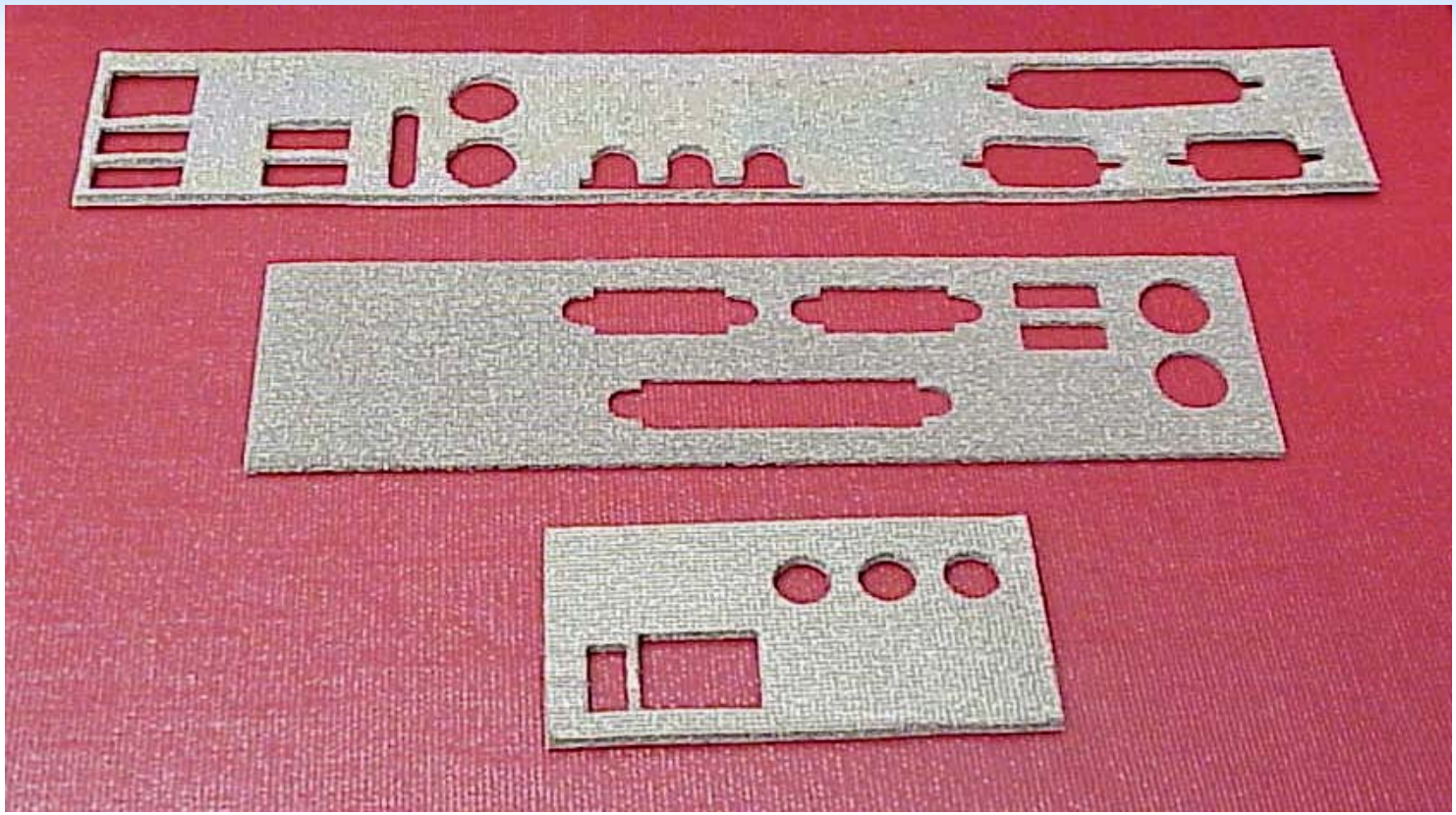
Conductive Foam



I/O Examples of Conductive Foam
UL 94 HB Rated

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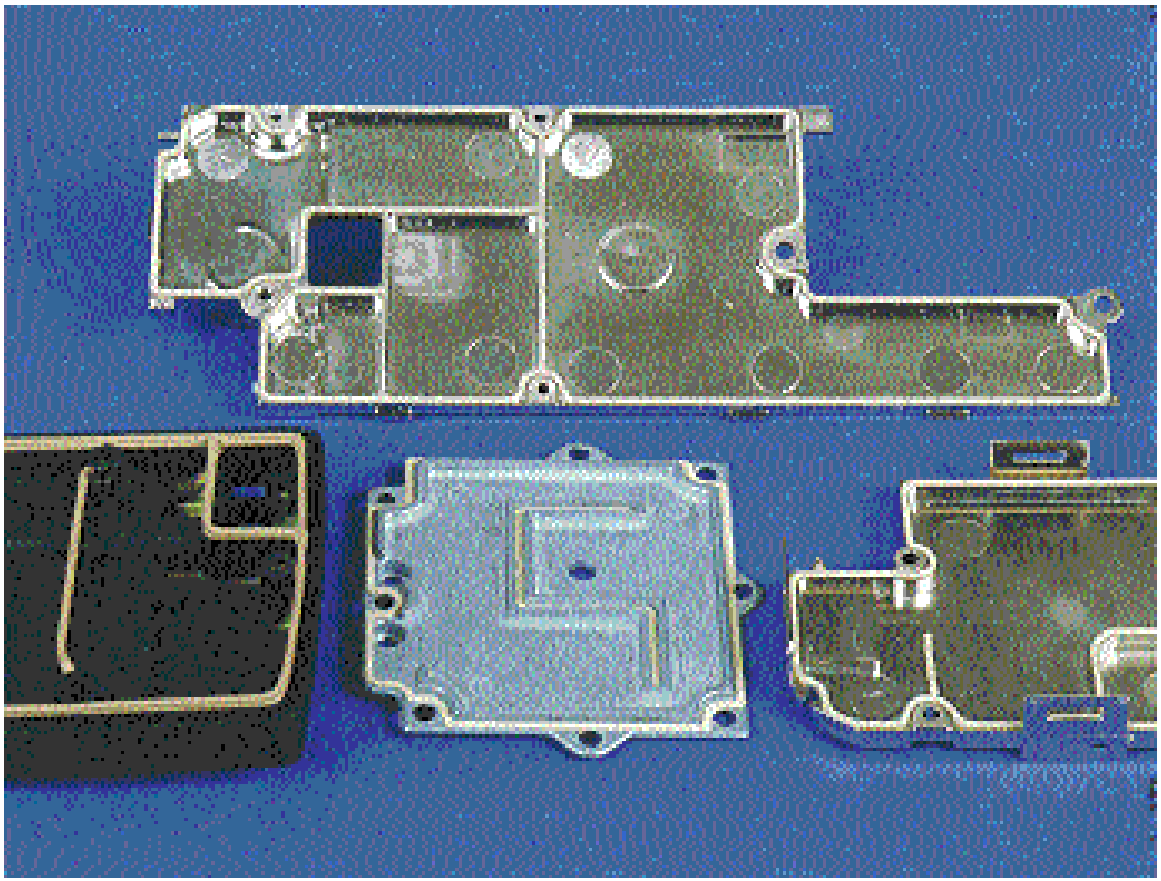
Form-In-Place Elastomer Gaskets



- Applied to die-cast metal or metalized plastic parts.
- Can be applied to non-planar surfaces.
- Can be applied with standard application machinery

