DRIVEALUMINUM

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AUTOMOTIVE LIFE CYCLE ASSESSMENT: FACT CHECKING STEEL INDUSTRY STUDIES

White Paper Summary

The Aluminum Association

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FACT CHECKING STEEL INDUSTRY STUDIES

Decarbonization is critical as the United States and the rest of the world strive for a more sustainable future. The automotive industry is one of the leading contributors to global carbon emissions, and to reduce its environmental impact, the U.S. aluminum industry supports comprehensive, scientifically-sound life cycle assessment (LCA) as a tool for decision-making. As the leading voice representing the North American aluminum industry, the Aluminum Association offers a rich history as a trusted source of LCA data for aluminum, dating back to 1993.

LCA is a quantitative environmental assessment method designed to evaluate the cumulative environmental impact of a product throughout its life cycle from "cradle" (e.g., the extraction of raw materials), through the use of the product over its lifetime, and to "grave," which is until the product is disposed or recycled. However, not all LCAs are created equal. The inherit complexity of LCA, coupled with individual practitioners' freedom and flexibility with inputs when conducting an assessment, can generate misleading or false results – either by mistake or by intent. For automotive materials, the key to accurate assessment is precise reflection of raw material sourcing, manufacturing efficiency improvements, and engineering innovations from both the steel and aluminum industries.

To inform stakeholders about key issues related to automotive LCA and factors that can significantly impact a study, the Aluminum Association conducted a comprehensive review of studies released by the steel industry. Major differences between the steel industry and the rest of LCA community were identified and developed into an Aluminum Association white paper titled, "Automotive Life Cycle Assessment: Fact Checking Steel Industry Studies."

The following pages summarize the contents of the full paper and provide insight on the importance of conducting LCA using well rationalized and widely agreed upon assumptions and parameters, as well as accurate and up-to-date input data. Accurate inputs ensure accurate outputs and even small variances can drastically alter the outcome and validity of an LCA.

To that point, researchers at the United States Environmental Protection Agency (EPA) reviewed dozens of LCA studies and confirmed, *"Aluminum was identified as the material most often specified by the LCAs for providing the highest benefits in terms of life-cycle energy and [greenhouse gas] reductions."* EPA researchers also observed that no studies, other than those from the steel industry, claim steel is more sustainable than aluminum overall. EPA concluded, *"…assumptions from reports that have divergent results from the majority of the literature [which confirms aluminum's lower life-cycle carbon footprint] need to be carefully analyzed so that they can inform rather than detract from the larger scientific consensus."*

To assess the impact of the determined flawed inputs, below is a summary of key factors identified by the Aluminum Association that lead to the differing results and conclusions of steel industry studies.

Mass Reduction Potential

Lighter vehicles have a smaller carbon footprint than heavier vehicles, making weight the foundation for difference in evaluating life cycle environmental impact of automotive materials. LCA works from the steel industry demonstrates underestimating the technical ability of aluminum for mass reduction while overestimating the capability of advanced high strength steel (AHSS). Research papers published by researchers at U.S. Department of Energy, Argonne National Laboratory and others confirm that, on average, the mass reduction potential of aluminum is in the 30 to 60 percent range, and AHSS 15 to 20

percent range. Design experiences by auto makers and third-party firms confirm such potentials. These values are notably different from what the steel industry has used in its studies.

Mass-Induced Fuel Reduction Value (FRV

When considering fuel saving values attributed to lightweighting, steel industry data inaccurately portrays the figures to favor heavier steel-intensive vehicles rather than lighter, aluminum-intensive vehicles. Any small change to the fuel consumption factor has a significant impact on results. Due to its importance, the Canadian Standard Association (CSA) Group's SPE-14040-14 Guideline—a collection of standards and guidelines to regulate how assumptions, parameters and data shall be selected and documented for LCA—recommends researchers to use values from the 2010 Koffler et al study, "On The Calculation of Fuel Savings Through Lightweight Design In Automotive Life Cycle Assessments." Commonly, the steel industry FRVs are noticeably lower than what is recommended by leading experts.

Energy and Greenhouse Gas Values of Raw Materials

Life cycle inventory (LCI or LCIA) data for raw material production is another influential factor in LCA, particularly for the production phase of the life cycle. Because metals for automotive application can be sourced from production sites around the globe, accurate LCI data must be sensitive to time and geographic location. If a dataset represents the global average situation while the study is intended to analyze a certain region where raw material is sourced locally by auto makers, the dataset is deemed not representative. Some steel industry LCAs grossly overstate the production stage footprint of aluminum production despite current and available source data.

Recycling Recovery Rate

The higher the recovery rate of a material, the lower the total footprint. Steel's LCA model contains clear biases to the end-of-life allocation method and material recovery rates, using a combined metal recovery rate of 90.3% for steel and 78.6% for aluminum. Several studies, including a 2016 report from the Worcester Polytechnic Institute's Center for Resource Recovery and Recycling, confirm post-consumer automotive aluminum recovery rate exceeds 90 percent once an automobile is recycled.

As the full paper demonstrates, the steel industry's documented disinformation included in its ongoing LCA body of work paints a demonstrably false picture of the relative carbon footprints of leading automotive materials. To help shape a sustainable future for transportation and mobility, valid and credible information is vital to inform key audiences involved in the business and regulatory decision-making process for the global industry.

Driving Sustainability

At nearly 30 percent, the transportation sector generates the largest share of global greenhouse emissions and aluminum's inherent sustainability advantages play a vital role in helping automakers decrease life cycle carbon emissions. Exceptionally strong but amazingly lightweight, few other materials can offer the versatility, value and environmental benefits—all keys reasons aluminum remains the fastest-growing automotive material. Reducing vehicle weight with aluminum increases performance, safety and efficiency, which in turn produces fewer tailpipe emissions and extends the range of electric vehicles.

When evaluating the sustainability merits of one material over another, credibility is crucial. In separate studies of full vehicle systems, researchers at the Department of Energy's Oak Ridge National Laboratory, experts from Ford Motor Company and Magna International and, most recently, prominent LCA scientist, Lindita Bushi, evaluated the environmental impact of steel and aluminum-intensive vehicles, ranging from sedan to SUV and light truck. All independently arrived at the unified conclusion: aluminum is environmentally superior when full life cycle carbon emissions are considered.