North American Light Vehicle Production: A Decade of Change Within a Globally Integrated Industry

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NA Production Update

1) Inserted Into a Global Framework
2) Changing With The Times
3) Summary
IHS Corporate Overview

• In business since 1959, we are a leading global source of information and expert analysis in pivotal areas shaping today’s global business landscape

• Data and expertise from industry-specialized professionals enables innovative and successful decision making

• Helping governments, multi-national organizations, regional companies and technical professionals in more than 180 countries

• Approx. 8,000+ IHS colleagues in 140 offices located in 31 countries speaking 42 languages

• IHS customers include 80% of the Global Fortune 500, and nearly 70% of the US Fortune 1,000
World Economic Growth
Most major economies expected to improve in 2014

World Average
2014 = 3.3%

Source: IHS Data Insights
Exchange rates per US dollar

**Canadian dollar**
(Canadian dollars per US dollar, quarterly averages)

**Euro**
(Euro per US dollar, quarterly averages)

**Japanese yen**
(Yen per US dollar, quarterly averages)

**Chinese renminbi**
(Yuan per US dollar, quarterly averages)
Global Production

- 20 million (45% = C/E EU)
- 85 million (65% = Mexico)

- Greater China: 9.7 million
- South Asia: 4.1 million
- Europe: 3.6 million
- North America: 2.0 million (65% = Mexico)
- South America: 1.5 million
- Middle East/Africa: 0.9 million
- Japan/Korea: -1.7 million
Global Production Outlook
2013 – 2021: Market Growth

Variance By Global Segment

Top 10 - Variance By OEM

Global LV Production (mil)

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Faster, Greater Scale & Integrated
Industry Pace and Risk Rises …

- **Program Cadence**
  - Weighted Cadence (Years)

- **Multi-Region Platforms**
  - Multi Region Share
  - Percentage: 20%, 40%, 60%, 80%

- **Global Launch Events**
  - Launch Event Count

- **Average Platform Volume (Over 50K/Year)**
  - Years: 2010, 2015, 2020
Global Segment Shifts
Growing Smaller & Converging ….

- NAFTA begins to converge with global trends in the mid-segments (B, C & D)
- Greater than 60% of global volume is C-segment or smaller by 2020
- In NAFTA, more than 75% of volume is D-segment and smaller by 2020
Market Dynamics
Detroit 3 in the Minority


Millions

0 1 2 3 4 5 6 7 8 9 10

US 3  Asian 4  German 3  Others

+2.8M

+0.3M 11% CTG
+1.3M 46% CTG
+0.6M 23% CTG
+0.6M 20% CTG

+2.8M
Market Dynamics
Launch Activity Surges, Investment & Competition Too

North American Program Launches

Source: IHS Automotive Light Vehicle Production Forecast
NAFTA Output By Region
Shifting Towards the US South & Mexico

Share by Region

Over 50% of NA output will be south of Ohio by 2014

Mexican production growth is one of the fastest through the balance of the decade – rivaling Brazil, Russia and India
LV Production Locational Analysis
2013-16 Change

1, 2 & 4 hour logistics circles

Cambridge
Detroit
Columbus
Georgetown
Kansas City
Greenville
Chattanooga
Montgomery
Canton
Arlington
Hermosillo
Monterrey
Queretaro
Puebla

(Thousands)
LV Production Locational Analysis
2016-20 Change

1, 2 & 4 hour logistics circles

Legend:

+750-1,000
+500-750
+250-500
+100-250
-100-100
-100-250
-250-500
-500-750
-750-1000
(Thousands)
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We Too Can Change ..
## Efficiency Tradeoffs Shift Over Time

<table>
<thead>
<tr>
<th>Propulsion</th>
<th>Weight</th>
<th>Parasitics</th>
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<tbody>
<tr>
<td>• Hybrids, Electrics</td>
<td>• BIW &amp; Closures</td>
<td>• Aerodynamics</td>
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<tr>
<td>• Boosting &amp; Valve Technology</td>
<td>• Build Process</td>
<td>• Rolling Resistance</td>
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<tr>
<td>• Transmission &amp; Driveline</td>
<td>• Joining and corrosion</td>
<td>• Energy/Thermal Management</td>
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- Efficiency gains emanate from several sources with a cost:
  - Lightweighting costs $80-180 per 1% FE increase
  - Diesel technology costs $130 per 1% FE increase
  - Hybrid powertrains cost $110-220 per 1% FE improvement
- Fuel economy regulations stiffen by 5% per year after 2015MY
  - Each cycle will need to reach gains of 20-25% by the end of the cycle
  - Every OEM has mass reduction goals averaging 3-5% per year depending upon CAFE credits, current vehicle mass, supplier affiliations and capital infrastructure
Powertrain Technology Trends

- VVT almost standard on any new engine; many migrating to advanced designs
- GDI and gas boosting both ramp up quickly. The initial rollout is being led by American and German manufacturers, although the others aren’t far behind
- Stop/Start technology growing, helped by CAFE off-cycle credits
- Diesel and Hybrid/EV still relatively low-volume players in North American market, though Hybrids gain traction late in the decade

Source: IHS Automotive Powertrain and Component Forecasts
Massive Structural Change Through 2025

Vehicle design cycles starting in 2013 have **less than 2 cycles** to comply with the 2025 NHTSA standards – an increase of over 45% from 2016 levels.

**Mid-Cycle Review** is gearing to be a substantial battle with OEMs and suppliers on both sides.

**US Fuel Economy/Emission Standards**

- **2014**
- **2017**
- **2022**
- **2027**

**FE standards stiffen by 45% from 2016 to 2025**

Technologies required to meet FE gains due for the 2025 period are required to be tested, cost proven and design integrated by the 2017-19 timeframe.
New Platform Concepts

MQB A/B
“One of the prominent characteristics of the Modular Transverse Matrix is the uniform mounting position of ALL engines. Assembly kit allows for synergies between all vehicle classes”

- 2020 scale: 5.6 million units
- 2020 program count: 130+

EMP2
“Advanced modularity allows for new combinations: Four different track widths; Five wheelbases; Two cockpit and cowl solutions; Two rear suspension architectures”

- 2020 scale: 1.7 million units
- 2020 program count: 50+

CMF1
“Common Module Family is based on the assembly of compatible Big Modules: engine bay, cockpit, front underbody, rear underbody and electrical/electronic architecture”

- 2020 scale: 1.7 million units
- 2020 program count: 50+
Pressure for weight reduction is slated to focus on body and structure first as aluminum, advanced high strength steels and lighter forgings begin to penetrate the body and structure.

Second focal point will be chassis/suspension with a material shift towards new steel forming processes, aluminum and new drive designs.
A Decade of Structural Change Emerges

What Impacts Material Substitution?

- OEM capital & supplier infrastructure
- Efficiency of other FE measures
- Competition & CAFE credits
- Cost and engineering capability
- Vehicle vocation/durability
- Cadence & tooling
- Platform cycle position
- Global production and supply
- Safety compliance

- Forming
- Recycling
- Joining
- Durability
- Multi-material construction

- A & B segment
  - Steel Intensive
- C & D & FF segment
  - Steel and Aluminum
- D, E segment
  - Aluminum intensive
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The Decade of Challenges ....

- Material shifts have long-term impacts: build process, durability, safety, internal skills, infrastructure, warranty and speed to market
- Each OEM has an implementation path dependent on platform cadence, credits, supplier capability and capital
- Supply base requires a healthy regional industry – think clusters
- Not business as usual …
Thank You

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