



# Federal-Mogul Company Overview

February 2010



# Company at a Glance

**2009 Sales:** \$5.3 Billion

**Employees:** 39,000 Globally

- » U.S. & Canada 11,000
- » Europe 16,000
- » BRIC & ROW 12,000

**Global Locations:** 104 Manufacturing and 21 distribution sites operating worldwide in 33 countries

**Research & Development:** 18 Globally-networked technology centers in North America, Europe and Asia

**Key Industries:** Automotive, aerospace, heavy-duty, industrial, marine, power generation, railroad

**Ticker Symbol:** FDML – NASDAQ Global Select Market



# Portfolio and Reporting Segments

## Powertrain Energy (PTE)

Automotive and industrial pistons, rings, pins, liners, valvetrain and ignition



## Powertrain Sealing and Bearings (PTSB)

Dynamic and bonded seals, hot and static gaskets, bearings & bushings, industrial bearings, heat shields and transmission components



## Vehicle Safety and Protection (VSP)

Brake disc pads, linings and components, halfblocks, wipers, lighting, chassis components, fuel systems, system protection and flexible shields



## Global Aftermarket (GA)

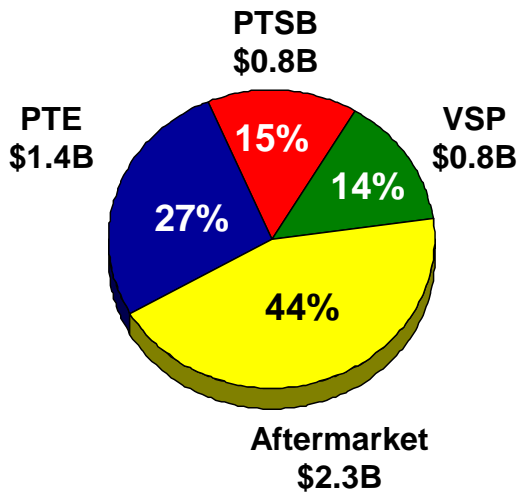
Full range portfolio of leading aftermarket products for global automotive, commercial vehicle and industrial replacement markets



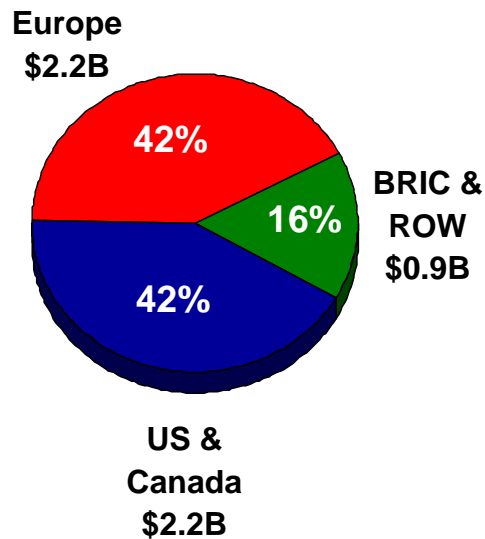
# Diversified Global Business

## 2009 Global Sales \$5.3B

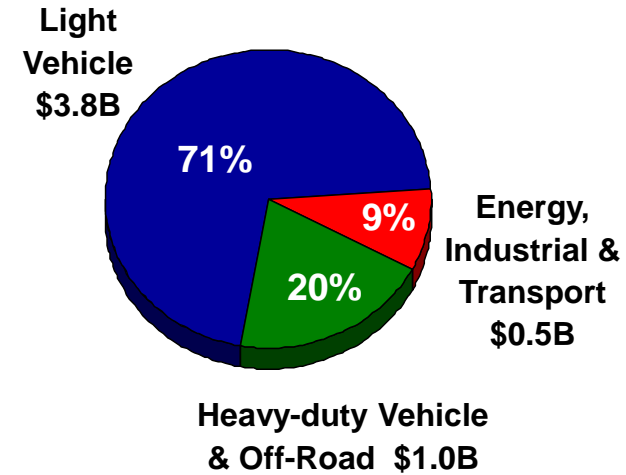
### Business Segment



### Region



### Market



# Q4 2009 vs. Q4 2008 Sales By Region

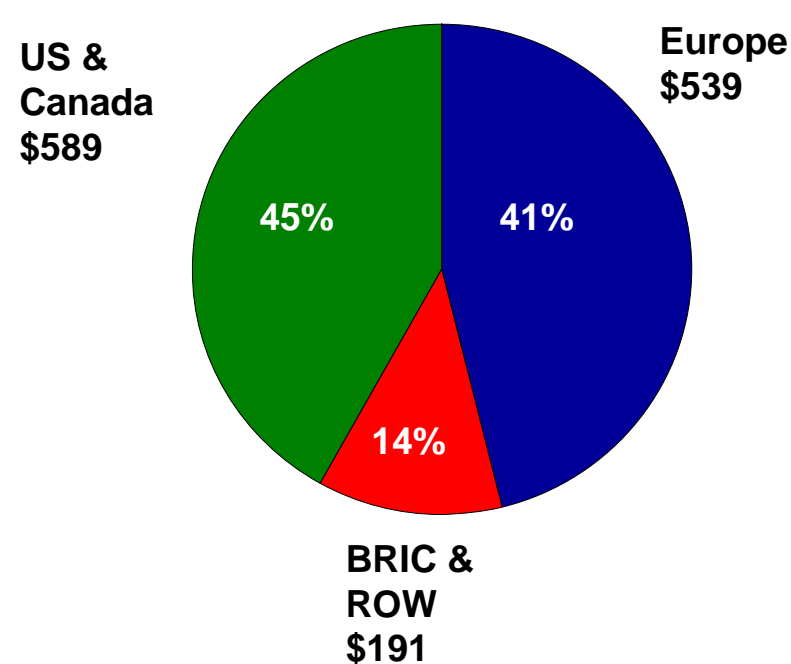
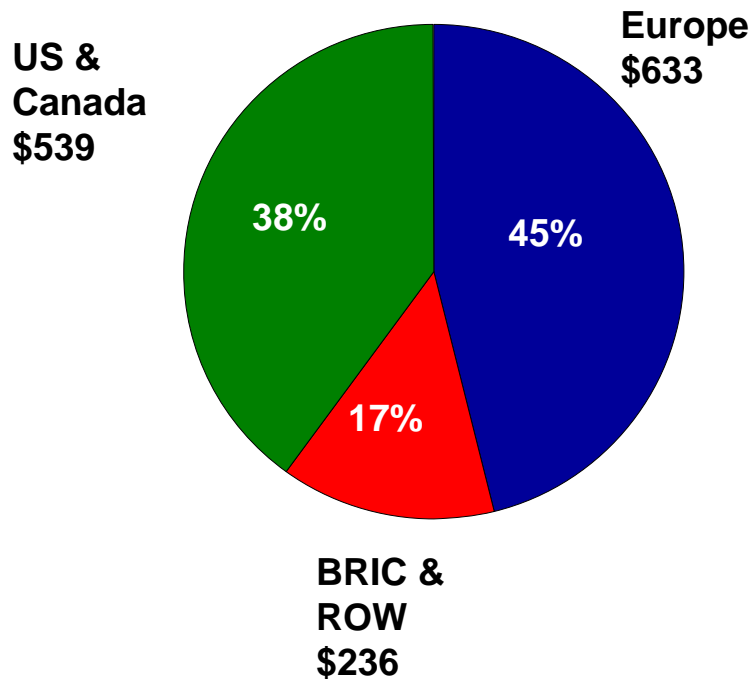
(\$ millions)

**2009 Q4**

**2008 Q4**

**Net Sales: \$1,408**

**Net Sales: \$1,319**





# Capitalizing on Growth Markets

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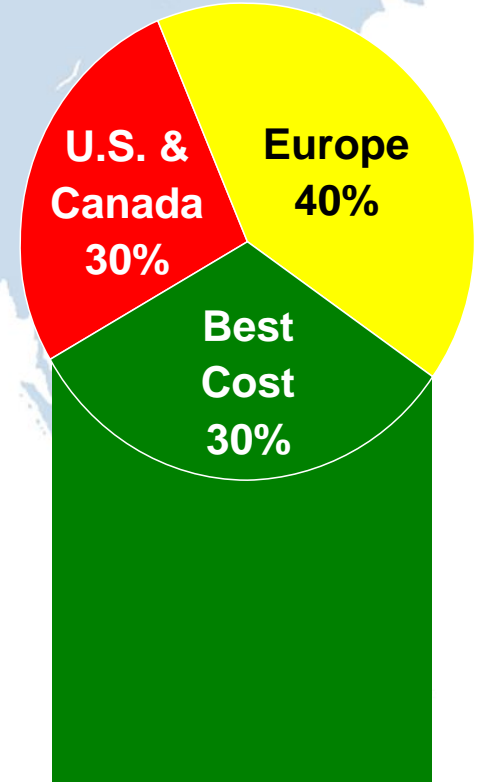
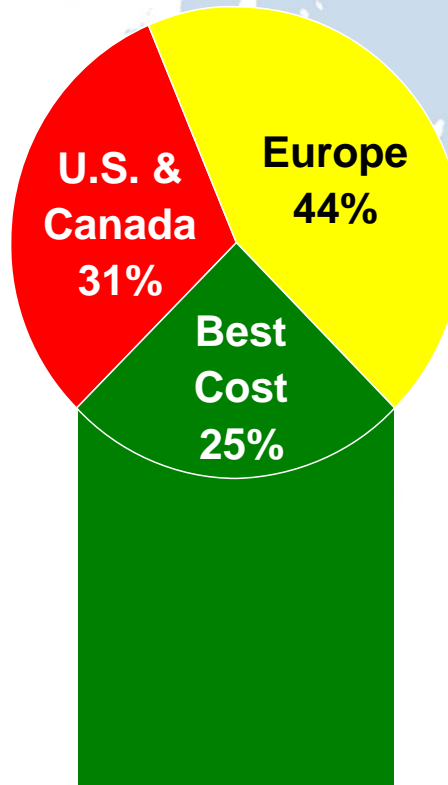
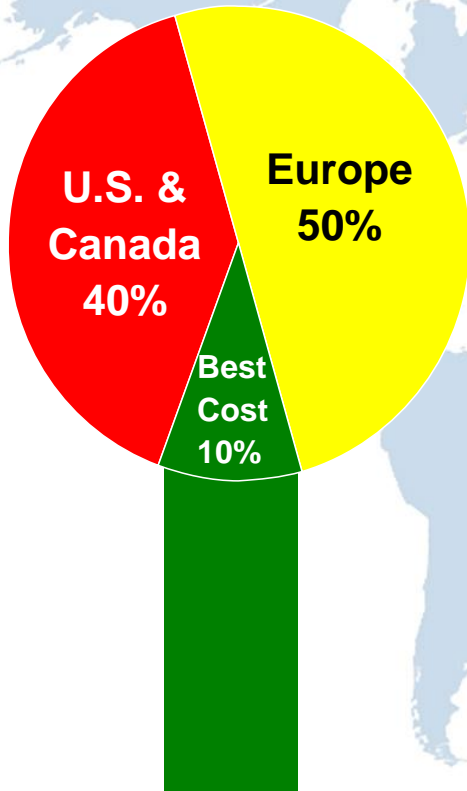
- Vehicle production in China, India and Brazil is forecast to continuously grow, representing an opportunity to gain share during the global downturn
  - China
    - 8 operating sites manufacturing main product segments
    - Newly opened Shanghai Headquarters and state-of-the-art Tech Center
    - Recently expanded Nanchang, Qingdao, Shanghai and Wuhan plants
  - India
    - 5 operating sites manufacturing main product segments
    - Recently enhanced majority position in F-M India and local joint venture
    - Opened new India Headquarters in New Delhi; expanded Tech Center in Bangalore
    - Leading market position with main Indian customers and global OEMs localizing there to serve both local and export markets
  - Brazil/Argentina
    - 7 operating sites manufacturing main product segments
    - New plant recently opened in Araras, Brazil
    - Supplier to major global vehicle makers for local market

