

From Field to Factory: Growing the Bio-Based Automotive Components Sector

The Center for Automotive Research (CAR) recently released a study of the status of current bio-based materials technology and use within the automotive industry, emerging industry trends toward deployment of bio-based materials, leading organizations that are active in the automotive bio-based materials sector, and feedstock and resource base considerations associated with production of bio-based materials. The paper focuses specifically on the adoption of bio-based materials in the manufacture of automotive components and the opportunities for growing the bio-based materials industry in the Great Lakes region.

The automotive industry's renewed emphasis on environmentally-friendly materials and technologies has been spurred by government regulations, consumer preferences, and, in some cases, financial savings that can be realized from the adoption of these materials and technologies. The wheat straw fiber-reinforced composite

used in the Ford Flex storage bin (right), may also be used in seals made by Novi, Michigan-based Cooper Standard. The Akron, Ohio-based compounder of this material, A. Schulman, is also investigating other automotive applications. The table below highlights several applications of bio-materials in current automotive products. The Great Lakes region has many advantages when it comes to developing bio-based materials for use in automotive components. The region is known for both its manufacturing and agricultural production capacity, and in recent years, the region has also become host to significant bio-based materials research, as well as associations interested in promoting the development of the bio-based materials industry. Targeting bio-based materials and parts and components made from these materials may provide opportunities for Michigan's automotive industry. [READ THE STUDY](#)



Ford Flex Wheat Straw Reinforced Storage Bin; Photo: Ford Motor Co.

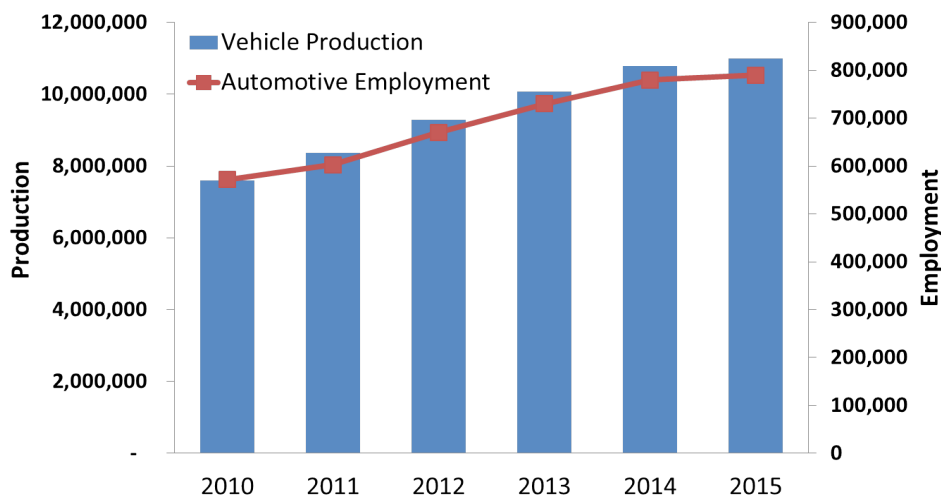
Model(s)	Feedstock	Material	Application
Ford Focus BEV	Coconut	Polypropylene	Loadfloor
Ford Escape	Soy	Polyurethane	Foam seating, headliner
GMC Terrain	Cotton, kenaf	Polyester	Acoustic insulator, ceiling liner
Honda Pilot	Wood	N/A	Floor area parts
Lexus CT200h	Bamboo, corn	Polyethylene terephthalate	Luggage-compartment, speakers, floor mats
Mercedes-Benz A-Class	Abaca, flax, other natural fibers	Composite material	Underbody panels, seatbacks, spare tire cover

CAR's Forecast: U.S. & Michigan Auto Employment

In the next three years, LMC Automotive projects that U.S. light vehicle production will increase by rate of 7 to 10 percent per year, reaching a peak of 11 million in 2015. CAR projects that U.S. automotive and parts manufacturing employment will also grow by 11 percent (67,100) in 2012, and another 9 percent (60,000) in 2013.

Michigan's light vehicle production is projected to peak at 2.4 million units in 2013, a 25 percent increase over 2011 production levels. CAR forecasts that automotive and parts manufacturing employment in the state is expected to increase by 13 percent (16,300) in 2012, and another 12.5 percent (18,000) in 2013.