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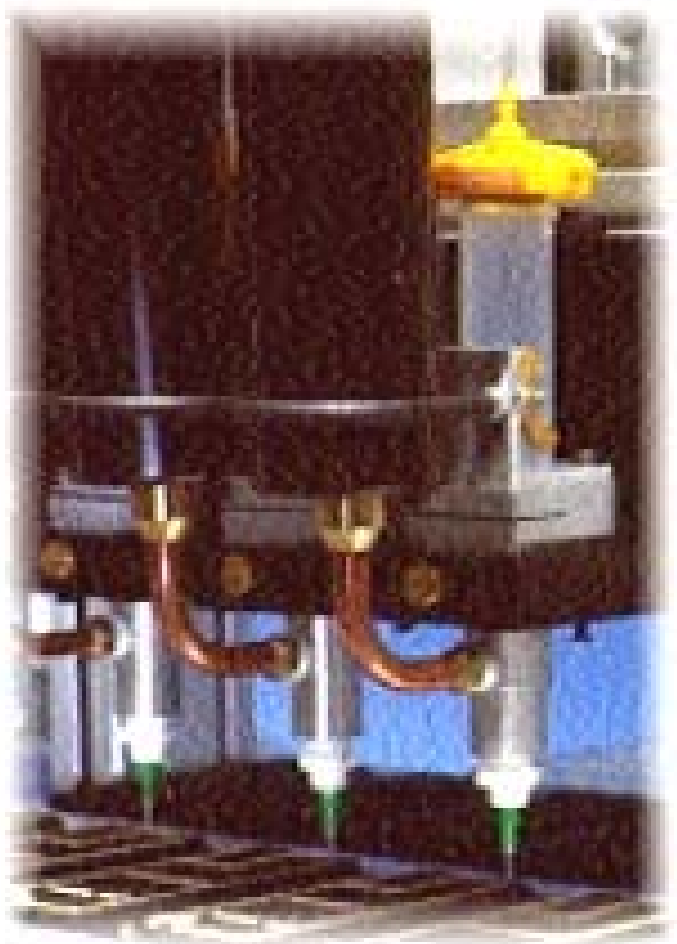
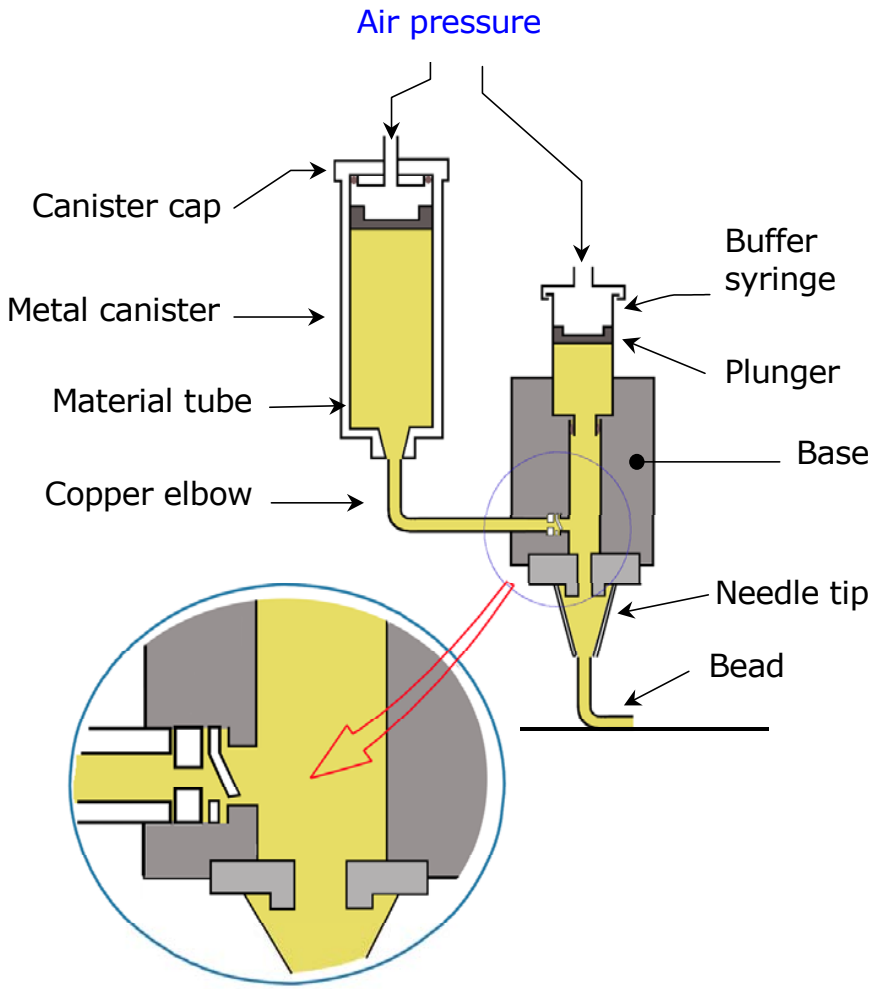
Form-In-Place





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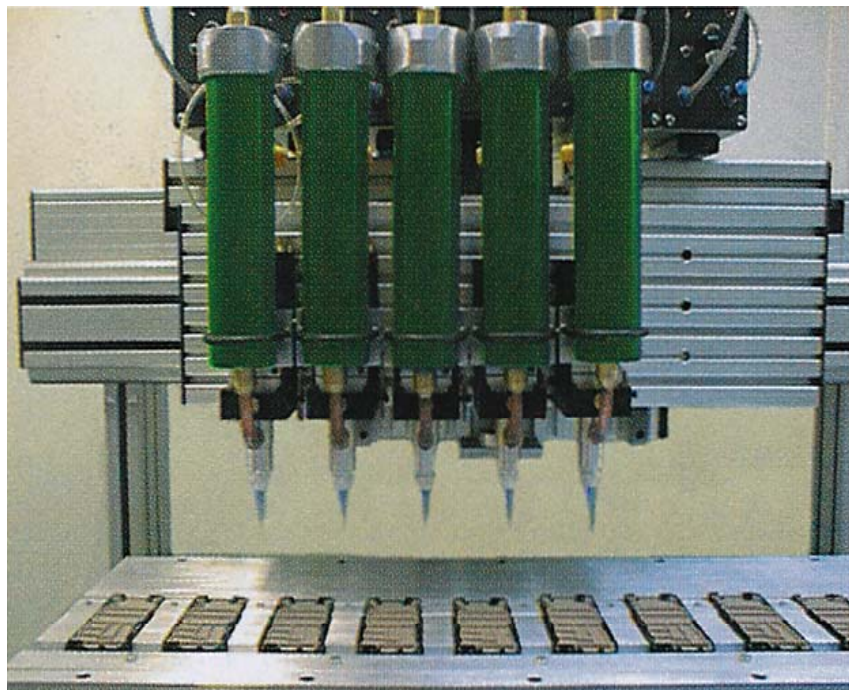
Form in Place Gasket Technology

A robotically controlled dispensed gasket that provides;

- Conductive shielding gaskets on enclosures, covers and components
- Accurately, Repeatedly and Dependably.
- Low cost shielding solution
- Prototypes and Production