# Global Manufacturing Capacity by Region

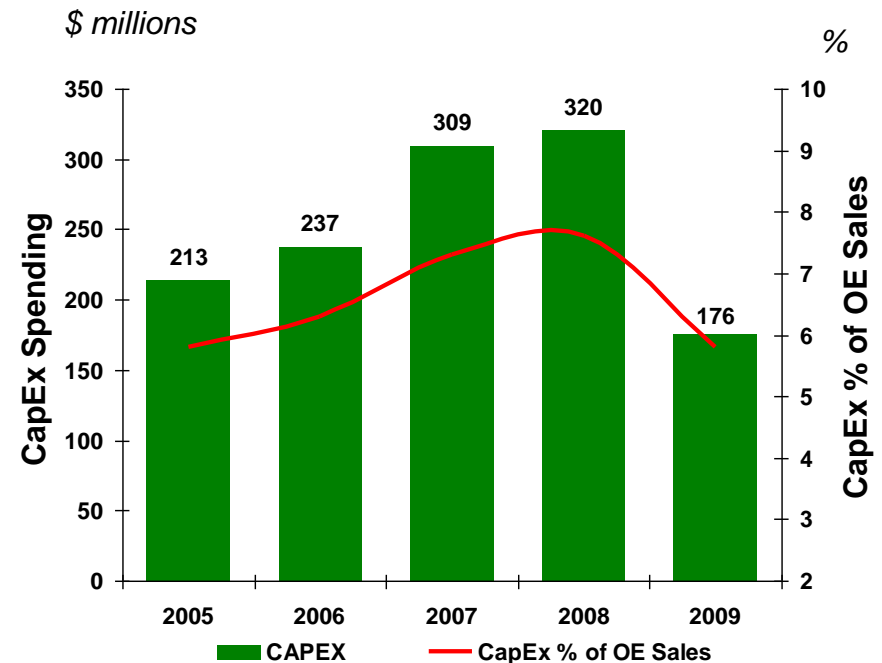
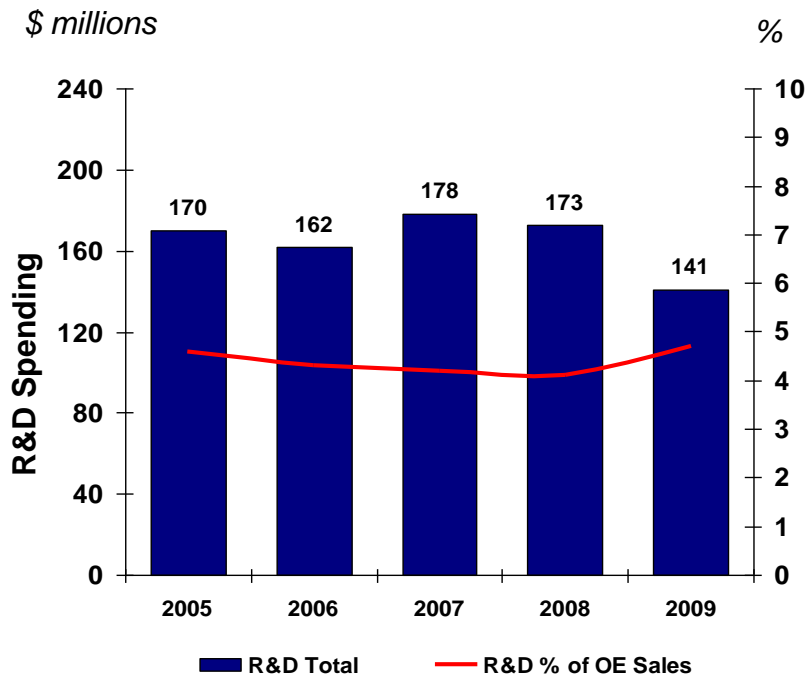
2004

2008

2010 Budget



# Significant R&D / CapEx Investment



- \$824 million R&D investment over last 5 years, averaging over 4% of sales per year, to maintain and grow Federal-Mogul's leading technology and innovation portfolio
- 1,830 Patents awarded to Federal-Mogul scientists and engineers between 2005 and 2009
- \$1.3 billion capital investment over last 5 years, averaging nearly 7% of OE sales per year, to maintain and grow Federal-Mogul's world-class engineering and manufacturing
- Internally-funded R&D and CapEx from operations while generating cash



# Energy, Industrial and Transport Markets and Products

- Aerospace
- Construction
- Freighters & Ferries
- Hydroelectric Turbine
- Industrial Equipment
- Power Generation
- Railway
- Recreational Marine
- Wind Turbines

**Bearings**




**Sintered Products**




**Friction Railway**



**Systems Protection**




**Large-Bore Rings**



**Natural Gas Spark Plugs**



**Porous Filters**



# Leading Technology & Innovation Industry Trends

- Vehicle and Powertrain Efficiency - Alternative Energies
  - Biofuels      – Hybrids      – CNG, LPG
  - Flex-fuels    – Electrical    – Fuel Cells
- Downsizing and using higher compression, turbo-charging and high precision fuel injection
- Reduced CO<sub>2</sub> through lower fuel consumption and aggressive dilution and aftertreatment
- Enhanced vehicle safety and protection, including new friction formulations for brake systems, wiper systems and lighting
- Quieter vehicles, free of mechanical, environmental or electronic interference
- Green focus in all products and manufacturing processes