U.S. Light Vehicle Production and CAR's Motor Vehicle & Parts Employment Forecast, 2010-2015



Source: LMC-Automotive; BLS; CAR

U.S. and Michigan Motor Vehicles and Parts Employment Forecasts

	U.S.	Michigan
2012	670,000	144,000
2013	730,000	162,000
2014	780,000	161,000
2015	790,000	161,000

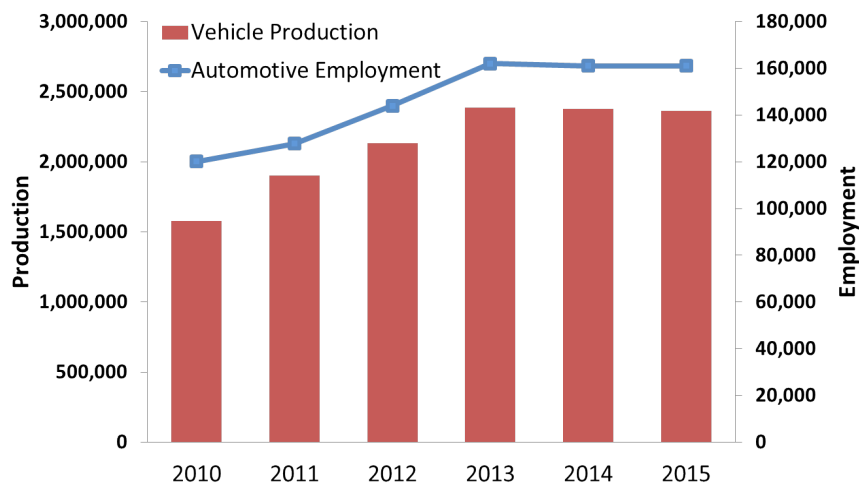
Source: CAR

U.S. and Michigan Motor Vehicles Production Forecasts

	U.S.	Michigan
2012	9.3	2.1
2013	10.1	2.4
2014	10.8	2.4
2015	11.0	2.4

Source: LMC-Automotive

Michigan Light Vehicle Production and CAR's Motor Vehicle & Parts Employment Forecast, 2010-2015



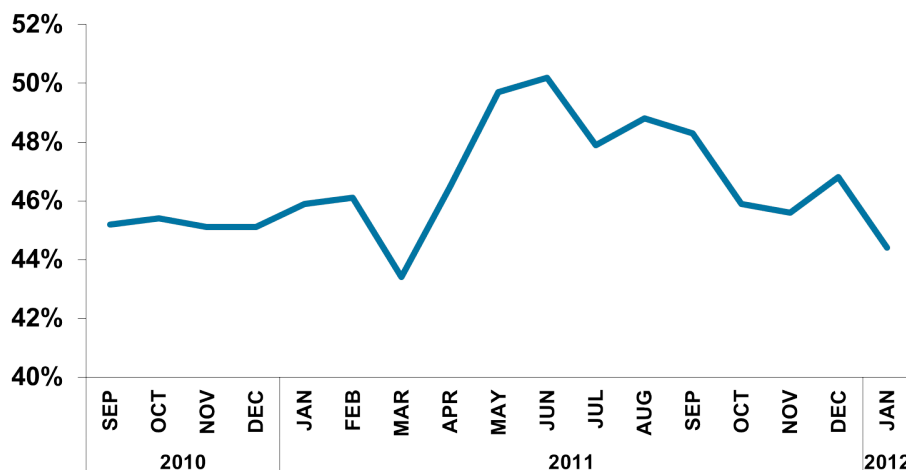
Source: LMC-Automotive; BLS; CAR

Eye on the Market: Is Detroit Three Market Share Back?

Market share took a roller coaster ride in 2011, ending the year at 46.8 percent. Shares shifted as the automakers dealt with the impacts the March tsunami and subsequent nuclear crisis in Japan, and the late summer floods in Thailand. As 2012 begins, the Detroit Three will try to defend their gains with a variety of new products (both in showrooms and in the pipeline), Honda and Toyota will seek to rebuild their shares with their replenished inventory of vehicles on dealer lots and components at their manufacturing plants, and Hyundai will continue to come on strong. The battle is on for market share and margin.

Taken together, Chrysler, Ford and GM-owned U.S. market share fell below 50 percent for the first time in 2007, and bottomed out at just below 43 percent in 2009. The chart at right shows Detroit Three market share from September 2010-January 2012. Prior to the onset of the crises in Japan, Detroit Three U.S. market share had recovered to just above 46 percent. As their competitors struggled with component and vehicle supply interruptions, the Detroit Three managed to claim over 50 percent of the U.S. market in June 2011. In the following months, however, the international automakers have reclaimed all of the Detroit Three's temporary gains, and in January 2012, Detroit Three U.S. market share fell back to 44.4 percent.

