


REDUCING  
A VEHICLE'S WEIGHT BY

10%

CAN IMPROVE THE  
FUEL ECONOMY  
OF THE VEHICLE BY

6-8%

  
CARBON FIBER  
HAS THE POTENTIAL TO REDUCE  
THE WEIGHT OF SOME VEHICLE  
COMPONENTS BY 75 PERCENT

CF PLASTIC  
COMPOSITES  
CAN ABSORB UP TO  
12 TIMES  
THE CRUSH ENERGY OF STEEL

IF JUST ONE QUARTER OF THE LIGHT-DUTY VEHICLES IN THE U.S.  
USED LIGHTWEIGHT COMPONENTS  
AND HIGH-EFFICIENCY ENGINES,  
WE COULD SAVE MORE THAN 5 BILLION  
GALLONS OF FUEL ANNUALLY BY 2030

 = 5 BILLION

[HTTP://ENERGY.GOV/ARTICLES/545-MPG-AND-  
BEYOND-MATERIALS-LIGHTEN-LOAD-FUEL-ECONOMY](http://energy.gov/articles/545-mpg-and-beyond-materials-lighten-load-fuel-economy)

DEPARTMENT OF ENERGY (DOE)



AUTOMOTIVE PLASTIC PRODUCTS ARE PRODUCED AT  
1,572 PLANTS LOCATED IN 45 STATES.  
THESE PLANTS DIRECTLY EMPLOY  
57,400 PEOPLE  
AND FEATURE A PAYROLL OF \$2.8 BILLION

THE VALUE OF  
AUTOMOTIVE PLASTIC  
PRODUCTS PRODUCED IN  
THE UNITED STATES WAS  
\$18.1 BILLION

  
STATE AUTOMOTIVE PLASTICS SHIPMENTS:  
MICHIGAN (OVER \$3.8 BILLION),  
INDIANA (OVER \$2.4 BILLION),  
OHIO (OVER \$2.1 BILLION) AND  
TENNESSEE (OVER \$1 BILLION)

  
THE USE OF  
ADVANCED  
PLASTICS  
AND COMPOSITES IN AUTOMOTIVE  
HAS DOUBLED  
IN THE LAST 20 YEARS



TODAY'S PLASTICS  
TYPICALLY MAKE UP  
50%

OF THE VOLUME OF A NEW LIGHT VEHICLE  
BUT LESS THAN  
10% OF ITS WEIGHT,  
WHICH HELPS MAKE CARS LIGHTER AND  
MORE FUEL EFFICIENT, RESULTING IN  
LOWER GREENHOUSE GAS EMISSIONS.  
THE AVERAGE LIGHT VEHICLE NOW CONTAINS  
377 POUNDS OF PLASTICS AND COMPOSITES, OR  
ABOUT ~ 10% OF THE TOTAL WEIGHT. THIS IS UP  
FROM 286 POUNDS IN 2000 AND 194 POUNDS IN  
1990. IN 1960, LESS THAN 20 POUNDS WERE USED.

CURRENTLY MANUFACTURERS IN 45 STATES USE  
OVER 5.7 BILLION  
POUNDS OF PLASTICS ANNUALLY  
TO CREATE INNOVATIVE VEHICLE PARTS AND COMPONENTS,  
AND THE USE OF PLASTICS IN VEHICLES  
CONTINUES TO CLIMB

SOURCE: TOWNSEND SOLUTIONS

THE BUSINESS OF CHEMISTRY IS A  
\$797 BILLION  
ENTERPRISE PROVIDING OVER  
800,000  
SKILLED AMERICAN JOBS



WITH APPROXIMATELY  
14 MILLION

LIGHT VEHICLES ASSEMBLED IN THE U.S. AND  
CANADA DURING 2012, THE AUTOMOTIVE MARKET  
REPRESENTS THE EQUIVALENT OF SOME  
\$44.4 BILLION IN CHEMISTRY



MORE THAN  
96%

OF ALL MANUFACTURED GOODS  
ARE DIRECTLY TOUCHED BY  
THE BUSINESS  
OF CHEMISTRY,  
INCLUDING THE  
AUTOMOTIVE  
INDUSTRY



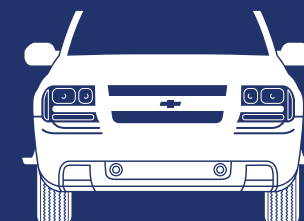
CARBON-FIBER  
[PLASTIC]  
COMPOSITES COULD...  
IMPROVE FUEL EFFICIENCY  
BY ABOUT 35%  
WITHOUT COMPROMISING  
PERFORMANCE OR SAFETY.  
DEPARTMENT OF ENERGY (DOE)