# Leading Technology & Innovation Energy, Environment & Safety

## Safety

### Energy & Environment

#### Pistons



30-40% lower friction

#### Rings



25-35% lower friction

#### Bearings



22% lower power loss

#### Wipers



#### Lighting



#### Brake Pads



#### Chassis



### Energy & Environment

#### Ignition



Combustion & Packaging efficiency

#### HTA & MLS Gaskets

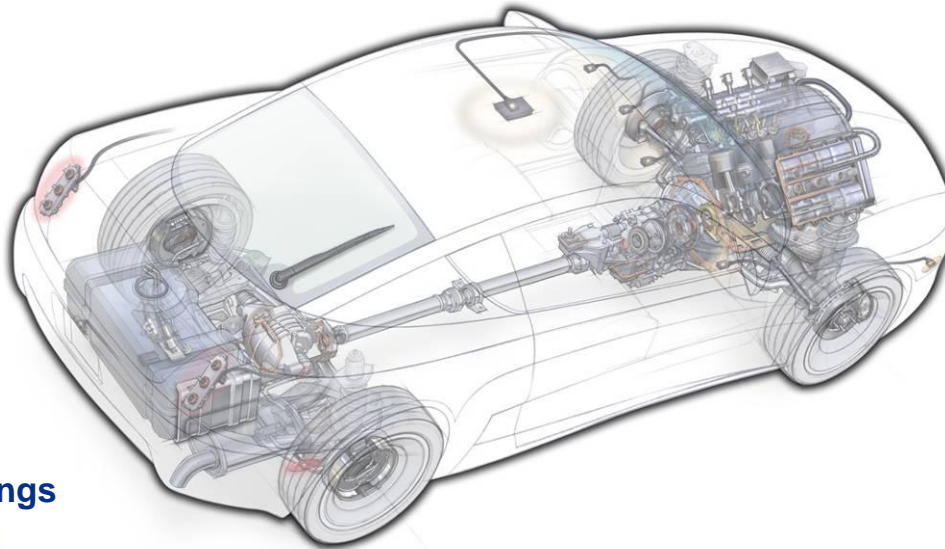


250 bars sealing

#### Seals & Unipistons

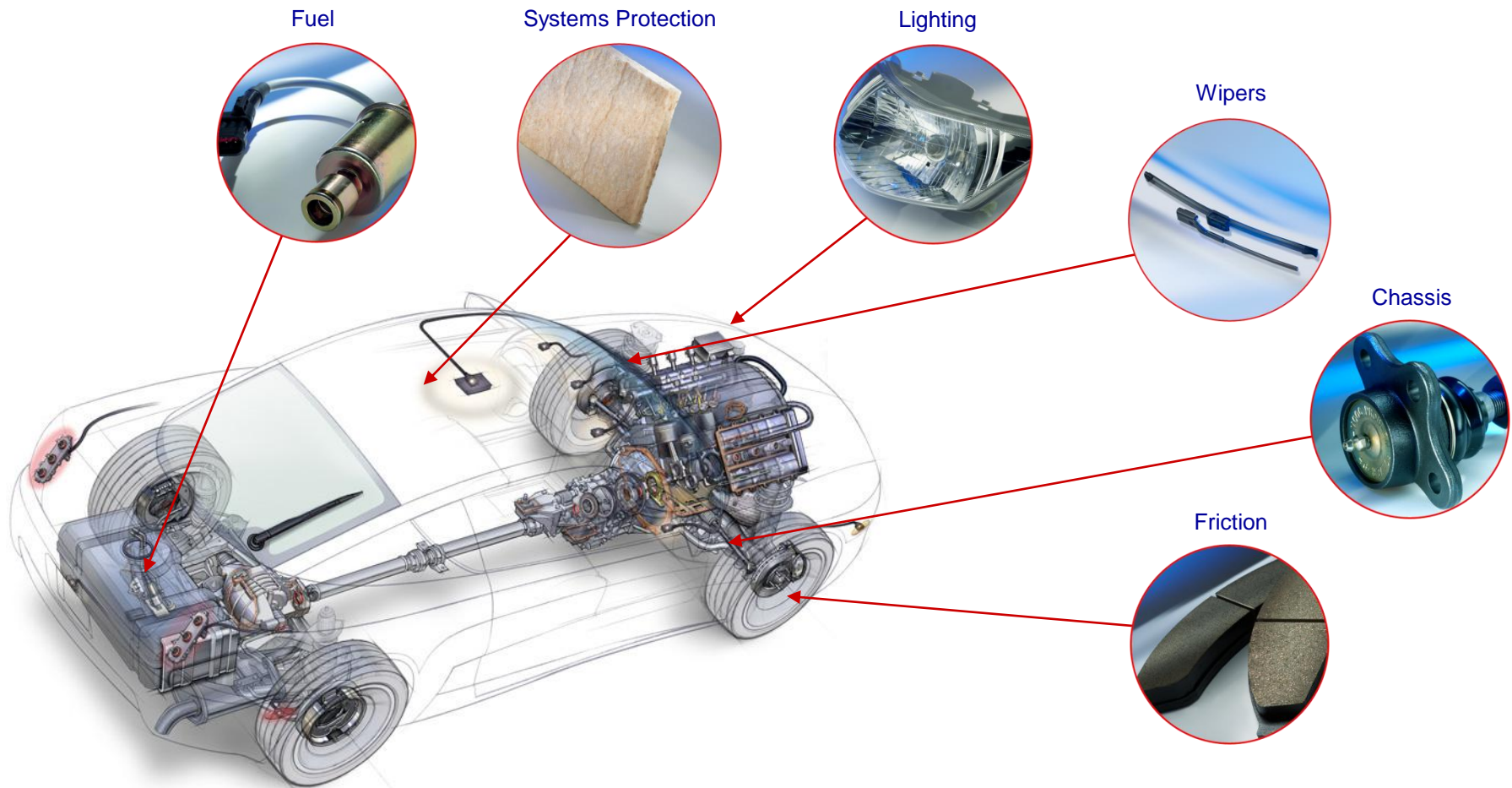


## Enabling Technologies





Federal-Mogul is a leading provider of innovative components and systems that increase vehicle performance, reliability and safety.



# VSP

## At a Glance



### Sales:

\$1.8 Billion (OE + Aftermarket)

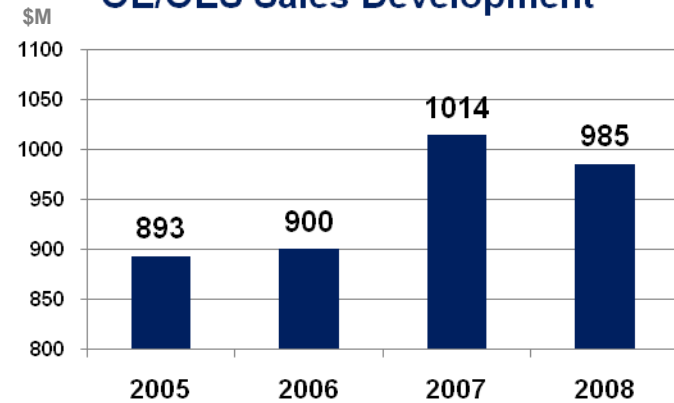
### Employees:

8,700 Worldwide (Q3 '09)

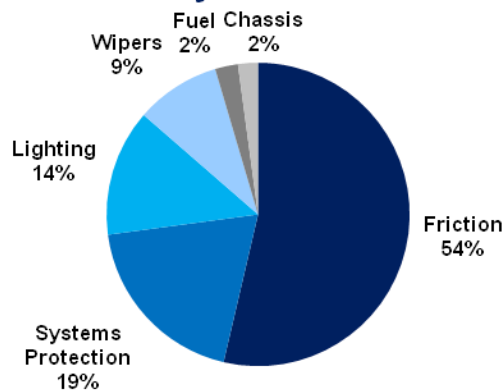
### Global Locations:

39 manufacturing sites in 16 countries

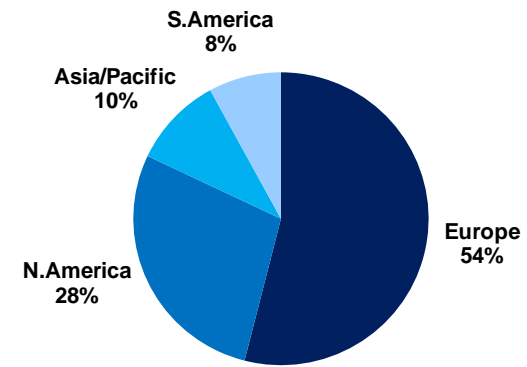
### OE/OES Sales Development



### Sales by Product Line



### OE/OES Sales by Region







**Bentley**Harris<sup>®</sup> *protection products  
manufactured by:*



# VSP – Systems Protection At a Glance



## Sales:

\$190 Million

## Employees:

700 Worldwide (Q3 '09)

## Global Locations:

7 manufacturing sites in 7 countries

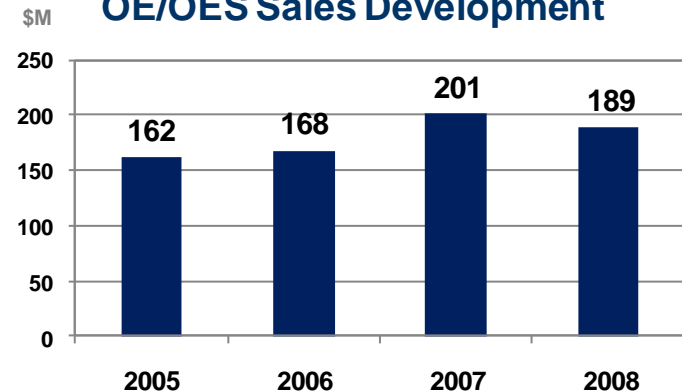
## Research & Development:

1 Technology Center in the US  
Technical Service capability in  
3 continents

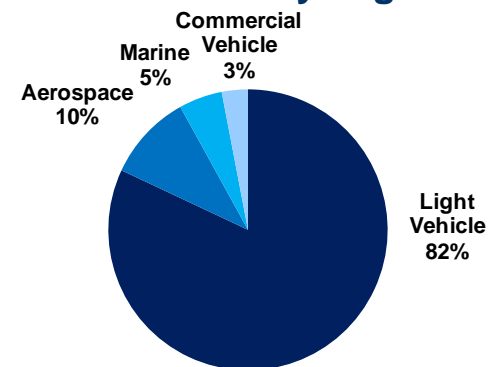
## Key Industries Served:

Automotive, light commercial, heavy-duty truck, off-highway, agricultural, aerospace, marine and industrial