Monthly Detroit Three U.S. Market Share
September 2010-January 2012



Source: Automotive News

So, how much do sales volumes really matter and what comes next? The Detroit Three appear to have reached a new level of discipline in limiting incentive levels, with the priority clearly shifted to profit margins rather than market share. For example, when inventories of the Chevrolet Cruze began to swell in 2011, GM idled the Lordstown, Ohio plant instead of using incentives to pare the stockpile. Likewise, when Ford's 2013 Fusion (slated for

production in Flat Rock) received rave reviews at the 2012 North American International Auto Show in Detroit in January, some industry observers speculated it may outsell the Toyota Camry—the best-selling car in the U.S. for 14 of the past 15 years. Ford executives were quick to counter that Fusion volume is not their aim, but maximizing profit per unit sold will be the goal. Detroit Three market share is not back—yet, but margins are improving, and that's positive news for Michigan.

News from CAR's Book of Deals

Since 2009, automakers alone have announced almost \$10 billion in new private investments in Michigan. This information comes from CAR's Automotive Book of Deals, a proprietary database that catalogues the details of all major North American automotive investments—including both private and public investment, and job creation and retention estimates.

CAR's Book of Deals contains detailed information on GM's recently announced

a \$68 million investment in its Oshawa #2 (Canada) assembly plant to build the next generation Chevrolet Impala. Michigan will benefit from this investment, as over 80 percent of the engines supplied to the new vehicle will be produced at GM's Flint South engine plant. Likewise, Chrysler's recent \$1.7 billion investment in its Toledo North Assembly Plant will benefit Chrysler's engine plant in Trenton, Michigan, which will produce a majority of the new Jeep Liberty's engines.

Did You Know?

Did you know that in 2011, Michigan produced...

- 39 percent of all light vehicle engines made in the United States?
- 25 percent of all light vehicle transmissions made in the United States?
- 22 percent of all light vehicles manufactured in the United States?

Source: IHS|Global Insight, 2011,
Automotive News

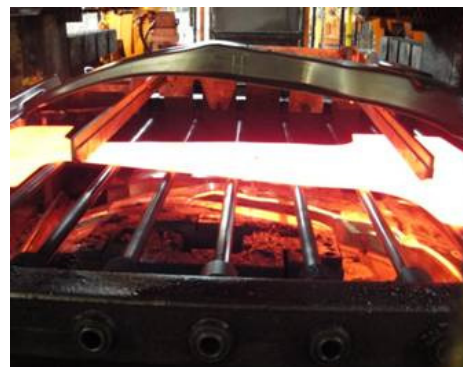
Technology Focus: Press-Hardened Advanced High-Strength Steel

Increasing fuel economy requirements are driving automakers to reduce vehicle weight—while also meeting higher safety standards. Vehicles that were once almost entirely made of steel, are now incorporating many other materials; however, steel will remain a key material in automotive design, engineering and manufacturing for the foreseeable future. Advanced high-strength steels are thinner gauge, but have higher yield strengths than conventional mild steels (greater than 280 megapascals—MPa).

One challenge of working with high-strength steel is that it is difficult to form complex shapes using conventional stamping technology. Simple shapes can be formed on a conventional stamping press using very high-strength material (up to 980 MPa). The limits on material strength and forming complexity have led to the development of new forming methods, including press-hardening (or hot-form-

