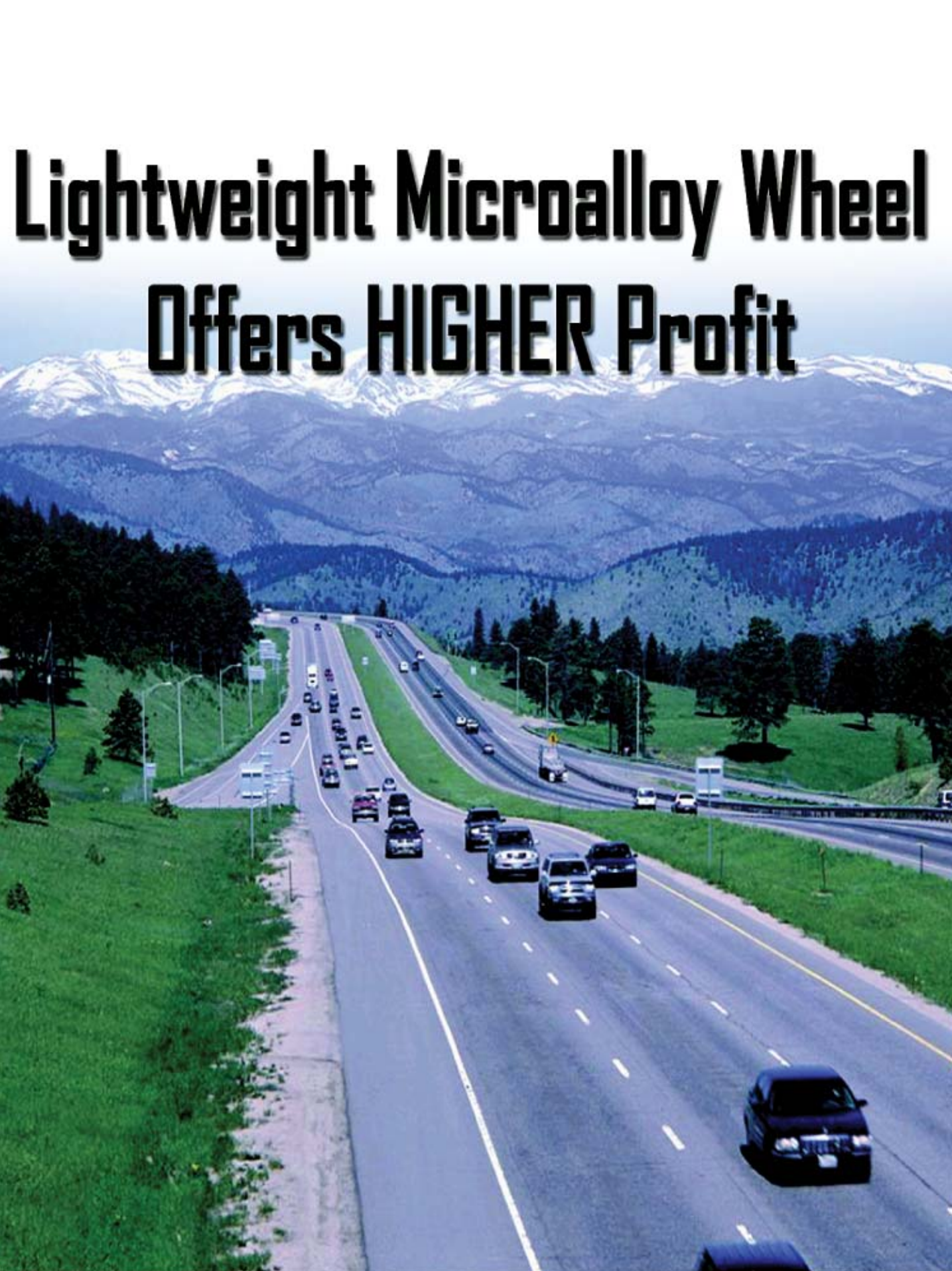
Lightweight Microalloy Wheel Offers HIGHER Profit



What do consumers want in a wheel? How can automakers utilize styled steel wheels to reduce weight and cost and increase profitability? The Wheels Task Force of the American Iron and Steel Institute (AISI), working closely with wheel manufacturers, trim suppliers and car companies, conducted consumer research to answer these questions.