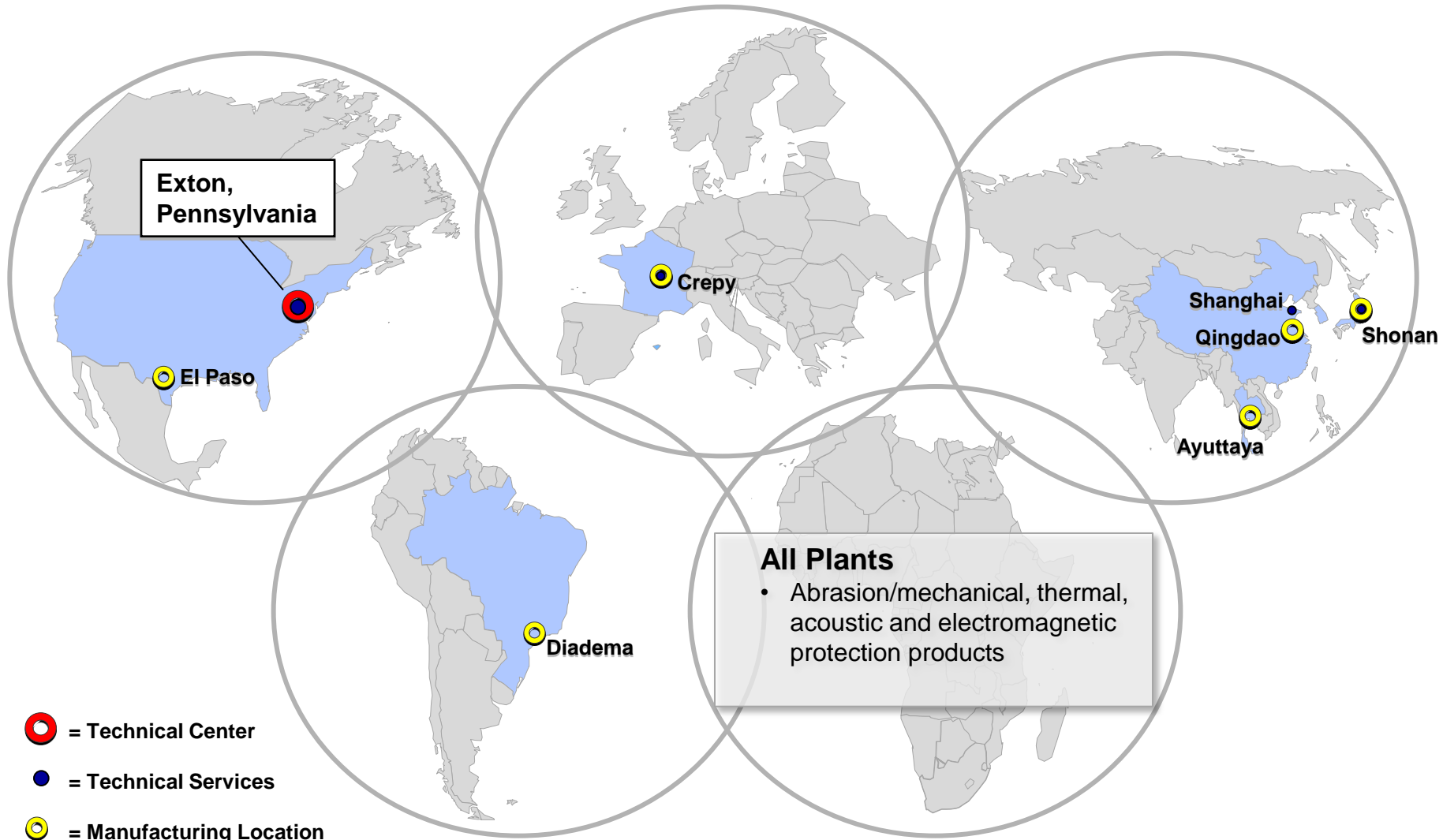
## OE/OES Sales Development



## OE/OES Sales by Segment



## Footprint

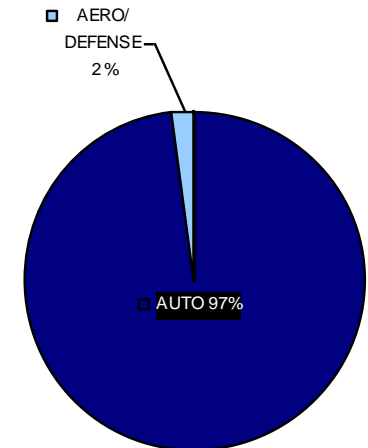
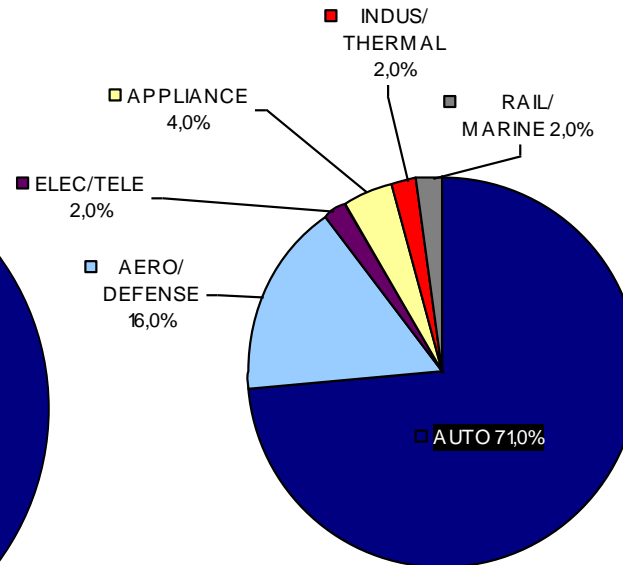
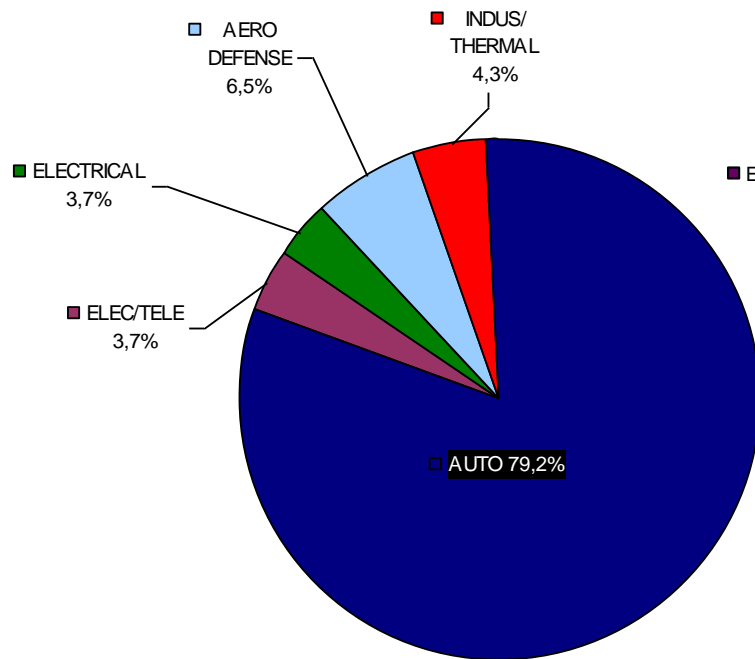