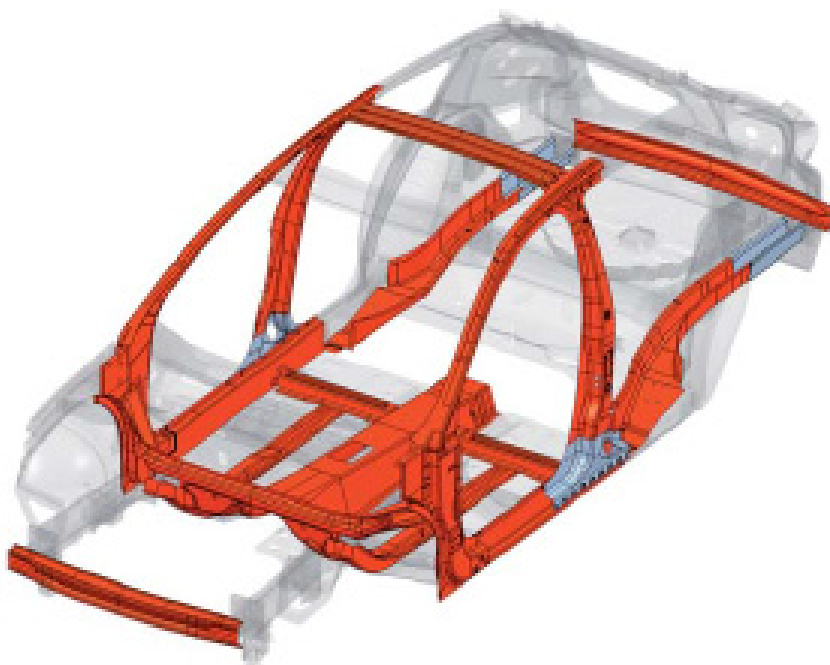
ing—see sidebar for more info). Press-hardening technology can precision form complex shapes in one hit—including structural parts such as the A or B pillar, roof rail, or engine compartment rail—using ultra-high-strength steel (1,000-1,600 MPa). Part cycle time varies from about 15 seconds until about 60 seconds, which is much slower than conventional stamping.

The use of press-hardening is projected to increase two- or three-fold in the next decade. The automakers generally look to the supply base to provide ultra-high-strength steel parts, and there are at least three major independent suppliers in North America that specialize in hot-forming technologies: Benteler, Gestamp, and Magna. As demand for ultra-high-strength steel parts increases over the next several years, more hot-forming manufacturing capacity may be needed, which creates an opportunity for press-hardening investment growth and attraction in the United States.



Part being press-hardened (hot formed)

Photo: Gestamp



Possible Press-Hardened Applications

Photo: Arcelor Mittal

Six Key Steps in Press-Hardening

1. Steel is de-coiled (de-stacked).
2. Steel is heated to approximately 900° centigrade.
3. The heated part is then fed into a special stamping press (e.g. hydraulic) with a special hot-form die.
4. The press closes the die and shapes the part. The press remains closed while the part is quenched with a water-cooling system integral to the die.
5. The formed part may be trimmed or have holes made using another stamping press or a laser system.
6. In some cases, the final step is shot-blasting to clean the surface of the part.

Michigan Plants and Shifts (As of January 30, 2012)

Company	Plant	Shifts	Regular weekly hours	Overtime
CHRYSLER LLC	CONNER AVE	2	80	
	JEFFERSON NORTH	2	80	Yes
	STERLING HEIGHTS	2	80	
	WARREN	2	80	Yes
FORD	DEARBORN TRUCK	2	120*	
	FLAT ROCK	1	40	
	MICHIGAN ASSEMBLY	2	120*	
GM	FLINT TRUCK	3	120	Yes
	HAMTRAMCK	1	40	
	LANSING DELTA	3	120	Yes
	LANSING GRAND RIVER	1	40	
	ORION	2	80	

*2 shifts / 3 crews

Source: Chrysler, Ford, General Motors, Automotive News

2011 Michigan Vehicle Production and Employment

	Vehicles Produced	Employment
Jan-11	119,889	125,900
Feb-11	140,357	126,900
Mar-11	189,535	127,400
Apr-11	157,089	126,600
May-11	171,530	127,400
Jun-11	152,133	129,200
Jul-11	106,293	118,000
Aug-11	194,772	125,900
Sep-11	173,123	129,100
Oct-11	184,943	131,400
Nov-11	161,811	131,400
Dec-11	157,814	133,200
TOTAL	1,909,289	

Source: Ward's Automotive Reports, U.S. Department of Labor

about CAR

CENTER FOR AUTOMOTIVE RESEARCH

Michigan Automotive Focus is sponsored by the Michigan Economic Development Corporation to advance knowledge of Michigan's automotive industry, and is produced by the nonprofit Center for Automotive Research (CAR).

CAR is focused on a wide variety of important trends and changes related to the automobile industry and society at the international, federal, state and local levels. CAR

conducts industry research, develops new methodologies, forecasts industry trends, advises on public policy, and sponsors multi-stakeholder communication forums.

CAR Affiliates include over fifty automakers, suppliers, associations, and key stakeholders in the North American automotive industry, including: Chrysler Group LLC, Ford Motor Company, General Motors, Honda, Nissan North America, Toyota, and Volkswagen Group of America.

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