The work has resulted in the development of two lightweight wheel concepts – one for passenger cars and one for light trucks. These wheels meet three major objectives: they provide a weight competitive to cast aluminum wheels, they offer higher profit and offer consumers the good looks they want in a styled wheel. In addition, they provide the strength, affordability and durability associated with steel.

Study Shows Styled Steel Wheels Shatter Perception

A widely held perception is that consumers prefer aluminum alloy wheels. American Iron and Steel Institute found the opposite to be true. Consumers' preference of styled steel wheels over styled aluminum wheels was a key finding from an independent study conducted by Burke Marketing Research in 2000. AISI commissioned the study to survey attitudes of consumers in order to estimate the relative value that steel and aluminum wheels can add to a vehicle.

Results

- Replacing aluminum wheels with styled steel wheels in upgrade packages will maintain option package demand and revenue.
- Consumers consistently ranked steel wheels at parity with aluminum or higher than aluminum wheels.
- While many respondents would not pay more to have one wheel material versus the other, a notably higher percentage of respondents said they would pay more to have steel wheels rather than aluminum wheels.
- Steel wheels were more readily associated with greater strength, weight, and safety.
- Respondents associated lower cost with aluminum wheels, perhaps in contrast to the perceived strength and safety of steel.

Research Method

- Burke conducted the study among 300 consumers visiting retail shopping malls in 17 cities across the United States. All respondents were in the market for a new vehicle or planned to obtain one within the next 18 months.
- Each respondent was placed into one of three vehicle categories (mid-size sedan, pickup truck or minivan), based on their intent to purchase that particular vehicle type.
- Researchers then gauged consumers' price perceptions and preferences for six steel versus six aluminum wheels. Researchers also gauged consumer preferences on style, safety and value of eight different wheel styles.

Key Conclusions

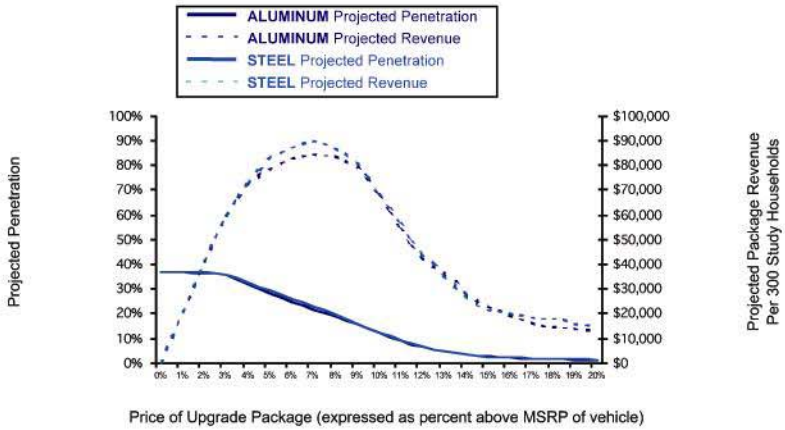
The Lightweight Microalloy Steel Wheel Offers:

- A weight comparable to cast aluminum wheels;
- Higher profit;
- Styling at parity with aluminum.

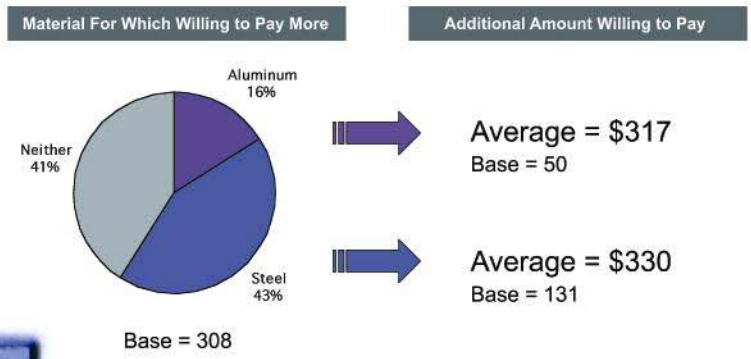
BY USING STYLED STEEL WHEELS ON PASSENGER CARS AND LIGHT TRUCKS,