## Key Markets in 2008

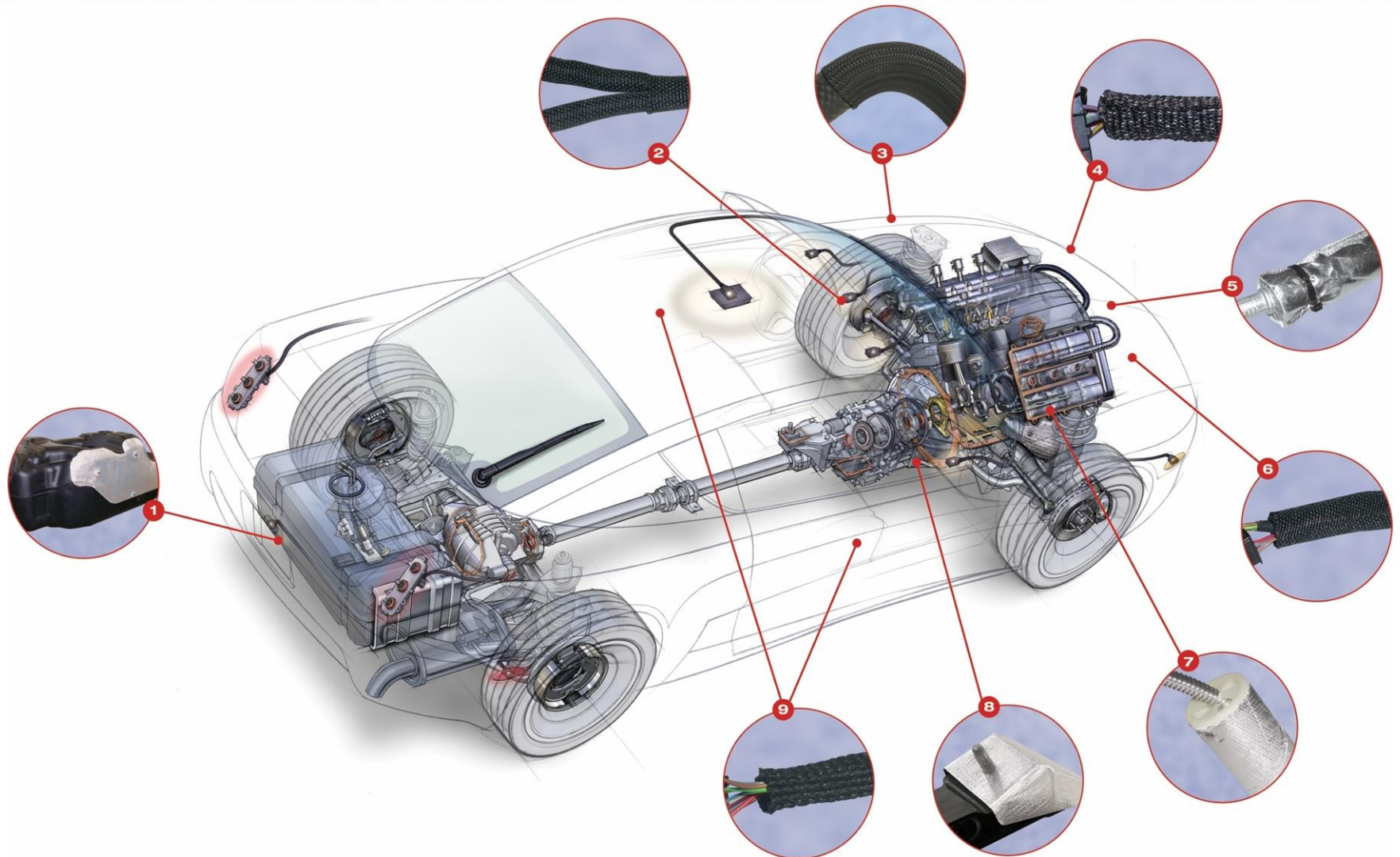
Americas

Europe

Asia

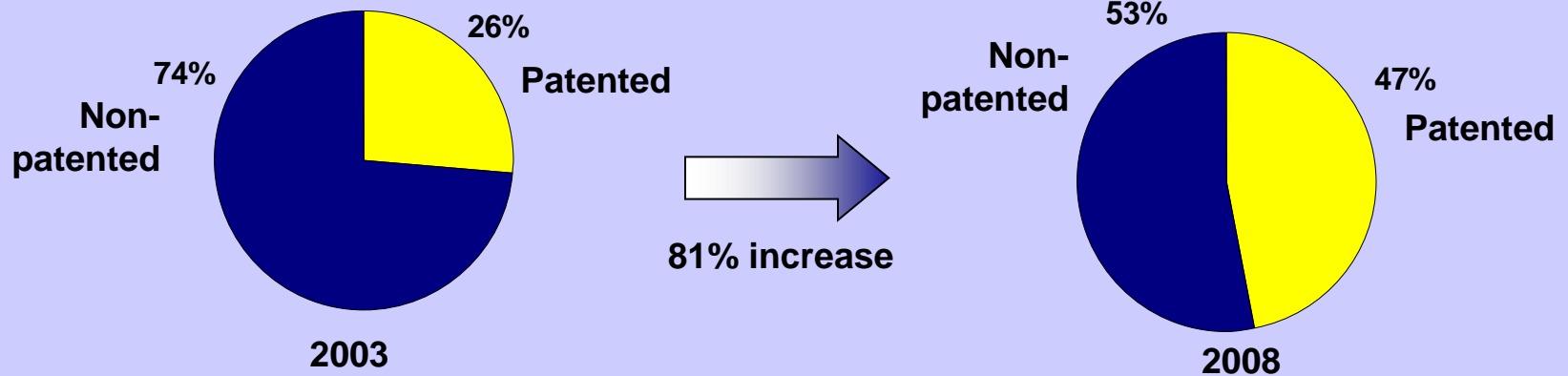


# Europe Automotive Applications

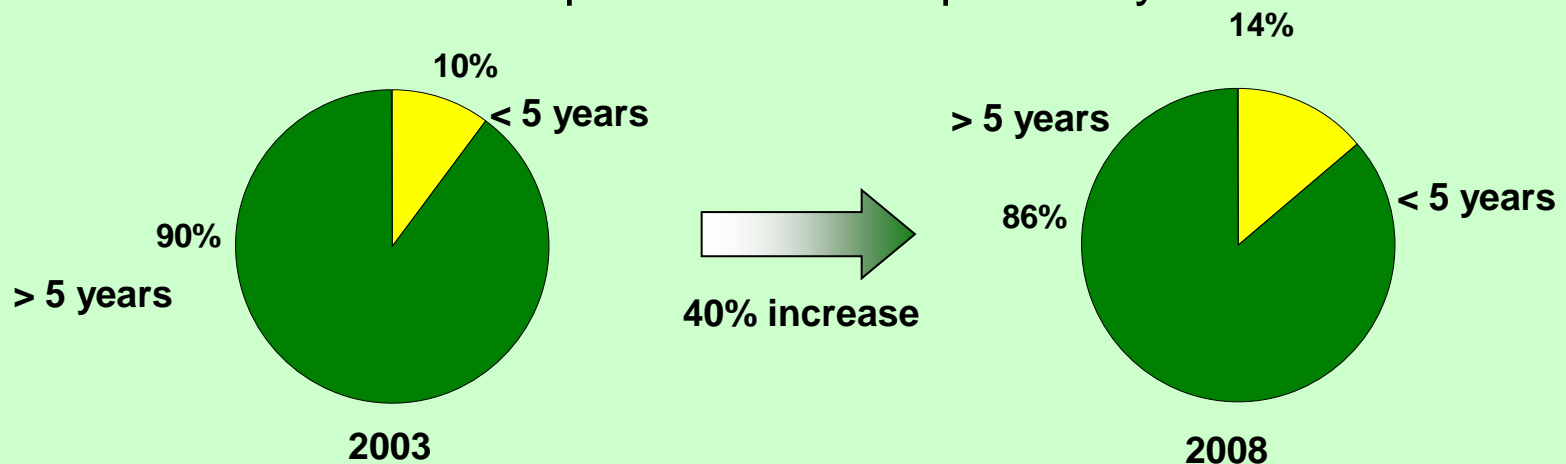


# VSP – Systems Protection Profitable Technology Commercialization

### Patented Products as a % of sales



### Sales of products developed < 5 years





# VSP – Systems Protection From Trend to Development

<b>Market Trend</b>	<b>Impact</b>	<b>Material / Technology / Product Needs</b>
Reduction in fuel consumption	<ul style="list-style-type: none"><li>• Component weight reduction</li></ul>	<ul style="list-style-type: none"><li>• Lighter weight materials</li><li>• more open constructions</li><li>• smaller yarn size</li></ul>
Reduced environmental impact	<ul style="list-style-type: none"><li>• Strict emission controls</li><li>• Component recyclability</li><li>• Reduced waste stream</li></ul>	<ul style="list-style-type: none"><li>• Improved exhaust system Insulation</li><li>• use of recycled materials</li><li>• implementation of new materials</li></ul>
Alternative energy vehicles	<ul style="list-style-type: none"><li>• Increase need for high voltage and intermediate voltage assemblies</li></ul>	<ul style="list-style-type: none"><li>• Multi-purpose protection products (color identified, EMI and abrasion)</li></ul>
Increased electronic complexity	<ul style="list-style-type: none"><li>• Increase in electromagnetic interference</li><li>• Decrease of available space for wiring</li></ul>	<ul style="list-style-type: none"><li>• Higher attenuation products</li><li>• Improved wiring management within troughs and existing routing</li></ul>

# VSP – Systems Protection Product Overview

All Industries				
<p><b>Flexfit®</b> Abrasion protectic</p> 	<p><b>Flexguard®</b> Abrasion protection</p> 	<p><b>Twisttube® 2420</b> Bundling/Abrasion protection</p> 	<p><b>Flexwrap® 3500</b> Bundling/Abrasion protection</p> 	<p><b>Shrinkguardt®2800</b> Abrasion protection</p> 
<p><b>Locatguard® 2700</b> Abrasion protection</p> 	<p><b>Quietgard 3600</b> Acoustic/ anti crash protection</p> 	<p><b>Harnasleeve®1740</b> Thermal /Abrasion protection</p> 	<p><b>Reflecsleeve® 1451</b> Thermal protection</p> 	<p><b>ReflexWrap 1466</b> Thermal protection</p> 
<p><b>ReflectShield® 1435</b> Thermal protection</p> 	<p><b>Flexfit® EMI 208</b> EMI Shielding</p> 	<p><b>Thermflex® 1226</b> Thermal protection</p> 	<p><b>Thermflex® 1224</b> Thermal protection</p> 	<p><b>Thermojacket®M</b> Thermal insulation</p> 



## FlexFit

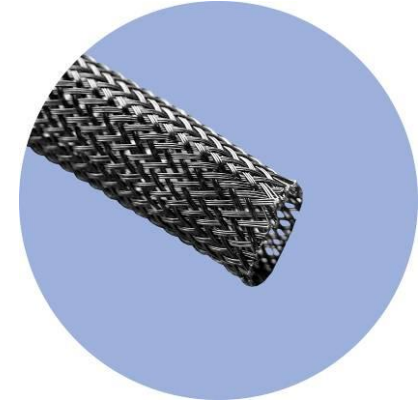
Flexfit is a flexible, expandable sleeve designed to provide abrasion protection.

### Products Highlights

- Tubular
- Lightweight
- Various Expansion ratios
- Raw material : Polyester
- Working Temperature : up +150°C

### Applications

- Ideal for components exposed to sharp edges or mechanical abrasion
- Functions well as both an aesthetic and bundling aid
- Wire harnesses, hoses, cables and tubing





## FlexGuard

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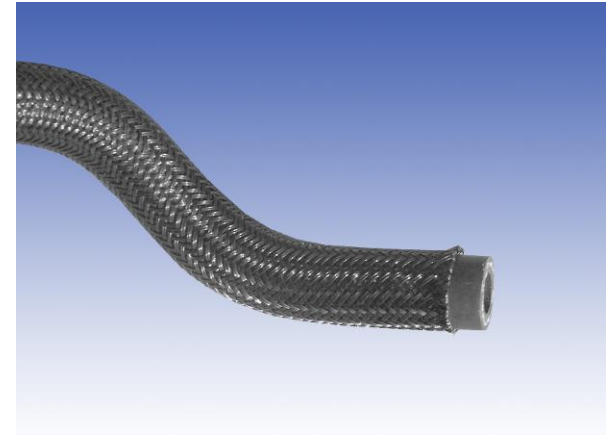
FlexGuard products are highly flexible, expandable sleeves that are lightweight and rugged.

### Products Highlights

- Tubular
- Lightweight
- Various Expansion ratios, various colors
- Raw material : Polyester, PPS
- Working Temperature : Up to +125°C (FG 2131)  
Up to +200°C (FG 2135)

### Applications

- Ideal for components exposed to condensation and mechanical abrasion
- Wire harnesses, hoses, cables and tubing, sensor assemblies





## TwistTube

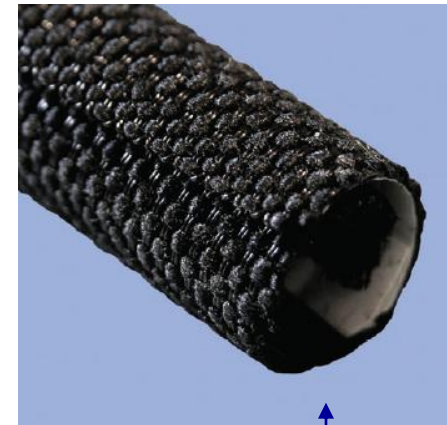
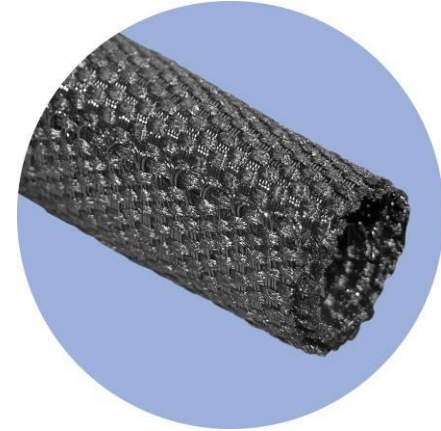
TwistTube products are flexible, self-wrapping sleeves that offer superior abrasion resistance.