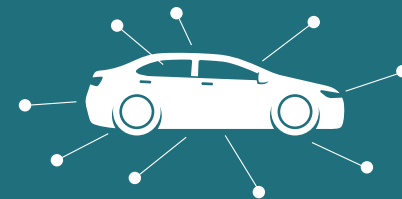
THESE ADVANCED LIGHTWEIGHT  
PARTS ARE ESSENTIAL TO  
HELPING MANUFACTURERS  
REDUCE VEHICLE MASS AND  
ACHIEVE INCREASED

FUEL  
ECONOMY  
STANDARDS BY THE YEAR 2025

LIGHTWEIGHTING  
ONLY THE  
ASSIST STEP ON ALL  
2007 TRAILBLAZERS  
SAVES  
THE EQUIVALENT ENERGY OF  
2.7 MILLION  
GALLONS OF GASOLINE<sup>†</sup>  
<sup>†SEE REVERSE FOR COMPLETE DETAILS</sup>



WE ARE WORKING TO PROVIDE MANUFACTURERS WITH  
ADDITIONAL WAYS TO INCREASE PLASTICS IN AUTOMOTIVE,  
REDUCE VEHICLE WEIGHT AND  
LOWER GREENHOUSE GAS EMISSIONS



THERE ARE A MYRIAD OF PLASTICS  
AND COMPOSITE AUTOMOTIVE APPLICATIONS  
INCLUDING: EXTERIOR BODY PANELS, TRIM, AND BUMPER FASCIA, AS WELL AS INTERIOR TRIM  
PANELS, INSTRUMENT PANEL SUBSTRATES, KNEE BOLSTERS, WINDOW ENCAPSULATION AND  
SIDE LIGHTS, HEADLAMP HOUSINGS AND LENSES, MANIFOLDS AND VALVE COVERS, OIL PANS AND  
FUEL TANKS, UNDERBODY SHIELDS, TRUNK WELLS, WHEEL-WELL LINERS, ELECTRONIC/ELECTRIC  
PARTS AND COMPONENTS, LED LIGHTING AND LIGHT PIPES, KNOBS AND BUTTONS, WIRING  
HARNESSES, STEERING WHEELS AND STEERING COLUMN COVERS, INSULATION, DAMPENING AND  
SOUND DEADENERS, UPHOLSTERY FABRICS AND CUSHIONING MATERIALS, MECHANICAL PARTS  
AND COMPONENTS, AIRBAG FABRICS, SAFETY GLASS INSERTS, TIRES, AND ON AND ON AND...

OUR TEAM EFFORTS FOCUS ON:  
ADVOCACY  
PRE-COMPETITIVE  
RESEARCH  
COMMUNICATIONS  
OUTREACH  
SUSTAINABILITY  
EFFORTS



- ✓ Lighter Weight
- ✓ Saves Customer Fuel
- ✓ Consolidates Parts – Easing Storage/Handling
- ✓ Reduces Assembly Time
- ✓ Meets Part Performance Tests
- ✓ Less Primary Energy Used (LCA)<sup>†</sup>
- ✓ Less Global Warming Potential (LCA)<sup>†</sup>

<sup>†</sup>Cradle-to-grave, peer reviewed, ISO 14040/14044 Standards, Life Cycle Assessment (LCA) conducted by Cradle-to-grave, peer reviewed, ISO 14040/14044 Standards, Life Cycle Assessment (LCA) conducted by PE International, Inc. 2012, incorporates inputs to manufacture both parts, and complete use phase for 150,000 miles with end-of-life disposal, including 98% recycling rate for steel end-of-life. Contact the Plastics Automotive Center for further information at [248] 244-8920 or on-line:

<http://plastics.americanchemistry.com/Education-Resources/Publications/Life-Cycle-Assessment-of-Polymers-in-an-Automotive-Assist-Step.pdf>

## AUTOMOTIVE LIGHTWEIGHTING WITH PLASTICS RESULTS IN REDUCED FUEL USE AND CO<sub>2</sub> EMISSIONS

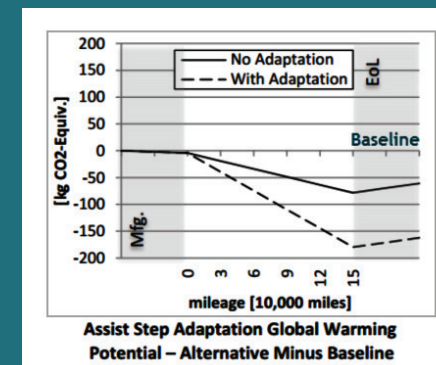
### CHEVROLET TRAILBLAZER/GMC AUTOMOTIVE ASSIST STEP CRADLE-TO-GRAVE LCA

A cradle-to-grave, ISO compliant LCA for the bolster considered a total service life of 150,000 miles:

- 51% lighter plastic assist step for the Chevrolet Trailblazer/GMC replaced steel assist step (runner board)