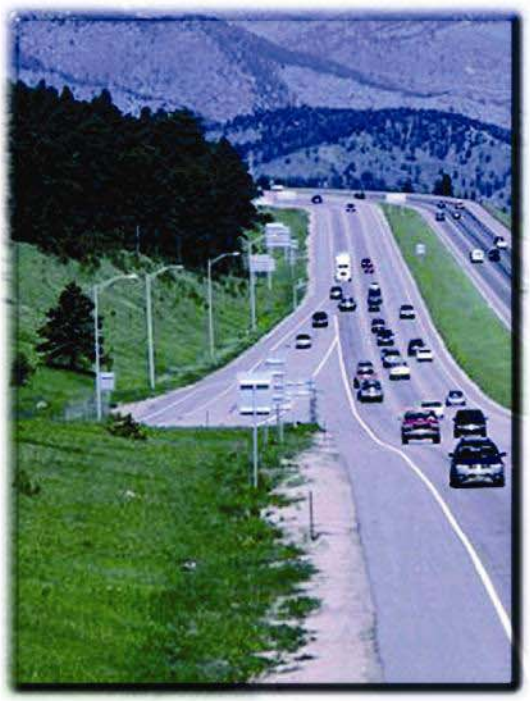
This market research, combined with data gathered from car companies, has aided the AISI Wheels Task Force in developing a **lightweight microalloy steel wheel** for passenger cars and light trucks. Both alternatives to cast aluminum wheels offer cost and weight savings to OEMs, yet provide the attractive appearance that consumers demand.

For both steel and aluminum, relative revenue is maximized at a package price of roughly 7% above the base price for the base vehicle.



Respondents were notably more likely to pay more for styled steel wheels than aluminum wheels. Among those willing to pay more, the prices willing to be paid were not statistically different.





Results of the Burke study indicate that consumers are likely to pay more for styled steel wheels than for aluminum wheels, due to the perception that steel wheels are stronger, safer and more durable.

Styled steel wheels are defined as steel wheels with highly-styled permanently bonded trim. There are more than eight million steel wheels with permanent trim on the road today, compared with just 600,000 five years ago.

Examples of current production vehicles using steel wheels with permanent trim include GM Astro Van/ Safari, GM Silverado/Sierra, Ford Explorer/Ranger, Dodge Full-Size Ram Van and Pickup, Ford F-150, Ford F-250, Ford F-350, Ford Expedition and Toyota Tacoma.

OEMs CAN MAINTAIN REVENUE WHILE REDUCING COSTS . . .

Steel Wheels Lose Weight

The AISI Wheels Task Force manufactured prototypes of two lightweight microalloy steel wheels, and developed trim styling packages for the prototypes. The key to achieving weight savings is through the use of flow-forming technology and the selection of microalloy steel as the primary material.

When manufacturing passenger car and truck wheels, the Task Force used flow-forming technology for the rim. The process involves rotating the rim on a mandrel and using a forming tool, moving metal from one location on the rim to another, resulting in variable rim thickness. Flow-forming technology may also be used on a disc to achieve further weight savings.