### Products Highlights

- Self wrapping design
- Attractive Appearance
- Raw material : Polyester
- Working Temperature : Up to +150°C

### Applications

- Offer suppression abrasion resistance in combination with noise suppression capabilities.
- Wire harnesses, hoses, cables and tubing, sensor assemblies



**Adhesive version :  
LocatWrap 2480**





## FlexWrap

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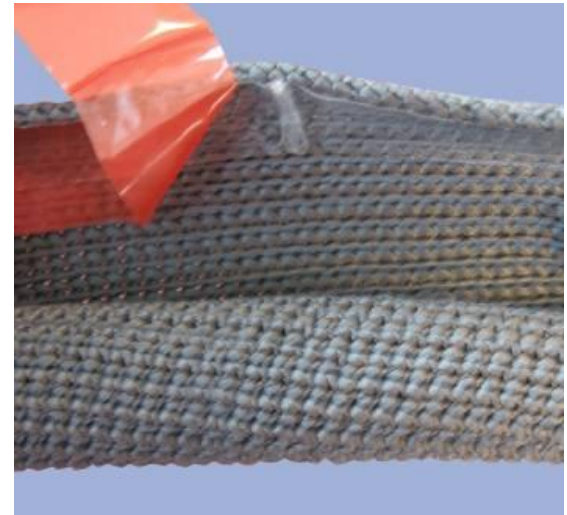
FlexWrap is lightweight, flexible and available with an overlapping design or hook and loop self-closing feature. Ideal for recalls

### Products Highlights

- Wrappable
- Raw material : Polyester
- Flexible
- Very soft

### Applications

- Provide cut-through and abrasion protection while allowing easy access for inspection, rework or component replacement
- Wire harnesses, hoses, cables and tubing







## ShrinkGard

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ShrinkGard 2800 is a heatshrinkable sleeve which provides superior abrasion resistance for rubber hoses and tubing applications.

### Products Highlights

- 2:1 shrink ratio
- Raw material : Polyester and Polyethylene
- Working Temperature : Up to +150°C
- Flexible
- Very soft

### Applications

- Dedicated to rubber hoses and tubing





## LocatGuard

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LocatGuard 2700 is a textile sleeve especially designed for abrasion protection of tubes.

### Products Highlights

- Fixed in place
- Color change after heat setting
- Raw material : Polyamide
- Working Temperature : Up to +125°C



### Applications

- Used for fuel and vacuum lines



## QuietGuard

QuietGuard 3600 is a tubular sleeve to protect fuel line or wire harness during a car accident.

### Products Highlights

- Tubular
- Excellent noise suppression
- Raw material : Polyester
- Excellent cut through performances
- Working Temperature : Up to +150°C



**Double layer version :  
QuietGuard 3601**

### Applications

- Used for PA Fuel lines, Tubing, wire harness



## HarnaSleeve

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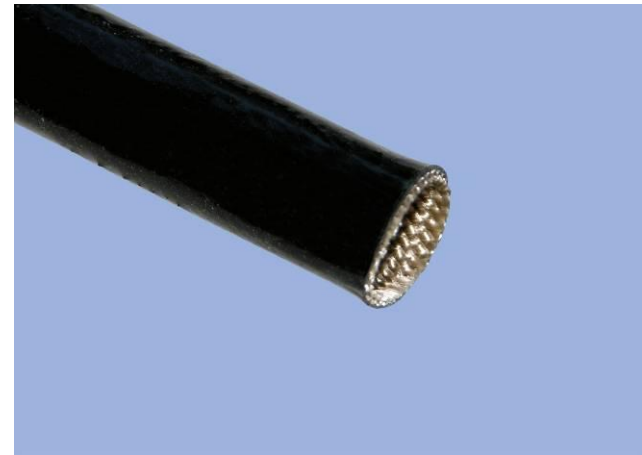
HarnaSleeve is a silicone coated fiberglass sleeving used to protect wires against heat and abrasion.

### Products Highlights

- Tubular
- High flexibility
- Fray Resistant
- Raw material : Fiberglass
- No skin irritation
- Working Temperature : Up to +200°C

### Applications

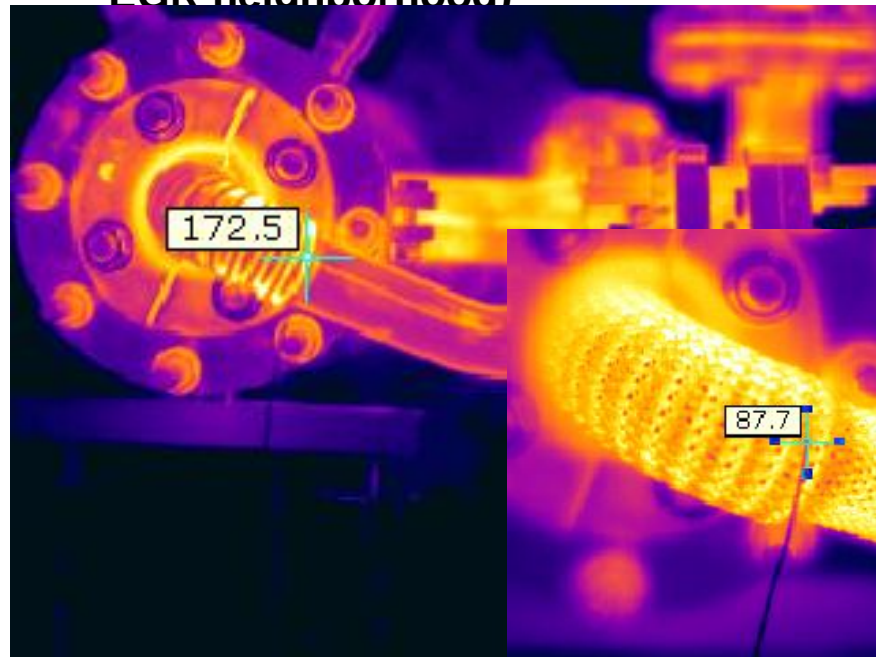
- Wire harnesses, hoses, cables and tubing



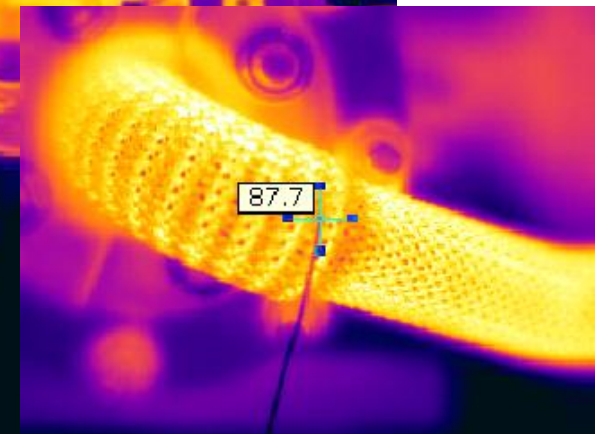
# Innovative Thermal Protection Sleeves

## ThermFlex 1226

- Tubular glass fiber knitted sleeve
- 575°C continuous
- Application: Thermal insulation of components in high temperature areas (ex. EGR neighborhood)



Gas  
200°C





## Textalu

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Textalu 1202 is an insulative fiberglass sleeving designed to protect components in high temperature areas. It provides superior insulation to components that must maintain stable temperatures.

### Products Highlights

- Tubular
- Excellent thermal protection
- High Flexibility
- Raw material : Fiberglass
- Fray Resistant
- Working Temperature : Up to +550°C



### Applications

- Used for PA Fuel lines, Tubing, wire harness





## ThermGuard

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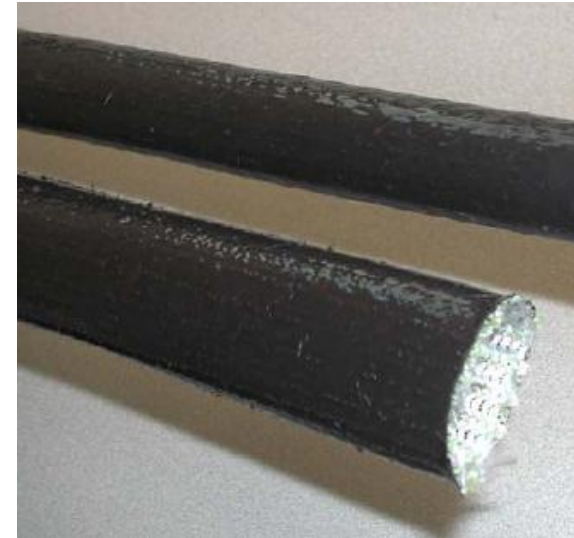
ThermGuard™ 1280 is a heat-treated sleeve that provides superior protection against conducted and convected heat.

### Products Highlights

- Tubular
- Excellent thermal protection
- Excellent abrasion resistance
- Raw material : Fiberglass / Aramid / Silicone
- Non flammable
- Working Temperature : Up to +225°C

### Applications

- Used for PA Fuel lines, Tubing, wire harness close to engines and exhaust systems.





## Fyrejacket

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Fyrejacket 1610 is used to protect hoses, lines and cables in high temperature areas. It additionally provides protection against short term hazards such as flame blasts.

### Products Highlights

- Tubular
- Flame resistant
- Raw material : Fiberglass and silicone
- Working Temperature : Up to +550°C

### Applications

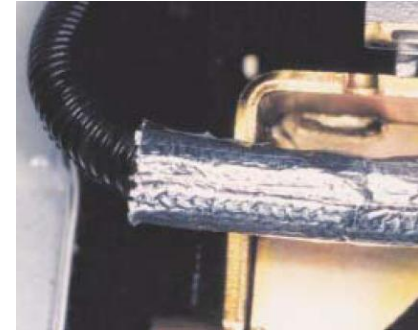
- retards the penetration of the flame. This can allow critical components to continue to function for a short amount of time.
- Used for PA Fuel lines, Tubing, wire harness





## Reflective Protection

Tubular or self wrapping design. Aluminized and flexible sleeve engineered to protect components from radiant heat.