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Form In-Place Capabilities

Shielding Effectiveness: 80-100dB to 18GHz

Soft /Low durometer compounds

One component RTV:

Elastic: remains pliable/does not age harden

Superb adhesion: plated plastic, aluminum, zinc, or cast metals

RTV=Room Temperature Vulcanization

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Dispensing Robot
Performance parameters

- Head travel speed: 0 to 160mm (6”)/sec.
- Average dispensing speed: 15-25 mm/s cell phone
- Capacity: 1 to 8 dispensing heads for prototypes or high volume production.
- Cell phone production: 4000+ per shift with 8 heads.
- Average gasket material cost per cell phone: $0.07

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Form-In-Place

- Automatically dispensed bead widths .075" to .014" & .065" to .014" high.
- High bead adhesion strength assures positive electrical and mechanical bond of dispensed compound onto surface to be shielded.
- Excellent EMI shielding providing > 90 dB at 100 MHz.
- Provides dust and moisture seal.
- Highly compressible compound provides low closure force necessary when used with thin wall miniature housings.
- Dispensable on any clean surface.

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Rotating dispensed gasket

- Could replace MIP applications in some cases.(no need of tooling + short delivery for prototypes).

Technical limits: h/w <2

- Radius > 1 mm.

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FIP Examples

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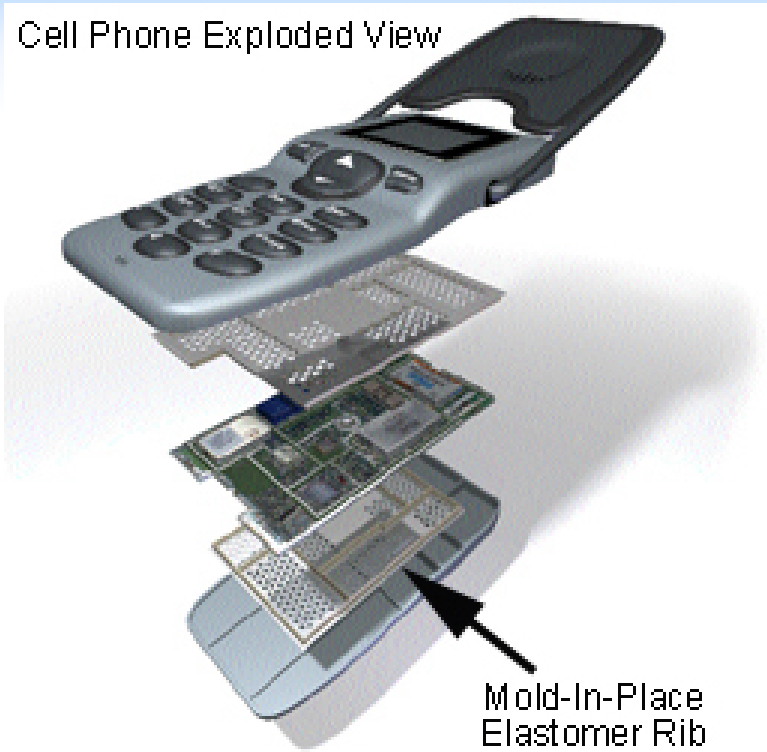
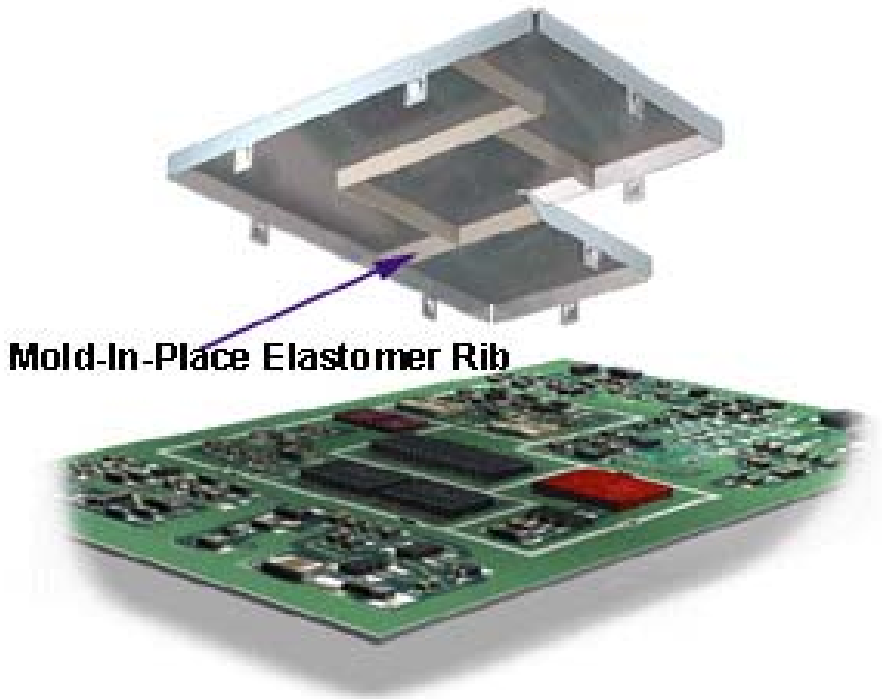
Mold-In-Place PCB Shield



