Design for the Environment Program

Green Chemistry & Commerce Council Meeting
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Outline

- Delphi Overview
- IMDS / GADSL a Suppliers Perspective
- Delphi’s Design for the Environment Process
- EH&S Benefits & Challenges
Delphi is a Global Supplier

Major Technical Centers

- Auburn Hills, MI; USA
- Bascharage, Lux.
- Krakow, Poland
- Juarez, Mexico
- São Paulo, Brazil
- Shanghai, China
- Bangalore, India

15 Technical Centers ■ 11 Countries ■ 17,000 Scientists & Engineers
114 Manufacturing Sites ■ 30 Countries ■ 104,000 Employees
Delphi Products

**Electrical/Electronic Architecture**
- Electrical/Electronic Distribution Systems
- Connection Systems

**Electronics & Safety**
- Electronic Controls
- Infotainment & Driver Interface
- Navigation System
- Active Safety Systems
- Audio Systems
- Body and Security Electronics and Systems
- Communication Systems

**Powertrain Systems**
- Gasoline Engine Management Systems
- Diesel Engine Management Systems
- Fuel Handling Systems,
- Evaporative Emissions Systems
- Transmission Management Systems

**Thermal Systems**
- Thermal Automotive
- Thermal Residential and Commercial Heat Exchangers
- Condensers
- Radiators
- Fan Modules
- HVAC Modules

**Product & Service Solutions**
- Diesel
- Independent Aftermarket
- Original Equipment Service
Diverse Customer Base
IMDS / GADSL a Supplier’s Perspective
Supplier’s perspective on IMDS / GADSL

- Vehicles are a complex collection of components, technologies and materials

- Many tiers to the supply chain feeding OEMs

- A Tier 1 supplier’s biggest issue is their ability to gather information from the supply chain. Customer data requests should be sensitive to the need for a common format and the ability to aggregate lower tier supplier data.

- Farther into supply chain you travel, solicited suppliers % of sales to Auto Sector diminished – influence diminished
Suppliers perspective on IMDS / GADSL

This BOM is over 9 pages long
Suppliers Perspective on IMDS / GADSL

GADSL single most important accomplishment towards fulfilling auto sector need to identify substances of concern

Before GADSL

Raw Material Suppliers

Tier 2 Supplier A
  Tier 2 Supplier B
  Tier 2 Supplier C
  Tier 2 Supplier …

Tier 3 Supplier A
  Tier 3 Supplier B
  Tier 3 Supplier C
  Tier 3 Supplier …

Tier n Supplier …

Delphi

OEM List 1
OEM List 2
OEM List 3
OEM List 4
OEM List …

All TIERS
Auto Sector Supply Chain

After GADSL

GM
HONDA
VW
Ford
DAIMLER

CHRYSLER
TOYOTA

Tier 2 Supplier A
  Tier 2 Supplier B
  Tier 2 Supplier C
  Tier 2 Supplier …

Tier 3 Supplier A
  Tier 3 Supplier B
  Tier 3 Supplier C
  Tier 3 Supplier …

Tier n Supplier …
Suppliers Perspective on IMDS / GADSL

- CLEPA / AIAG / Japia members strictly support the GADSL approach and use this harmonized list as the base for material data reporting along the supply chain.

- We prefer IMDS reporting to other customer specific formats because:
  - over 89,000 companies representing the worldwide automotive industry are utilizing IMDS
  - Avoids redundant/duplicate data entry at lower supplier tiers
  - Best practices and data format recommendations are established between supplier groups (including Chemical Suppliers) and OEM partners
Delphi’s Design for the Environment Process
Design In Strategy

Proactive vs. Reactive

- **Ability to Influence**
- **Cost**
- **Direct & Indirect**

**Resources**
- Engineering
- Changes

**Cost**

**Design In Strategy**
- Good Technical Information
- Team Work
- Communication

**Bubble up**

<table>
<thead>
<tr>
<th>Phase 0</th>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Proactive</strong></td>
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<tr>
<td>Product Design</td>
<td>Production</td>
<td>Manufacturing Design</td>
<td>Assembly</td>
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**DELPHI**
Delphi’s Design for the Environment Process

- **Hazard**
- **Exposure**
- **Fate**

- **Bill of Materials**
- **Suppliers**
- **Engineering Design**
- **Manufacturing**
- **Product In-Use**
- **End of Useful Life**

- **Community**
- **Employee**
- **Customer**
- **Consumer**
- **Ecosystem**

Delphi's Design for the Environment Process
Delphi’s Design for the Environment Process

Key Ingredients

- Integration into Product Development Process
  - ADP, BOM, BOP info

- Divisional Alignment of Resources
  - Divisional & Regional - dfEH&S Engineer
  - Technical center and site engagement

- Continuous Improvement – metrics

- Leveraged Technical Expertise
Delphi’s Design for the Environment Process

Engineering

Technical Review

- Environmental Regulatory
- GADSL
- Customer Requirements
- Occupational Safety and Health Regulatory
- Human Health Effect Toxicology
- SAR
- Industrial Hygiene
- Environmental Toxicology
- PBT
- Air Toxics Screening
- GHG
- LCA

Product / Manufacturing / Material Engineering Feedback
Product Life Cycle Benefits

Bill of Materials

- Engineering Design
- Bill of Process
- Manufacturing
- Product In-Use
- End of Useful Life

Improved Vehicle Performance
- Increased MPG
- Reduced Tail Pipe Emissions
Delphi Green Product Solutions

- Fuel Economy and Performance Technologies
  - Cylinder Deactivation System
  - Two-step Valve Train with Dual Independent Cam Phasers
  - Brushless Fuel Pump Modules
- Reman ECM/PCM
- Universal Reflash Tool
- Alternative Fuel Systems/Components
  - Fuel System for Dimethyl Ether
- Evaporative Emissions Canisters
- Diesel Fuel Injection Systems and After-treatment
- Gasoline Direct Injection
- Next Generation Energy Efficient A/C
- HVAC Compressors
- HVAC Systems for Alternative Refrigerants
- Diagnostic Systems

- Electric HVAC Systems
- Hybrid and Electric Vehicle Technologies
- Power Conversion Products
- High Voltage Battery Pack System
- Ammonia, Planar Oxygen & Battery IVT Sensors
- Electronics Packaging
- Halogen-free Cable
- Aluminum Cable
- Miniaturization
- Navigation
- Ultra Light Radio
Delphi EH&S Benefits & Challenges

Benefits
- Proactive vs. Reactive
- Reduce Risk
- Reduce Cost
- Competitive advantage

Challenges
- Supplier Disclosure
- Regulatory / Scientific Finding Surveillance
- Engineering Engagement
- Scientific Data Availability
Thank You