The Importance of Steel in Future Automobiles

Information provided by the American Iron and Steel Institute to the Joint EPA/NHTSA Hearing on Proposed Rulemaking to Establish Light-Duty Vehicle Greenhouse Gas Emissions Standards and Corporate Average Fuel Economy Standards

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I want to thank the EPA and NHTSA for holding this hearing today and for allowing me to address this public forum. On behalf of the American Iron and Steel Institute (or AISI), I am pleased to offer comments to this committee on the significant and relevant work that has been and is being carried out between domestic steel and automotive companies with respect to improvements in vehicle emissions performance.

My name is Ron Krupitzer, vice president automotive applications, for AISI and I have spent my working life in both the steel and automotive industries, in both the engineering laboratory and on the factory floor. I have a keen appreciation of the importance of both industries to the United States. Today I will report on the collaborative work between steel and auto that has gone on for more than 20 and how it is relevant to the issues raised by this proposed rulemaking.
Steel is the basis for modern vehicles in the U. S. and around the world. Recent studies (notably by Mega Associates and by Ducker Worldwide published over the last 3 years) have found that the average light vehicle in North America contains about 60% steel. Our goal, of course, in the steel industry is to keep steel in the vehicle – to preserve and grow this vital market. Let me explain why this steel industry objective supports the goals of EPA and NHTSA; that is, why steel technology helps to reduce emissions associated with vehicles.

I want to make three points today: steel’s reinvention, the significance of steel and auto collaboration, and steel’s greenness.

First, the steel industry has re-invented its automotive steel products in the past and must continue to do so in the future, if it is to continue to provide safe, practical and affordable means of reducing vehicle mass, which leads to emissions reductions. For example, in my experience working with GM, Ford, and Chrysler as well as the new North American domestics including Toyota, Honda, Nissan, Hyundai, BMW, Mercedes and others, I can tell you that all of these companies, which manufacture vehicles in North America, make use of state-of-the-art high-strength steel grades, which they receive from domestic steel mills. The proposed rule clearly reports the consensus by EPA and NHTSA that reducing vehicle weight is an effective part of the overall strategy for meeting the proposed emissions and fuel economy standards (Section III-F-4). EPA further has asked for
comment on its conclusion that it is “technically feasible to reduce vehicle weight without reducing vehicle size or footprint or structural strength”. AISI agrees with this statement since that is exactly what is accomplished by the effective use of advanced high-strength steels (AHSS). I will explain further.

These new steels have helped carmakers achieve 5-star crash ratings in their latest models without increasing vehicle mass. This is consistent with EPA comments written in Section 7.6 of EPA’s Weight Reduction and Vehicle Safety Draft Regulatory Impact Analysis, which describes methods for reducing vehicle mass: “Substitution of lower density and/or higher strength materials... high-strength steels, aluminum, magnesium, or composite materials for components currently fabricated from mild steels.” Significantly, new advanced high-strength steels clearly help to reduce mass while providing improved safety. In fact, it these AHSS grades in today’s cars and trucks, and their growth over the last 10 years that have made steel bodies and chassis components considerably stronger and lighter, and more crashworthy, compared to vehicles made 10 short years ago. Such grades includes “dual phase” and “TRIP” steels in production today and largely unknown to carmakers 10 years ago. These new steels are the fastest growing materials in today’s vehicles (as measured by Ducker Worldwide) and have already proven to be significant in their ability to reduce the mass of body structural components by 25% or more compared to mild steel, and more affordably than can be achieved by other materials considered for mass reduction.
My second point has to do with collaboration. AISI believes that collaboration is essential for both the steel and automotive industries to move forward and implement the technologies that drive down emissions. Our partnering together is well known for achieving productive results. In 1987, the Auto/Steel Partnership was formed with Chrysler, Ford, General Motors, and the major domestic steel companies and still operates today. In the 1990s, domestic steel companies helped to organize a global consortium of the world’s steel companies called: Ultra-Light Steel Auto Body – Advanced Vehicle Concepts, or ‘ULSAB-AVC”, that released a study showing the power of advanced CAE design coupled with AHSS for vehicle weight reduction.

Here is an example detailing mass reduction and safety concerning front rails, an important crash load path. Before ULSAB-AVC, these rails were mainly mild steel. After ULSAB-AVC and with the help of an Auto/Steel Partnership project on front rails, almost all front crash rails were converted to advanced high-strength steel (AHSS). The project showed specifically that the rails could be built 25% lighter with AHSS and absorb the same crash energy. This was proven with computer-aided engineering, and validated with actual frontal crash tests.

My third point is that steel is a green material, greener than most people think, particularly with respect to the emissions associated
with every phase of a vehicle’s life. For example, did you know that steel has a much lower energy content per ton [and therefore less CO2 emissions] than any automotive structural material? This is particularly important in containing emissions in the manufacture of vehicles.

- Aluminum is over 8 times more energy intensive.
- Magnesium is from 7 to 14 times more energy intensive
- Carbon fiber composites are over 10 times more energy intensive.

Additionally, the domestic steel industry has the lowest energy intensity per ton produced of any steel sector in the world and has reduced its energy intensity by 33% from 1990-2007. Also, steel is the most recycled material in the industry and averages a 97% recycling rate (tons of automotive steel recycled divided by the tons used to make new cars and trucks) for the last 20 years. **This is why steel has extremely low comparative emissions when the full life cycle of the automobile is considered.**

Therefore, steel contributes to emissions reduction in three ways. According to life cycle assessment (LCA) calculations, the green house gas emissions associated with making vehicles with high-strength steels in the “manufacturing phase” are the lowest of any structural material available. High-strength steels also enable mass reduction
and a reduction in fuel consumption in the vehicle “use phase”.
Finally, steel’s recyclability at the “end-of-life” phase is fully able to
reduce emissions for production of new vehicles.

In conclusion, the steel industry has a rich and productive history of
working with its automotive customers over the years towards
objectives like mass reduction and safety – objectives fully consistent
with those of EPA and NHTSA. Even in these very difficult times I can
report to you that our collaborative work is going strong, mainly
because we are working on important issues for future vehicles which
will lead to reduced vehicle emissions. AISI recommends that there
be serious consideration given to the LCA performance of materials in
the manufacturing of light vehicles in the future, with the
consideration of credits and allowances for those materials which
provide bona fide reductions in emissions over a vehicle’s life. In this
way all factors will be considered towards the goal of continuous
reduction of vehicle emissions.