Lightweighting and “Green” Technologies in Automotive Compounds

Ray C Hetherington
Senior Technical Support
Lightweight and “Green” Overview

• Lightweighting
  – Critical in motor vehicle manufacturing to improve fuel efficiency

• “Green” Rubber Technologies
  – Reduce environmental impact
  – Conserve resources
  – Promote polymers from renewable sources
Lightweight and “Green” Overview

• Innovative HEXPOL Technologies
  – Reduce part size and weight

• Options for Auto Designers and Specifiers to Consider

• HEXPOL “Green” Technology Experience to assist compound developers
  – Reduces emissions in manufacturing process
  – Reduces emissions from cars
Lightweighting in Automotive

• First Step
  – Make cars smaller

• Second Step
  – Lightweight materials
    (Plastics instead of carbon steel)

• Compounds for Auto Interior
Lightweighting in Automotive

• Newer and Lighter Compounds
  – Powertrain and chassis are latest areas for lightweighting

• The American Chemistry Council
  – Sets a path forward through 2030
Lightweighting Material Selection

- Customers Continue to Establish New Lightweighting Objectives
- Heat is a Side Effect of Smaller Engines
  - HEXPOL polymers, including silicone, are heat resistant
Lightweighting Organic Rubber and Silicone

**SG Reduction Through Loading**

- Lower Filler Loadings of Compounds
- Blowing Agents
  - Sponge rubber
- Nucleating Agent Dispersions
- Considerations
  - Specs, cost, properties
Lightweighting Organic Rubber and Silicone

Property Changes to Reduce Part Volume

• Increase Performance of a Part
• Smaller and Lighter Weight Part with Higher Performance Compound

• Considerations
  – Enhancing one property can negatively affect another
  – Specs, costs, properties, etc
HEXLITE™ Microdense Technology

• Additives to reduce specific gravity (SG) of existing compounds
• Offset loading costs
• Further reduce weight of current low density materials
• Considerations
  – Specs, costs, properties, etc
Lightweighting Thermoplastic Elastomers (TPE)

SG Reduction:

• Lightweight Fillers

• Foaming
  – Glass spheres, polymer encapsulated blowing agents, and dispersions of nucleating agents

• Material Design for Improved Part Design

• Other Considerations
Lightweighting Thermoplastics

Olefins

• Microspheres:
  – Easier to use in plastics than TPE
  – Glass spheres and polymer encapsulated blowing agents
    • Feed downstream through a side feeder

• Foaming
Lightweighting Thermoplastics

Olefins and Polyamides (Nylon®)

SG Reduction:
• Considerations
• Glass Spheres, Finer Materials, Nano Fillers
• Property Changes to Allow Reduced Part Volume
Lightweighting in Additives

Performance Additives:

• Lightweight
  – Foaming agents
  – Dispersions of glass spheres, polymer encapsulated blowing agents, and dispersions of nucleating agents

• Heat Stability
DRIVEN BY HEXPOL
“Green” Technologies

- Emission Reduction from Vehicles
  - Lightweighting
- Emission Reduction from Compound Manufacturing Plants
- Conserve Natural Resources
- Reduce Greenhouse Gas Emissions
- Reclaim Polymers for Use in New Compounds
“Green” Technologies in Rubber

• Natural Rubber – Hevea Brasiliensis
• Guayule Rubber or Other Alternate Resources
  – A dessert shrub as an alternative to tropical rubber trees
• Dandelion Rubber
“Green” Technologies in Rubber

Reclaiming Rubber

• Natural Rubber
• Silicone
• Fluorosilicone
“Green” Technologies in Rubber

Reclaiming Rubber

• De-vulcanize to recycle
• Breaking the cross-links formed during vulcanization
• Some technologies can reclaim 90% of compounds’ polymers
“Green” Technologies in Rubber

Reclaiming Rubber

- Ground Scrap
  - NBR
  - Tire Buffings
  - FKM
“Green” Technologies in Rubber

Reclaiming Raw Materials

• Carbon Black
  – Devulcanizing
  – Carbon Black Pellets

• Fillers

• Oil
“Green” Technologies in Rubber

• Fillers
  – Oyster Shells
  – Walnut Shells
  – Pine Tar
  – Wood Flour
  – Rice Hulls
“Green” Technologies in TPE

RECYCLE

RECLAIM

RENEWABLE
“Green” Technologies in TPE

- Post Consumer Materials
  - Tire Crumb
  - Reground Parts

- Ground TPE Parts:
  - 25% to 40% Reuse
  - No Chemical Reaction
  - Color Issues
“Green” Technologies in TPE

Reclaiming TPE

• Dryflex Green
  – Designed to Maximize Renewable Resources

• Lifocork
  – Natural Fillers

• Filler
“Green” Technologies in Thermoplastics

Rhevision®

• Replacing Traditional Fillers with Natural Fillers
  – Green fibers with lower SG
  – Weight savings and using renewable fibers

• Used for Nonvisual or Wrapped Parts
“Green” Technologies in Thermoplastics

• Fillers (Biocomposites)
  – Rice Hulls
  – Flax Fiber
  – Hemp Fiber
  – Wood Fiber
  – Agave Fiber
  – Pecan Shells
  – Coconut Shells
  – Walnut Flour
  – Pine Flour
  – Pine Tar
“Green” Technologies in Thermoplastics

Reclaiming Thermoplastics

- Post Consumer and Post Industrial
- Reground Material
- Carpet Reclaim
“Green” Technologies in Additives

- Recycled/Ground Tire Rubber
- Fortamix®: Glass filler made with recycled materials
“Green” Technologies

• Conserve Natural Resources
• Reduce Greenhouse Gas Emissions
• Reclaim Polymers for Use in New Compounds
Ways to Advance the Automotive Rubber Industry

Strategies for Achieving Improved Fuel Efficiency and Reduced Carbon Emissions

• Lightweighting
• “Green” Technologies
• HEXPOL Strategies
Thank you!

If you have any further questions please feel free to email them to Ray.Hetherington@hexpol.com