Today’s Presenters

- Kamini Patel
  Vice President – MD Europe
  kamini@powersys.com

- Chris Fisher
  Senior Commercial Vehicles Analyst
  cfisher@powersys.com
Agenda

• Introduction to Power Systems Research
• Global Market Outlook
• Commercial Vehicles Market Trends
• Truck Market Dynamics
• Manufacturers Strategies By Region
• Q&A
Introduction to Power Systems Research

Global provider of market research, industry data and forecasting

- History of innovation; 35+ years experience
- Unique database services & information tools
- Proprietary market studies
- Syndicated surveys
- Market modeling, forecasting

- data...information...intelligence

Offices in USA, Belgium, Brazil, China, Russia, India, Saudi Arabia and Japan and a network of analysts located across the globe
Unique Database Services
Specialized forecast and market information

EnginLink™
Global engine production forecast; model specifications

OE Link™
Original equipment production forecast; engine installations

CV Link™
Commercial vehicle production forecast; engine installations

MarineLink™
Pleasure boat production and engine installations

PartsLink™
Engine and original equipment population data – aftermarket data

Components Data
Component modules - can be customized to match your business model and information needs.
Segments Tracked

Single source of market information for all engine powered products

- Agriculture
- Construction
- Industrial
- Lawn & Garden
- Light Commercial Vehicles
- Marine Auxiliary
- Marine Propulsion
- Medium & Heavy Vehicles
- Minivans & SUVs
- Passenger Cars
- Power Generation
- Railway
- Recreational Products

- Fuel Injection Systems
- Turbo Chargers
- Transmissions
- Tyres
Global Market Outlook
3.5 tonnes+
Global Truck Production (3.5t+)

Market remains cautiously optimistic

- 5.5 million units forecast to be produced in 2014
- Still dominated by diesel powered
- Natural gas and hybrid will continue to grow

5 Year CAGR: 2%

<table>
<thead>
<tr>
<th>Year</th>
<th>Production</th>
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<tbody>
<tr>
<td>2000</td>
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<td>2013</td>
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<tr>
<td>2014</td>
<td>480</td>
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</table>

Source: CV Link™ 2014
Outlook By Region

We estimate production to grow to 6.25 million units by 2020

- **Asia** will remain 66% of global truck production
- Production will continue to grow at a higher pace in **India, South East Asia, Eurasia and South America**
- **Europe and North America** designed products will be introduced into developing markets

### Truck Production By Region (% of Total)

<table>
<thead>
<tr>
<th>Region</th>
<th>2009</th>
<th>2014</th>
<th>2020</th>
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<tr>
<td>Greater China</td>
<td>54%</td>
<td>42%</td>
<td>39%</td>
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<tr>
<td>Indian Subcontinent</td>
<td>0.3%</td>
<td>0.4%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Far East</td>
<td>2%</td>
<td>3%</td>
<td>5%</td>
</tr>
<tr>
<td>Russia/EurAsia</td>
<td>5%</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>North America</td>
<td>11%</td>
<td>14%</td>
<td>12%</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>9%</td>
<td>14%</td>
<td>12%</td>
</tr>
<tr>
<td>Central/South America</td>
<td>7%</td>
<td>6%</td>
<td>8%</td>
</tr>
<tr>
<td>Rest of World</td>
<td>0.3%</td>
<td>0.4%</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

Source: *CV Link™ 2014*
Outlook By Gross Vehicle Weight

Growth varies by segment

- The 3.5 – 6t (Class 3) segment is expected to remain flat in the next five years. Mainly due to fleet right sizing and some shift to 6 t+
- 6-16t (Class 4-7) shows steady 3% CAGR due to increasing urbanisation leading to hub and spoke distribution models and improvements in product range in China, South America, India, Eurasia and South East Asia. Class 7 performed poorly mainly as a result of declines in India, Japan and Korea. However expected to improve as mining and export conditions improve
- Class 8 will grow at a CAGR of 3% until 2020

Source: CV Link™ 2014
Global Truck Market Dynamics

Economy, Emissions, Energy and Total Cost of Ownership are the main drivers impacting truck production & demand

Drivers

• Economy – GDP, Capital Spending ★
• Emissions Regulation - GHG ★
• Global Energy Demand – Natural Gas
• Increased Urbanization
• Infrastructure Spending
• Freight Transportation and Technology Improvements

Challenges

• Total Cost of Ownership – Fuel Economy, New Truck Price, Resale Value ★
• Replacement Cycles
• Manufacturing Capacity – Global OEMs

Restraint

• Threat of Substitutes – Rail
• Government Stability and Spending
• Monitoring Compliance
Economic Forecast