#### Conclusions:

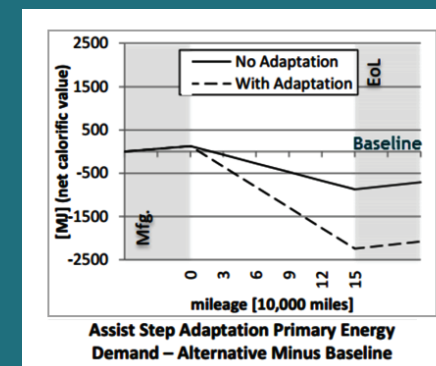
- Lighter plastic products performed better than the steel products for global warming potential and primary energy demand
- Even greater benefit potential exists when further mass reduction allows drivetrain reductions and adaptations, increasingly likely under new CAFE standards



### ENERGY AND COMMUTER SAVINGS EQUIVALENTS

Lightweighting this one automotive component on all 148,658 GMC 2007 Trailblazers reduces the emission of greenhouse gases by the equivalent of combusting more than 2.7 million gallons of gasoline over the life of the vehicles, which is equivalent to removing 3,182 commuters from area roads for a year. Additional plastics lightweighting can bring additional savings of energy and CO<sub>2</sub> emissions.<sup>†</sup>

<sup>†</sup>Based on EPA Average MPG of 21.5 MPG and EPA value of 19.6 lbs. CO<sub>2</sub>/gallon of gasoline, assuming adaptation and a 150,000 mile vehicle service life. Commuter estimate based on a 50 mile round-trip every day for 365 days.



## AUTOMOTIVE LIGHTWEIGHTING WITH PLASTICS RESULTS IN REDUCED FUEL USE AND CO<sub>2</sub> EMISSIONS

### FORD TAURUS FRONT END BOLSTER CRADLE-TO-GRAVE LCA

A cradle-to-grave, ISO compliant LCA for the bolster considered a total service life of 150,000 miles:

- A 46% lighter plastic bolster on the 2010 Ford Taurus replaced the 2008 plastic and steel bolster

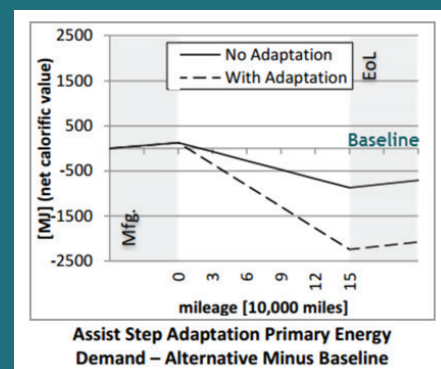
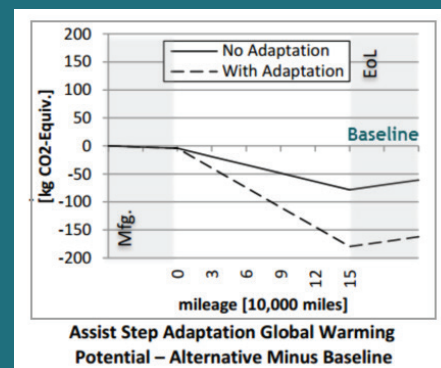
#### Conclusions:

- Lighter plastic products performed better than the steel products for global warming potential and primary energy demand
- Even greater benefit potential exists when further mass reduction allows drivetrain reductions and adaptations, increasingly likely under new CAFE standards

### ENERGY AND COMMUTER SAVINGS EQUIVALENTS

Lightweighting this one automotive component on all 70,666 Ford Taurus 2010 models reduces the emission of greenhouse gases by the equivalent of combusting over 770,000 gallons of gasoline over the life of the vehicles, which is equivalent to removing 907 commuters from area roads for a year. Additional plastics lightweighting can bring additional savings of energy and CO<sub>2</sub> emissions.<sup>†</sup>

<sup>†</sup>Based on EPA Average MPG of 21.5 MPG and EPA value of 19.6 lbs. CO<sub>2</sub>/gallon of gasoline, assuming adaptation and a 150,000 mile vehicle service life. Commuter estimate based on a 50 mile round-trip every day for 365 days.



- ✓ Lighter Weight
- ✓ Saves Customer Fuel
- ✓ Consolidates Parts – Easing Storage/Handling
- ✓ Reduces Assembly Time
- ✓ Meets Part Performance Tests
- ✓ Less Primary Energy Used (LCA)<sup>†</sup>
- ✓ Less Global Warming Potential (LCA)<sup>†</sup>

<sup>†</sup>Cradle-to-grave, peer reviewed, ISO 14040/14044 Standards, Life Cycle Assessment (LCA) conducted by PE International, Inc. 2012, incorporates inputs to manufacture both parts, and complete use phase for 150,000 miles with end-of-life disposal, including 98% recycling rate for steel end-of-life. Contact the Plastics Automotive Center for further information at [248] 244-8920, or on-line:

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