-Replaces multiple soldered printed circuit board shield cans with a single piece approach
-Ideal for hand held devices where space is at a premium
-The metal substrate acts as a shielded enclosure allowing the use of a non-conductive housing



-Metal component can be custom designed in various shapes, mounting tabs, and heights

- Elastomer mold-in-place ribs can be provided with a tapered design to lower compression force

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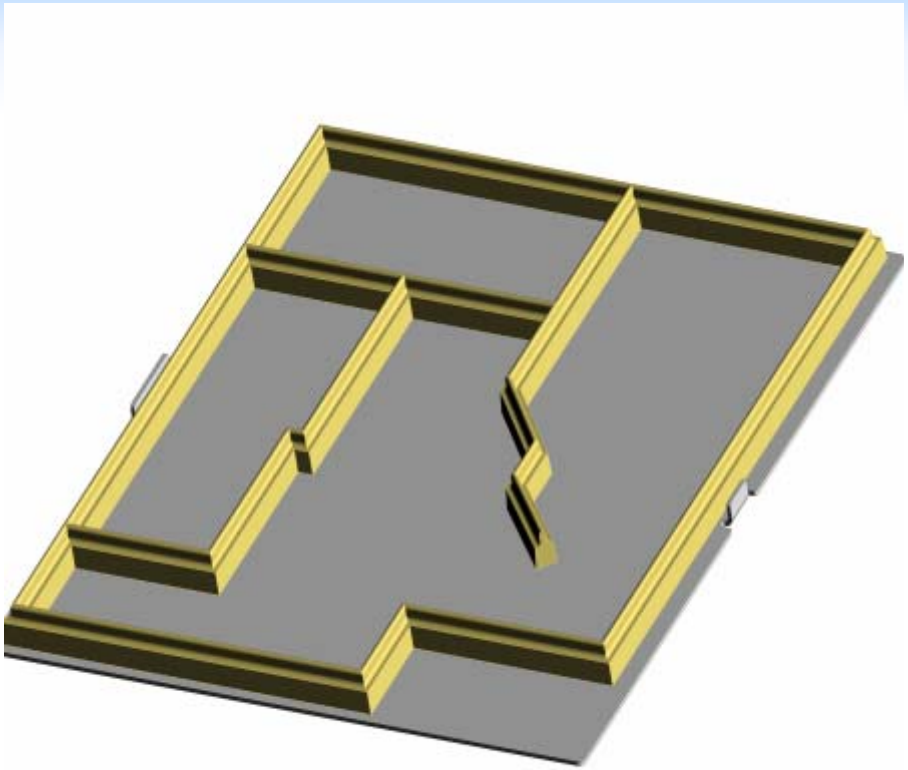
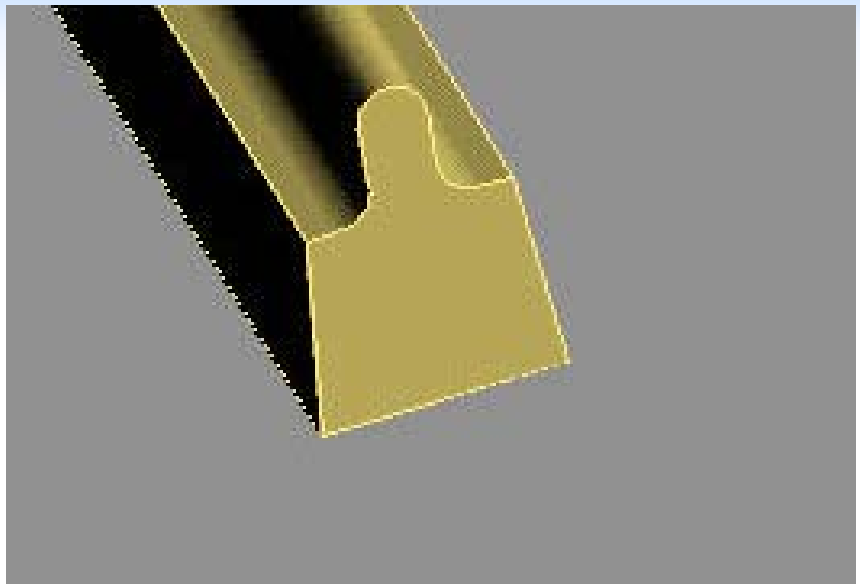
Mold In Place

