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Environmental Sustainability for the Automotive Industry: Progress & Next Steps

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SAE International

- Headquartered in Warrendale, PA with Automotive Headquarters in Troy, MI
- 501.c.3 not-for-profit foundation
- 128,000 members— industry, government, academia
- Share information and exchange ideas for advancing engineering mobility systems
- Standards development, events, and technical information and expertise used in designing, building, maintaining, and operating vehicles for use on land or sea, in air or space

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Overview

- Priorities for 2011
- Challenges for Auto Industry
- Michigan Green Chemistry & SAE's response
- Green Technology Steering Group scope
- Examples of Green Chemistry Principles in Automotive Sector
 - Materials - Recycling/reuse
 - Waste
- Elements in a "Green Car Factor"
- Goal: global standards for environmental sustainability in the mobility sector

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SAE Priorities for 2011

- Globalization—sustainability issues are global
- Expand influence of SAE standards
 - Proactive regulatory approach (US and Global)
- Maintain and grow suite of SAE standards
 - Develop mechanism for identifying standardization needs for emerging technologies
 - Reach out to other stakeholders and engage them in development process
- Enhance interactions across SAE sectors: aerospace, auto, and commercial vehicle

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Environmental & Green Challenges for the Mobility Industry

- Environmental issues are critical and global
- Concerns about "sustainable mobility" and "green mobility products"—what are they?
 - Green initiatives focus on fuel efficiency, but should be more than that
 - Difficult to commercialize new auto technologies
 - Individual companies active in sustainability and the green arena
 - Challenges for industry consensus and path forward

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SAE Proposed Actions for the Mobility Industry

- Provide technical information and feedback to address issues before regulations are imposed
- Make the Mobility Sector part of the solution
- Facilitate the industry's approach to be more environmentally responsive, yet cost-effective and time-sensitive
- Assure the Mobility Sector is recognized as a leader for new, green and sustainable technology

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Transportation

- Almost 20 percent of the world's total delivered energy is used in the transportation sector¹
- Transportation alone accounts for more than 50 percent of world consumption of liquid fuels¹
- 14.3% of greenhouse gases worldwide originate from the transportation sector making it the third largest emission source²
- In the US alone:
 - Transportation is responsible for 2/3 of our petroleum usage¹
 - On-Road vehicles responsible for ~80% of transportation petroleum usage¹

¹US Energy Information Administration
²World Resources Institute

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Auto Industry Trends

- Lightweight
- Low/zero emissions
- Alternative propulsion systems
- Reduced vehicle energy consumption
- Weight reduction to improve fuel economy
- Renewable/sustainable
- Recyclable

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Automotive Recycling Industry

- The automobile is the world's most recycled consumer product
- In North America, 95% of retired autos are processed for recycling every year
- At least 86% of a car's material content is recycled, reused and recovered
- Recycling vehicles provides enough steel to produce almost 13 million new autos and saves ~85 million barrels of oil annually
- Products expected to last more than 15 years

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Green Chemistry in Michigan as a Catalyst for Action in the Auto Sector

- 2006 Michigan Executive Directive
- 2008 Action Plan for Michigan Green Chemistry Research, Development, and Education
- Michigan Department of Environmental Quality, with support from the Michigan Green Chemistry Roundtable, awarded grant for a workshop to SAE in 2009
 - Feasibility Study for Establishing a Center for Green Innovation & Technology Transfer for the Automotive Industry in Michigan

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Green Technology Steering Group



Scope:
 To serve as a guiding body for consensus standards development for environmental sustainability issues in the automotive sector.

"Meeting the needs of the present generation without compromising the ability of future generations to meet their needs."

Defining concept of green: related to the size of the environmental footprint of a product, i.e. the degree to which a product has a negative impact on human health and ecosystems

Topics for consideration include materials, energy, water, waste, recycling and reuse, and manufacturing practices

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Work in Progress

- SAE J2960– "Implementation of Green Chemistry and Engineering within the Automotive Sector" under development
- SAE J2965 – "Terminology and Definitions for Green Innovation and Sustainable Practices in the Automotive Industry" under development
- Inventory of Green Chemistry & Engineering Case Studies from EPA Awards

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Examples of Green Chemistry & Engineering Projects in the Auto Sector

Prevent Waste

- Landfill: since 2005, 78 of 156 global manufacturing as well as 14 non-manufacturing operations are landfill free at GM
- Waste: since 2000, 43% decrease in waste, with 91% of all waste recycled at GM

Design Less Hazardous Syntheses

- PPG'S Green Logic® Paint Detackifier: replaces petroleum-based and melamine-formaldehyde products.
- Zircobond Pretreatment: eliminates chrome, zinc, nickel, manganese, and phosphate from the metal pretreatment process

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Example of Green Chemistry & Engineering Projects in the Auto Sector-2

Use Renewable Feedstocks

- Biomaterials in Autos
 - Biopolymers
 - Bio based resins: corn, castor beans, sugar cane
 - Soy, soy oil: foams, thermoset resins, fillers
 - Fillers and Reinforcements
 - Natural Fibers: hemp switch grass, flax, wheat straw, wood, kenaf, coconut
- One example of many products on the market: Biofoam soy seats
 - In over 2 million Ford vehicles
 - In GM's Chevy Volt, and
 - In Nissan's Leaf

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Elements in a "Green Car Factor" for Best Practices or Standards

- Direct vehicle emissions
- Fuel/energy source/environmental impact
 - Biofuels
 - Low carbon (e.g., natural gas)
 - Environmentally friendly charging sources
- Materials
 - Components: structure, panels, seats, electronics, power-train, tires
 - Service: refrigerants, coolants, lubricants, hydraulics
 - Impact on cabin air quality (chemical releases)
- Manufacturing processes
 - Waste produced
 - Resources (water, energy) consumed
- Recyclability/disposability

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Sustainable Mobility

"Sustainable mobility means delivering safe, energy-efficient products that meet our customers' needs while using the earth's resources responsibly, minimizing environmental impacts, relying on renewable energy, and responding to differing community needs for transportation, and at the same time fulfilling our fundamental role in driving world economies. ...It depends on collaboration, automakers working with government, energy providers and consumers to advance sustainable mobility through a comprehensive integrated approach"

Auto Alliance,
Reinventing the Automobile 2011

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Lessons Learned and Future Steps

- Sustainability issues are cross-cutting, generally not required by regulation or law, and not focused in discrete technical departments in companies
- Companies address sustainability differently
- No "silver bullet"

We need:

- General-high level industry support to integrate these efforts across departments;
- Collaboration and partnerships;
- Process to identify opportunities to advance sustainability across the industry;
- A few industry leaders in sustainability dedicated to the effort.

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Conclusion

SAE is providing a forum through the Green Technology Steering Group to address these issues and develop a framework and strategy for global standards for environmental sustainability in the mobility sector.

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Call for Experts

Volunteers for the green standards development committees,
contact Patricia Ebejer <PEbejer@sae.org>

The full report from the Green Engineering and Technology
Workshop is available at <http://www.sae.org/events/green/>