Weight - 15x6 Passenger Car Wheel

MATERIAL	MID-SIZE PASSENGER CAR WHEEL kg (lbs.)
Cast Aluminum	7.82 (17.25)
Microalloy Steel (Rim Flow-Formed)	7.38 (16.25)
Microalloy Steel (Rim and Disc Flow-Formed)	6.96 (15.35)
****DIFFERENCE** Microalloy Steel (Rim Flow-Formed) vs. Aluminum**	0.44 (1.00) **5.6%**
****DIFFERENCE** Microalloy Steel (Rim and Disc Flow-Formed) vs. Aluminum**	0.86 (1.90) **11.0%**

Weight - 16x7 Light Truck Wheel

MATERIAL	FULL-SIZE PICKUP LIGHT TRUCK WHEEL kg (lbs.)
Cast Aluminum	10.57 (23.3)
Microalloy Steel (Rim Flow-Formed)	10.98 (24.2)
****DIFFERENCE** Microalloy Steel vs. Aluminum**	**0.41 (0.9) 3.8%**

Cost - 15x6 Passenger Car Wheel

	MID-SIZE PASSENGER CAR WHEEL	
	COST (Wheel & Trim) Chromed Finish Per Wheel	COST (Wheel & Trim) Painted Finish Per Wheel
Cast Aluminum Wheel	$80	$45
Lightweight Microalloy Steel Wheel with Permanent Wheel Trim	$40	$35
****SAVINGS** Microalloy Steel vs. Aluminum**	**$40**	**$10**

Cost - 16x7 Light Truck Wheel

	FULL-SIZE PICKUP LIGHT TRUCK WHEEL	
	COST (Wheel & Trim) Chromed Finish Per Wheel	COST (Wheel & Trim) Painted Finish Per Wheel
Cast Aluminum Wheel	$85	$50
Lightweight Microalloy Full-Face Steel Wheel with Permanent Wheel Trim	$60	$30
****SAVINGS** Microalloy Steel vs. Aluminum**	**$25**	**$20**

Manufacturing and Materials

Lightweight microalloy steel is defined as a highly-formable steel containing small quantities of alloying elements such as vanadium, niobium and titanium.

Technical Data - 15x6 Passenger Car Wheel

	RIM	DISC
BASE STEEL WHEEL		
Thickness	2.92 mm (0.115 in)	3.68 mm (0.145 in)
Steel Grade	Plain carbon	Microalloy
Tensile Strength	345 MPa (50 ksi)	480 MPa (70 ksi)
MICROALLOY STEEL WHEEL*		
Thickness	2.29 mm (0.090 in)	3.43 mm (0.135 in)
Steel Grade	Microalloy	Microalloy
Tensile Strength	480 MPa (70 ksi)	620 MPa (90 ksi)

* Prototype Wheel Flow-Formed Rim

Technical Data - 16x7 Light Truck Wheel

	RIM	DISC
BASE STEEL WHEEL		
Thickness	3.68 mm (0.145 in)	4.70 mm (0.185 in)
Steel Grade	Plain carbon	Microalloy
Tensile Strength	345 MPa (50 ksi)	480 MPa (70 ksi)
LIGHTWEIGHT MICROALLOY STEEL WHEEL*		
Thickness	3.43 mm (0.135 in)	4.32 mm (0.170 in)
Steel Grade	Microalloy	Microalloy
Tensile Strength	480 MPa (70 ksi)	650 MPa (94 ksi)

* Prototype Wheel Flow-Formed Rim

THE BOTTOM LINE . . .

"Steel Wheels Give You Higher Profit, Weight Savings and the Appearance Consumers Desire."

- Steel wheels offer higher profit - up to $160 per vehicle.
- Lightweight microalloy steel wheels offer weight savings up to 11% compared to cast aluminum wheels.
- Steel wheels offer consumers attractive styling options at parity with aluminum or higher than aluminum.

Steel wheels utilize proven materials and technologies from steel, wheel and trim suppliers.

For more information about lightweight steel wheels for passenger cars and light trucks, or for a copy of the Burke Marketing Study, visit: http://wheels.autosteel.org.

Automotive Applications Committee Member Companies:

Bethlehem Steel Corporation

Dofasco Inc.

Ispat Inland Inc.

National Steel Corporation

Rouge Steel Company

United States Steel Corporation

Wheels Task Force Member Companies:

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ArvinMeritor Wheels Division

Bethlehem Steel Corporation

CMC/CLA

Ford Motor Company

General Motors Corporation

Hayes Lemmerz International

Hess Engineering, Inc.

Lacks Wheel Trim Systems

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