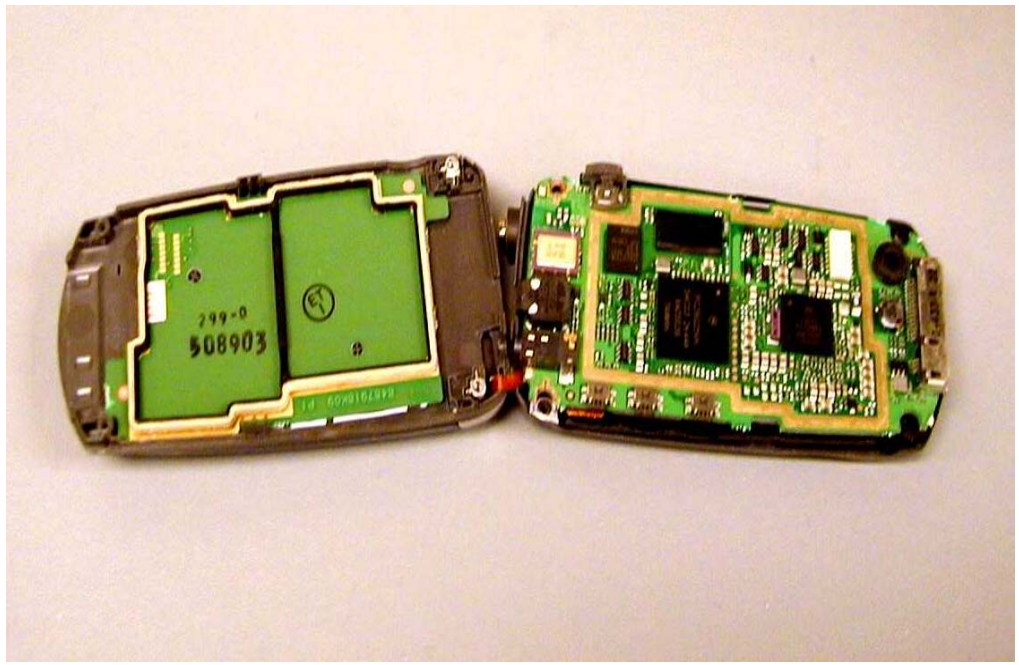




Various profiles to minimize forces, fit mating areas, etc.

Mold In-Place

- Used to create high aspect ratio gasket solutions:
  - Height > Width
- Rapid Cycle times
- Automated process
- Fully Cured during cycle
- Efficient material use
- On a substrate it is a…
  - Defined profile or shape
  - Conductive or
  - Non-Conductive
- Substrates:
  - Metal or Plastics



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Mold In Place

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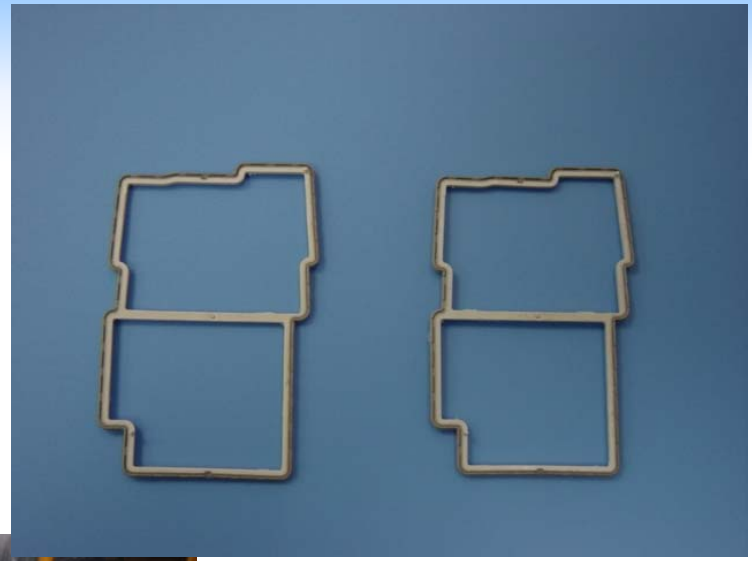
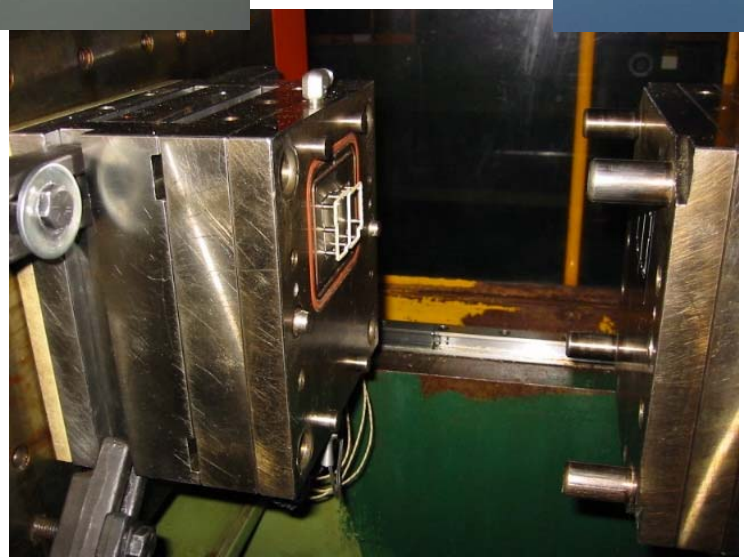
Molded EcE





