

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
1,540 PLANTS LOCATED IN 45 STATES.
THESE PLANTS DIRECTLY EMPLOY

63,145 PEOPLE

AND FEATURE A PAYROLL OF \$3.3 BILLION

THE VALUE OF
AUTOMOTIVE PLASTIC
PRODUCTS PRODUCED IN
THE UNITED STATES WAS
\$20.8 BILLION



STATE AUTOMOTIVE PLASTICS SHIPMENTS:
MICHIGAN (OVER \$5.3 BILLION),
INDIANA (OVER \$2.2 BILLION),
OHIO (OVER \$3.2 BILLION) AND
TENNESSEE (OVER \$1.6 BILLION)



THE USE OF
ADVANCED
PLASTICS

AND COMPOSITES IN AUTOMOTIVE
HAS DOUBLED
IN THE LAST 25 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.

THE BUSINESS OF CHEMISTRY IS A
\$553 BILLION
ENTERPRISE PROVIDING OVER

542,000

SKILLED AMERICAN JOBS



WITH APPROXIMATELY
16.8 MILLION



LIGHT VEHICLES ASSEMBLED IN THE US, CAN, &
MEXICO DURING 2017, THE AUTOMOTIVE MARKET
REPRESENTS THE EQUIVALENT OF SOME
\$56.1 BILLION IN CHEMISTRY

CURRENTLY MANUFACTURERS IN 45 STATES USE

OVER 5.8 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



**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

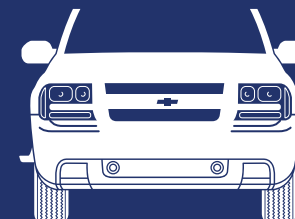
**FUEL
ECONOMY**
STANDARDS BY THE YEAR 2025

LIGHTWEIGHTING
**ONLY THE
ASSIST STEP ON ALL
2007 TRAILBLAZERS**

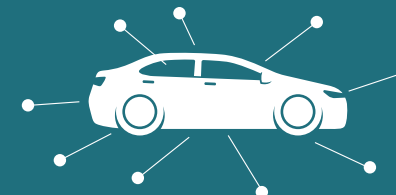
SAVES

THE EQUIVALENT ENERGY OF
**2.7 MILLION
GALLONS OF GASOLINE***

*SEE REVERSE FOR COMPLETE DETAILS



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)[†]
- ✓ Less Global Warming Potential (LCA)[†]

[†]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:

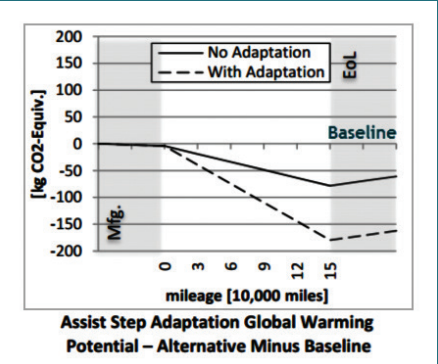
<http://plastics.americanchemistry.com/Education-Resources/Publications/Life-Cycle-Assessment-of-Polymers-in-an-Automotive-Assist-Step.pdf>

AUTOMOTIVE LIGHTWEIGHTING WITH PLASTICS RESULTS IN REDUCED FUEL USE AND CO₂ EMISSIONS

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

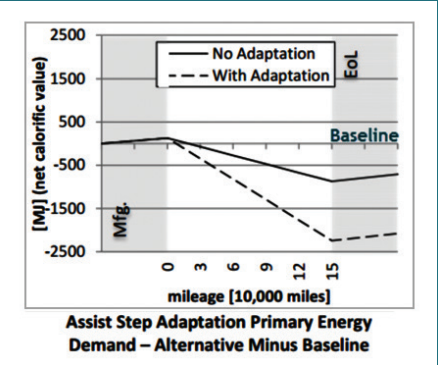
A cradle-to-grave, ISO compliant LCA for the bolster considered a total service life of 150,000 miles:

- 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 CO₂ emissions.[†]



[†]Based on EPA Average MPG of 21.5 MPG and EPA value of 19.6 lbs. CO₂/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 CO₂ 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:

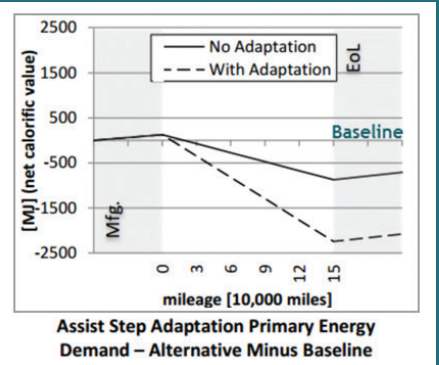
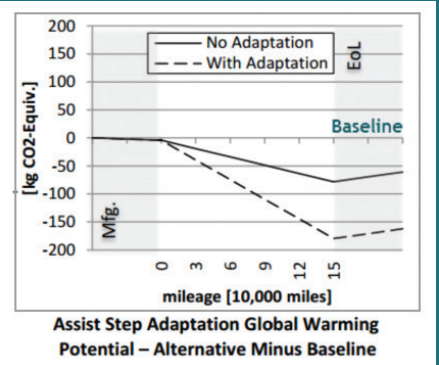
- A 46% lighter plastic bolster on the 2010 Ford Taurus replaced the 2008 plastic and steel bolster

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 CO₂ emissions.[†]



[†]Based on EPA Average MPG of 21.5 MPG and EPA value of 19.6 lbs. CO₂/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.



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- ✓ Consolidates Parts – Easing Storage/Handling
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