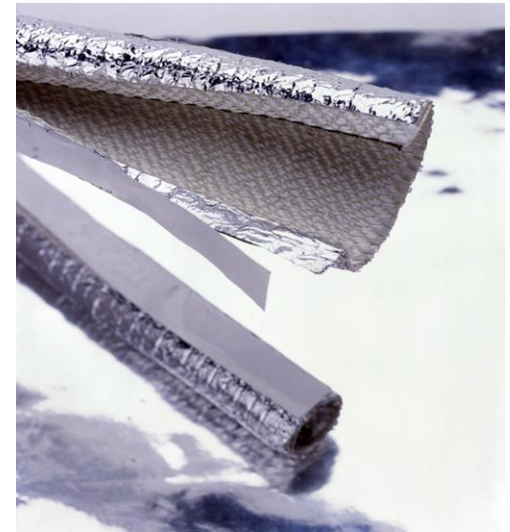
### Products Highlights

- Tubular or Wrappable
- Raw material : Aluminium + Fiberglass
- Easy installation
- Fluid and chemical resistant
- Working Temperature : Up to +250°C

**Tubular version : ReflectSleeve 1451**

### Applications

- Ideal for components exposed to radiant heat
- Wire harnesses, hoses, cables and tubing



**Open version : ReflexWrap 1466**



## Flexible HeatShields

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Aluminized and flexible customised parts used to protect components in high temperature areas.

### Products Highlights

- Excellent protection against radiant heat
- Customized parts
- Easy installation
- Various raw materials and adhesive versions
- Customized parts : cut & sew, die cut, kiss cut and slitting technology

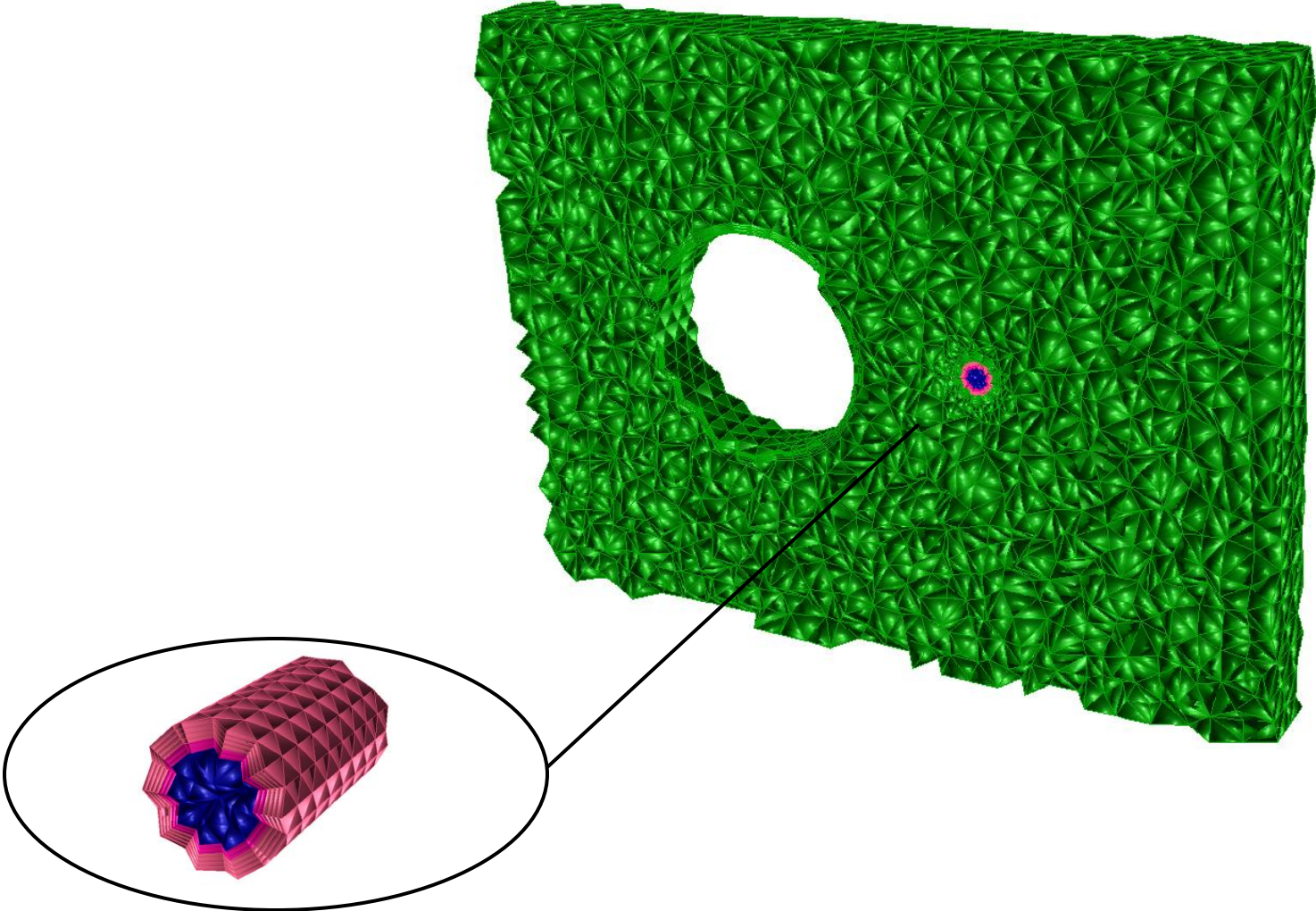


### Applications

- Ideal for components exposed to radiant heat
- Engine components, plastic fuel tanks, electronic components



# Cross Section of Mesh



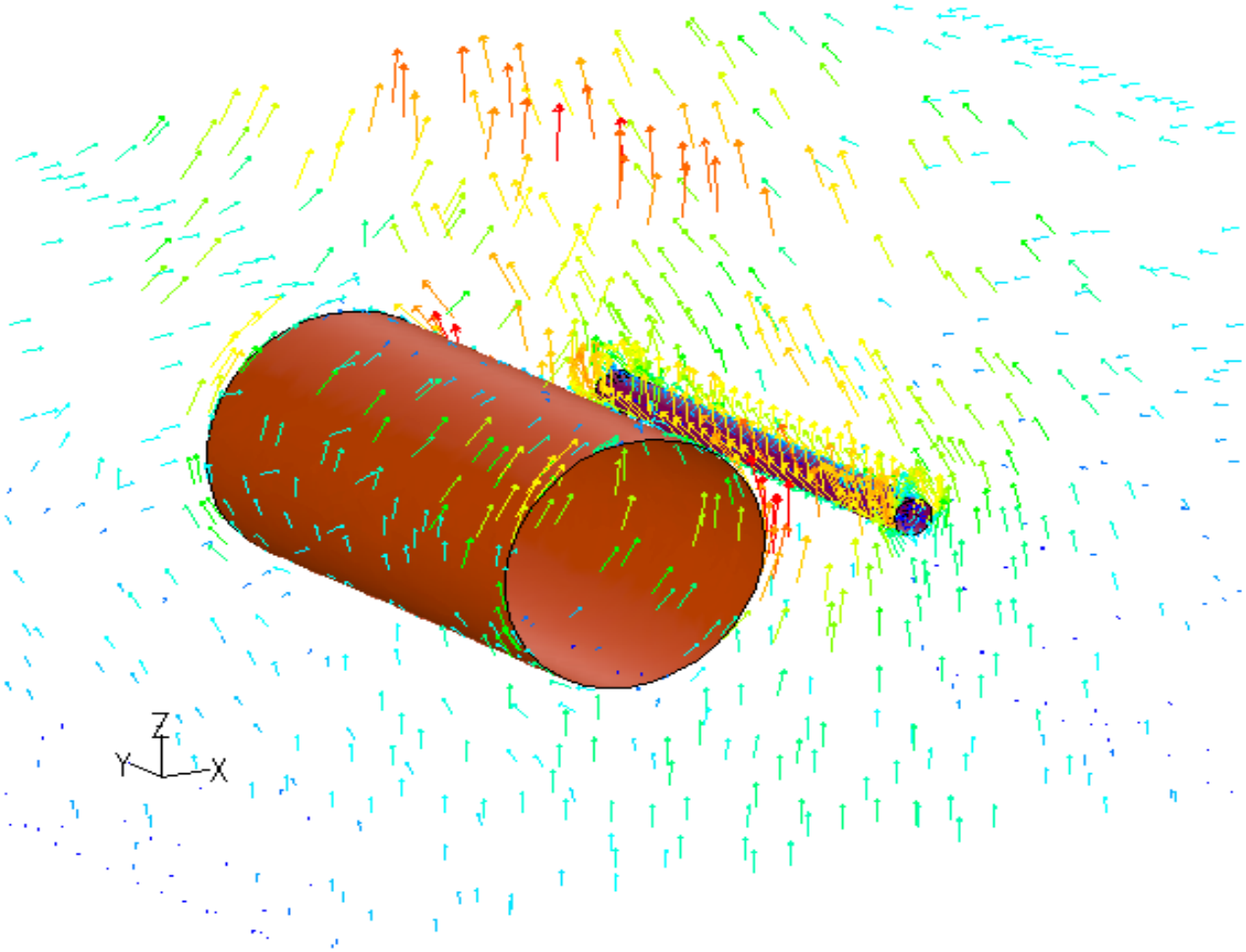
# Boundary and Mat'l Properties

Data file name	Radiation Model	Fluid in pipe	Fuel tube inlet	Fuel tube outlet	Z-direction natural convection	Ambient T (°C)
LandRover-A	DO	diesel vapor	free flow	free flow	yes	see results
LandRover-B	DO	diesel vapor	free flow	free flow	yes	see results
LandRover-C	DO	diesel vapor	free flow	free flow	yes	see results
LandRover-D	DO	diesel vapor	free flow	free flow	yes	see results

	material	Density (kg/m <sup>3</sup> )	Specific Heat Cp (j/kg-K)	Thermal Conductivity (W/m-K)	Emissivity
exhaust pipe	steel	8030	502.48	16.27	see results
fuel pipe	santoprene	970	645	0.16	see results
fuel pipe	nylon	1140	1670	0.25	see results