EcE-Electrically Conductive Elastomer

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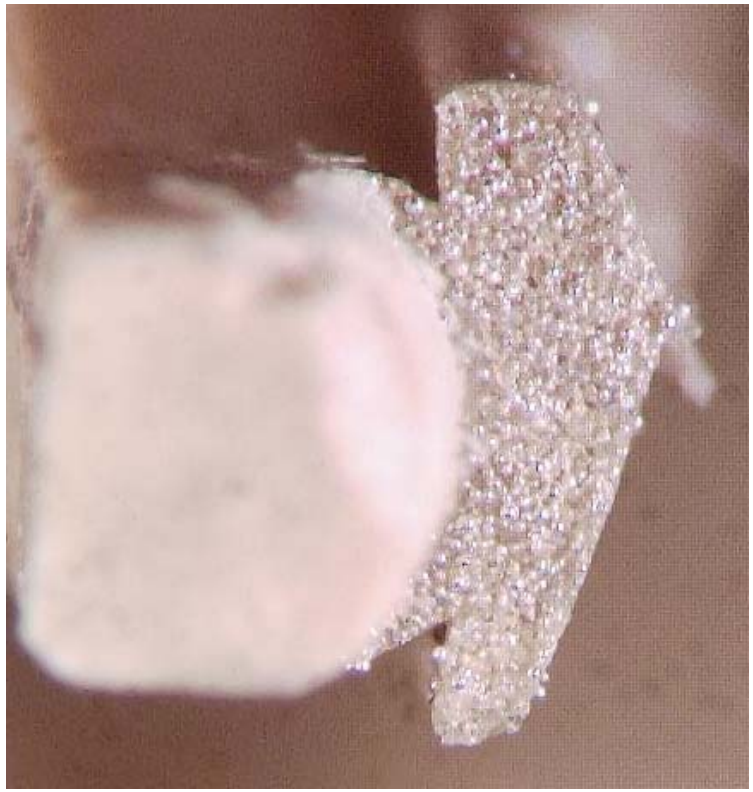
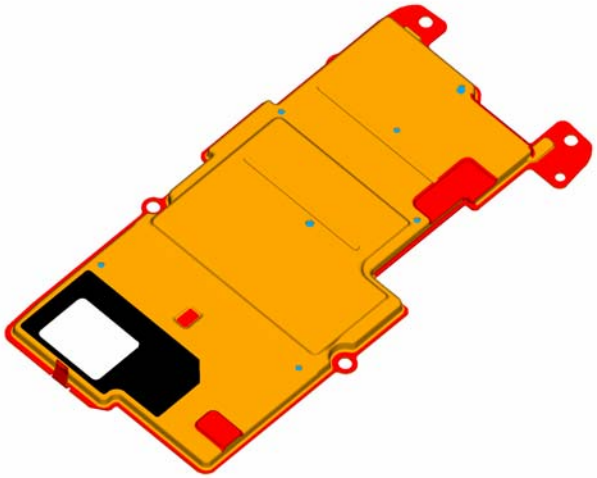
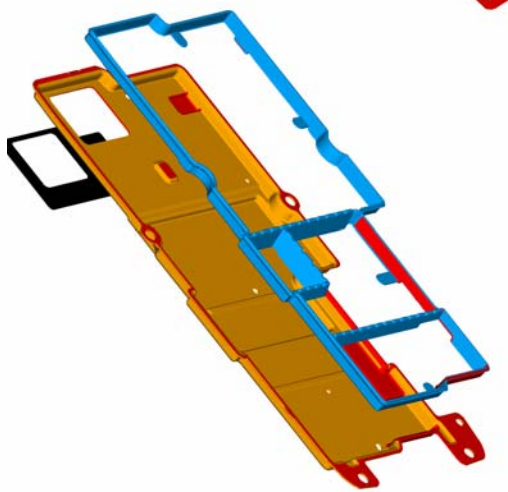
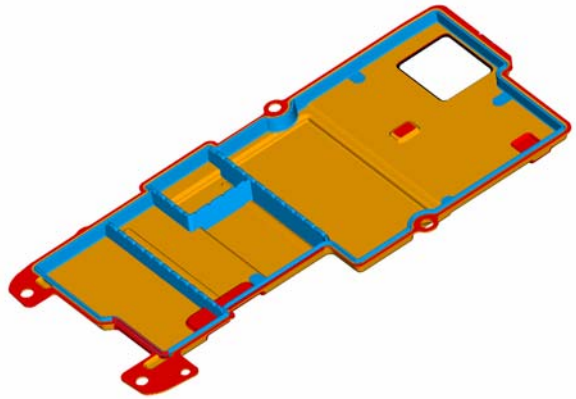
Injection Molding



