Legal Statement

The purpose of the information in this presentation is to guide ICA programs and provide members information to make independent business decisions.

Based on a combination of primary interviews and industry information The Martec Group is the source of forecast data in this presentation.
Antitrust Guidelines

ANTITRUST GUIDELINES
FOR
COPPER INDUSTRY TRADE ASSOCIATION MEETINGS

The following guidelines with respect to compliance with antitrust laws of the United States, Japan and European Community are intended to govern the conduct of participants in copper industry trade association meetings, both at the meeting itself and in informal discussions before or after the formal meeting.

Price. Competitors should not discuss future prices (including terms of sale) of their products. There is no blanket prohibition against the mention of or reference to current or past prices but limits must be observed. Such references or mentions should occur only when necessary in connection with the development of association programs. For example, reference to a particular price level in comparing the cost of a copper product to a competing product is permitted. Whenever possible, such references should be discussed in advance with legal counsel.

Competitive Information. Competitors should not discuss the market share of a particular copper producer or copper fabricator’s products. Furthermore, nothing should be said at a meeting which could be interpreted as suggesting prearranged market shares for such products or producer production levels. The overall market share of copper products may be discussed with regard to competition with non-copper products and general market acceptance.

New Products. Competitors should not encourage or discourage the introduction of a new product by another competitor or reveal a particular copper company’s plans to change the production rate of an existing product or to introduce a new product. No company should disclose to another company whether it is in a position to make or market a new product. New products may be discussed in a technical manner or from the standpoint of competition with non-copper products and general market acceptance. In addition, proposed methods for and results of field and laboratory testing can be considered.

The Role of Legal Counsel. Legal counsel attends association meetings to advise association staff and other meeting attendees regarding the antitrust laws and to see that none of the matters discussed or materials distributed raise even the appearance of antitrust improprieties. During the course of a meeting, if counsel believes that the discussion is turning to a sensitive or inappropriate subject, counsel will express that belief and request that the attendees return the discussion to a less sensitive area.

A paper entitled
"Copper Industry Trade Associations and the Antitrust Laws"
is available upon request.

10/92, 5/93, 10/10

1 Other foreign competition laws apply to International Copper Association, Ltd. (ICA)'s activities worldwide.
The Reality of Copper Substitution in Automotive Wire Harnesses

1. Survey Base
2. Study Global Indicators
3. Summary of Findings
Automotive Wire Harness - Summary of Interviews

Martec has completed 79 interviews with various key industry respondents:

- Leading global OEMs
  - GM, Toyota, Ford, Mercedes, BMW, VW/Audi, Honda, Nissan, etc.
- All leading global wire harness suppliers
  - Sumitomo, Yazaki, Delphi, Leoni, Furukawa, etc.

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Small Vehicles Will Grow At the Fastest Rate Over the Next 10 Years

Global Light Vehicle Production by Segment

Note: Small vehicles include A and B segment, Medium vehicles include C and compact truck segments, Large vehicles include D, E and full size truck segments
Future CO₂ Legislation Will Continue to Require Greater Advances in Technology

**Global Light Duty CO₂ Standards**

GHG regulations are globally driving new technologies for compliance:
- *Downsizing*
- *Downweighting*

US 2025: 107
China 2020: 117
Japan 2020: 105
EU 2020: 95
Average Copper Content in Wire Harnesses and Cables Ranges from 8.1 to 16.4 Kilos in Different Regions Globally

Recent Trends:
- North American decrease primarily due to vehicle downsizing
- Japan increase due to lower than expected gauge downsizing
- Global average decrease due to global vehicle downsizing trend, material substitution and gauge downsizing
Average Copper Content Range from 5.5 Kilos in Small (Basic) Vehicles to 23.2 Kilos in SUVs

Recent Trends:
- Increased use of wires to support feature content in large and large plus segments
- Decrease in SUVs, compact, midsize due to material substitution and downsizing
 Significant Downsizing Is Evident from 2008 to 2016 ... 0.13mm²

Introduction Is the Primary Driver

2008 vs. 2016 Average Midsize Sedan

Share of Total Harness Mass

Larger Gauge / Battery Cable is Most at Risk

No Substitution  Lower Risk of Substitution  Higher Risk Group
Global Substitution of Copper in Automotive Harnesses (Battery Cable and Other) Will Likely Displace 6% of Total Copper Mass by 2020.

**Global Material Share in Electrical Distribution System**

- Copper: 94% (2015), 93% (2018), 92% (2020)
- Al Battery: 6% (2015), 5% (2018), 4% (2020)
- Other Al: 2% (2015)

The trend shows a steady decrease in Copper share and an increase in Other Al share from 2015 to 2020.
Weight, More Than Cost, Is Agreed Upon as the Strongest Driver to Change

**Drivers for Copper Substitution**

1=Least Important, 7=Most Important

Respondents placed a greater emphasis on weight and cost for battery cables vs. other wire harnesses.
Cu Demand Is Forecast to Continue to Increase Over the Next 5 Years, Mainly Driven by an Increase in Vehicle Production Globally

Recent Trends:
- Avg. Cu kg/vehicle is expected to decrease from 11.7 to 11.0 in 2020
- Vehicle demand shifts are the key driver

**Best Case:** Japanese OEMs pursue Al substitution less aggressively, US OEMs maintain Cu battery cables

**Baseline Case:** Aggregate of Martec interview feedback from global OEMs and suppliers

**Worst Case:** US downsizes faster, moves quickly on Al battery cables; Technology allows Al substitution to be more feasible for diameters down to 1mm by 2020
The Market Indicates a Small Potential Downside for Cu Even Under Worst Case Scenario

Best Case vs. Projected Base vs. Worst Case

- Takes into consideration both decline of Cu usage on average and growth of global vehicle production
- Cu demand growing due to courtesy of production

Best Case vs. Projected Base vs. Worst Case Chart

Cu Tonnes

- 2015
- 2016
- 2017
- 2018
- 2019
- 2020

Best Case
Base
Worst
Summary of Key Findings

1. Copper continues to be the predominant material of choice for wire harnesses in the Automotive industry.
   - Currently: Copper ~98% and Aluminum ~2% share
   - Weight and cost are the key reasons to material substitution

2. Substitution is slow due to risk averse organizations.
   - Copper still holds major advantages over Aluminum, resulting in thin gauge Copper wires being “protected”
     - Corrosion risk, connectivity issues, packaging and flexibility
   - Automotive engineers are still more comfortable in using Copper (long standing history)

3. European and Japanese OEMs lead the charge on substitution.
   - European OEMs leading the charge with battery cables
   - Japanese OEMs focused on battery cables and body chassis harnesses

4. American OEMs are focusing more on downsizing of gauges.

5. Current market demand for Copper in Automotive wire harnesses is ~1M tonnes globally and is expected to grow to ~1.15M tonnes by 2020.
   - Increase due to growth of Automotive market and feature content