# Flow vectors

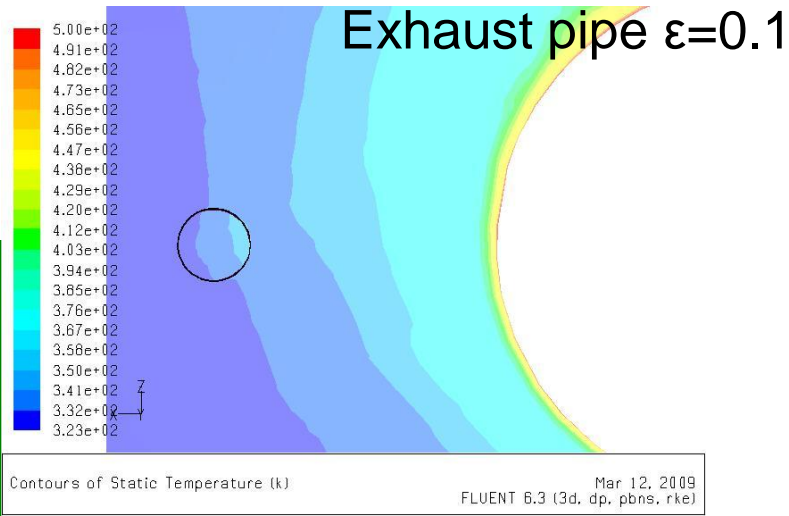


# Fuel Pipe Temperatures

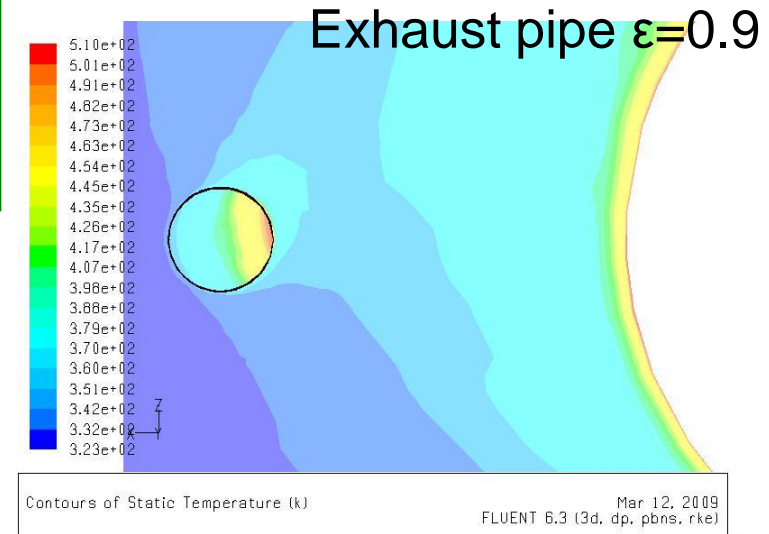
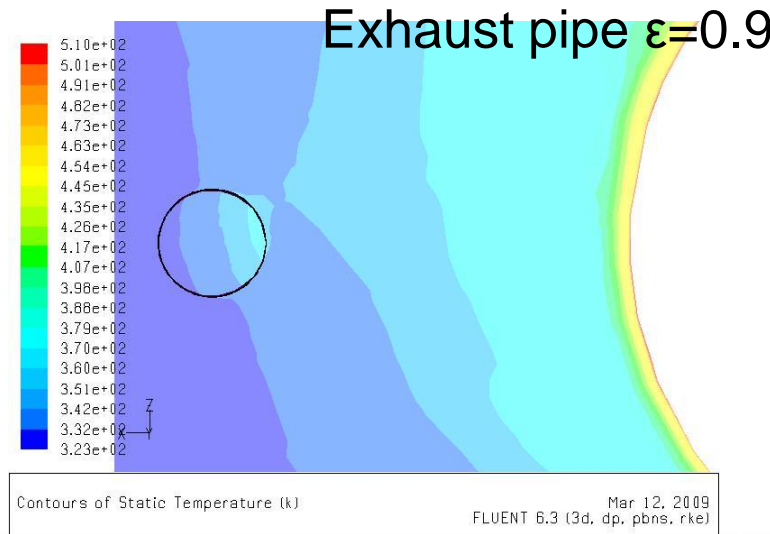
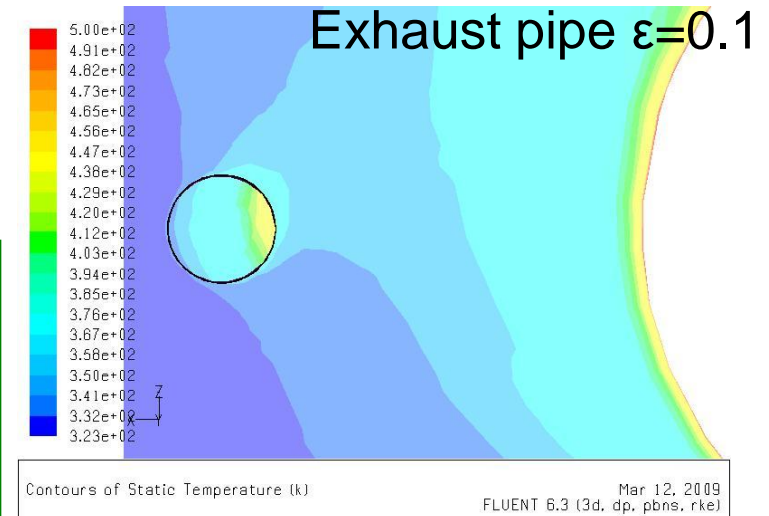
<b>Data file name</b>	<b>exhaust emissivity</b>	<b>Ambient T (°C) Set point</b>	<b>Max vertex surface temp outside fuel pipe (°C)</b>
Landrover-A	0.1	50	73.85
Landrover-B	0.9	50	175.85
Landrover-C	0.1	90	83.85
Landrover-D	0.9	90	236.85

# Ambient Images

Ambient 50°C



Ambient 90°C



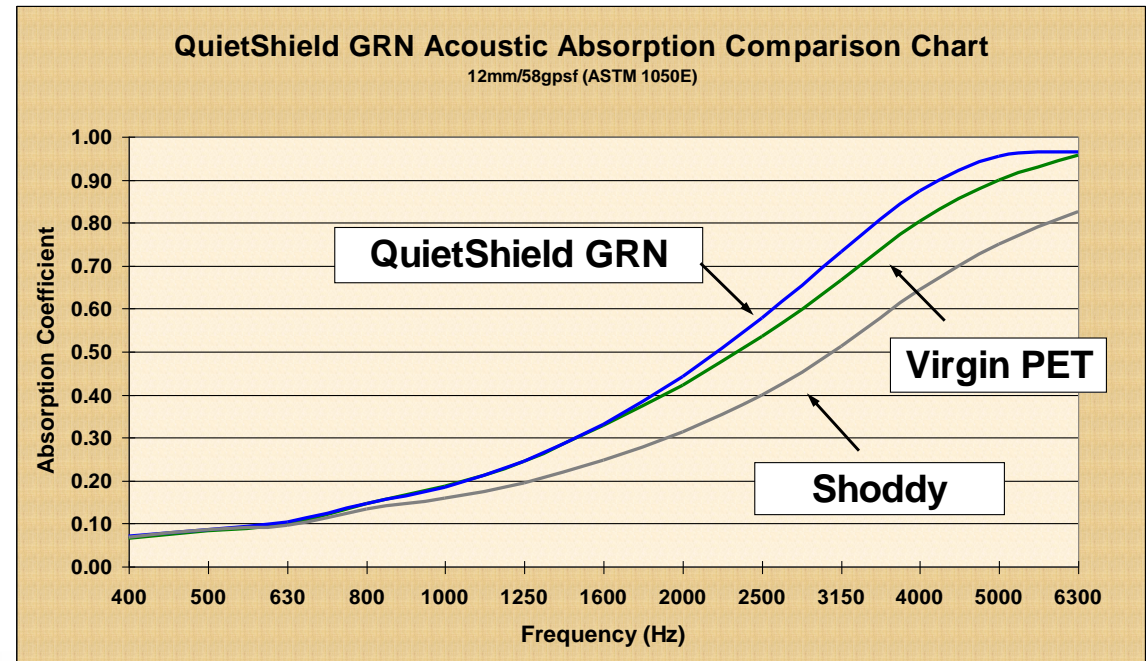
# Acoustic/NVH Protection



## QuietShield GRN 3104

An Earth friendly acoustic solution

- Utilizes a unique process that transforms non recyclable elements into usable raw material.
- Convert cardboard and recycled textile fibers into a non woven substrate.
- Combines an eco-friendly approach with effective acoustical properties.



## Full-service testing

...ensuring that solutions meet customer requirements

<b>ABRASION</b> SAE ARP 1536A ASTM D4157 SAE J112 8	<b>TENSILE STRENGTH</b> ASTM D2256 ASTM D5035 BH-68-001	<b>TEAR STRENGTH</b> ASTM D5733 ASTM D1004 ASTM D624	<b>IMPACT RESISTANCE</b> ASTM D256	<b>STONE IMPINGEMENT</b> SAE J400 ASTM D3170
<b>THERMAL ENDURANCE</b> BH 100-503	<b>THERMAL EFFECTIVENESS</b> SAE J2302	<b>THERMAL CONTAINMENT</b> BH 100-011 SAE J2495	<b>COLD FLEX</b> BH 100-016 Delphi ES-C836	<b>EMI/EMC</b> MIL-C-85485-A
<b>FLUID RESISTANCE</b> BH 100-003 MIL-DTL-23053E	<b>SALT SPRAY</b> ASTM G85	<b>VIBRATION</b> Model C10 Exciter	<b>IR SPECTRUM</b> ASTM D276	<b>DIELECTRIC</b> ASTM D149
<b>FLAMMABILITY</b> UL 1441 VW-1 ASTM D350 FMVSS 302 SAE J369	<b>SMOKE</b> ASTM E662 ASTM F814	<b>FOG</b> SAE J1756	<b>ACOUSTIC</b> BH 100-007	<b>Industry</b> SAE J2192 LV312

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