Drawn BLS with MIP Gasket







BLS – Board Level Shield
MIP – Mold In Place

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Material Choices

POLYMER	FILLER								
	Ag	Ag/Cu	Ag/Al	Ag/Ni	Ag/G	Ni/C	IA	C	TOTAL
SILICONE	3	3	2	1	2	3	1	1	16
FLUOROSILICONE	1	1	2	1	1	1	1		8
FLUOROCARBON				1					1
EPDM			1	1		1		1	4
TOTAL	4	4	5	4	3	5	2	2	29

ETHYLENE PROPYLENE DIENE MONOMER(EPDM)

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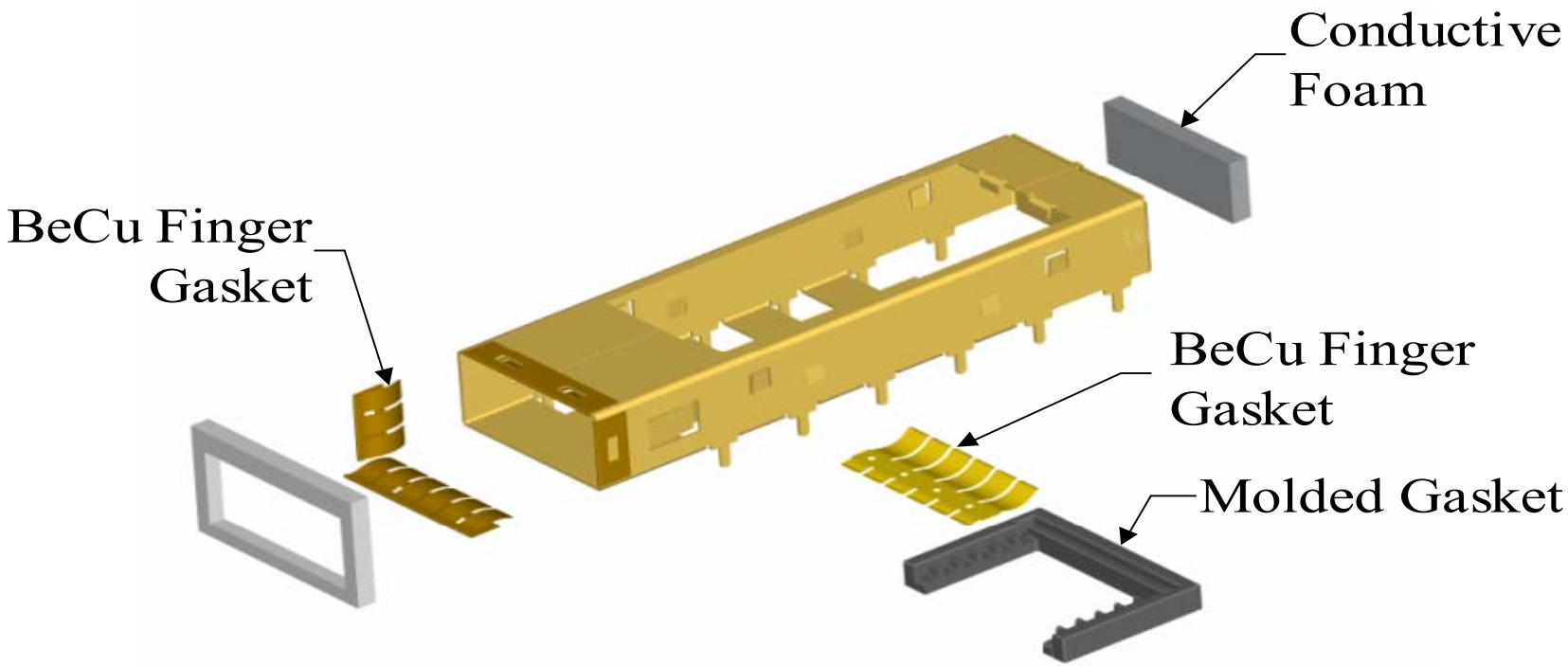
Conductive Fillers

- **CARBON(C)**
- **INERT ALUMINUM (IA)**
- **NICKEL COATED GRAPHITE(Ni/C)**
- **SILVER COATED GLASS(Ag/G)**
- **SILVER COATED NICKEL(Ag/Ni)**
- **SILVER COATED ALUMINUM(Ag/Al)**
- **SILVER COATED COPPER(Ag/Cu)**
- **SILVER(Ag)**

Combined Technology
10 Giga Bit Transceiver



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Conclusion

- New technology in RF vent panels allows for:
  - Lower cost
  - Greater airflow
- Sculpted Foam RF Gaskets
  - Lower Durometers (force)
  - Lower cost

Conclusion

- Conductive Foam technology allows for:
  - More direct conductive path
  - Lower compression force
  - Lower cost
- Integrated Technology
  - Metal/Elastomer combinations
  - Plastic/Elastomer combination
  - Others

Conclusion

- Today, conductive elastomer technology allows for many new:
  - Compounds
  - Shapes
  - Manufacturing methods
  - Durometers (force)
  - Smaller sizes
  - Higher attenuation at higher frequencies

Contacts

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