World GDP unlikely to return to pre-2007 levels

GDP % changes at constant prices

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<tbody>
<tr>
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<td>USA</td>
<td>3.2%</td>
<td>1.2%</td>
<td>3.3%</td>
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<td>European Union</td>
<td>3.0%</td>
<td>-0.1%</td>
<td>1.8%</td>
</tr>
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<td>Euro area</td>
<td>2.4%</td>
<td>-0.3%</td>
<td>1.4%</td>
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<tr>
<td>Japan</td>
<td>1.9%</td>
<td>0.1%</td>
<td>1.2%</td>
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<tr>
<td>Brazil</td>
<td>5%</td>
<td>3.7%</td>
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<tr>
<td>Russia</td>
<td>8.4%</td>
<td>2.2%</td>
<td>2.7%</td>
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<tr>
<td>India</td>
<td>10%</td>
<td>7.7%</td>
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<tr>
<td>China</td>
<td>13.5%</td>
<td>10.8%</td>
<td>8.3%</td>
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<td>Commonwealth of Independent States</td>
<td>9.1%</td>
<td>2.8%</td>
<td>3.0%</td>
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<td>ASEAN-5</td>
<td>6.8%</td>
<td>5.9%</td>
<td>5.4%</td>
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<tr>
<td>Latin America and the Caribbean</td>
<td>4.9%</td>
<td>3.9%</td>
<td>3.2%</td>
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<tr>
<td>Middle East, North Africa, Afghanistan &amp;</td>
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<tr>
<td>Pakistan</td>
<td>7.5%</td>
<td>4.7%</td>
<td>4.3%</td>
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<tr>
<td>Sub-Saharan Africa</td>
<td>7.7%</td>
<td>5.8%</td>
<td>5.6%</td>
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</tbody>
</table>

- World GDP will grow 3.9% by 2019
- Growth expected to slow in China and India although above world GDP
- By 2019, ASEAN – 5, Sub-Saharan Africa, Middle East expected to grow higher than World GDP
- European Union, Japan and United States expected to remain lower than World GDP

Source: IMF 2014
Emission Regulations

Implementation and monitoring of standards will drive growth

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</table>

- Increasing harmonization of standards although the pace of implementation will vary by region
- Fleets in mature markets have adapted to the implementation of EuroVI/EPA GHG 2014 whereas in China preparations are under way to implement NDIV and in India there are plans to implement BSIV to 50 cities and implement BS V by 2020
- Brazil and Russia are the laggards in this race although this will change 2015 onwards
Trends

Several Initiatives under way across the truck value chain

Conventional Powertrain
- Exhaust Heat Recuperation
- Valve Control
- Turbo
- Transmissions
- AMT
- Clutch
- Start Stop
- Alternative Fuels
- Downsizing

Alternative Powertrain
- Hybrid
- Gas
- Flywheel
- Electric

Body
- Lighter Weight
- Materials
- Tyres
- Aerodynamics and Design
- Auxiliary Units

Infrastructure
- Urbanisation
- Logistics
- Traffic Management
- Drive Training
- Self Driving

Fleet
- Telematics
- EC VECTO TOOL
- Capacity Planning
- Traffic Management

The goal is to reduce development cost, acquisition costs and improve efficiencies
Total Cost of Ownership
Manufacturers and Fleet Owners continued focus on reducing TCO

Manufacturers
- Design for Fuel Economy
- Improve Vehicle Profit Margins
- Emissions & GHG Regulations
- Fuel Technology Diesel, Natural Gas, Other Alternatives
- Low Cost Components

Fleet Owners
- Price of a New Truck and Resale Value
- Driver Cost
- Repair, Maintenance
- Fuel Cost
- Warranty

- To counteract increase in truck acquisition cost Euro 4000 – 6000 per vehicle
- Like the regulated markets of Europe, USA, BSV and NSV compliant product will be designed to improve fuel economy
- These drivers will shift the composition and dynamics of the truck market
Engine Manufacturers

As a result – consolidations and collaborations expected to continue to 2020…the top 20 engine manufacturers will supply 90% of the global truck market

Source: EnginLink™ 2014
Manufacturers Outlook
By Region

Chris Fisher
North America
North America

Green House Gas Emissions Specifics

• GHG Emission Regulations for MY 2014 – MY 2017
  • Applies to all on-road vehicles with GVWR > 8.5 tons
  • Reduction in fuel consumption ranging between 6% to 23% by MY 2017 compared to MY 2010 (U.S. 10 regulations)
  • Combination tractors: depending on type and weight require a 7% - 20% reduction in fuel consumption
  • Vocational vehicles require a 10% reduction in fuel consumption by MY 2017
• GHG 2020 will be finalized by March 2015
  • In May 2015, an announcement is scheduled to detail the requirements of the GHG 2020 emission regulations
North America

Manufacturers Trends in 2014

- Navistar is now using SCR in their medium engines
- Cummins put their ISX 15 liter natural gas engine on hold due to anticipated low volumes
- Volvo also cancelled their 13 liter natural gas engine project scheduled for introduction in 2015
- Navistar is now offering the Cummins ISB6.7 liter engine in the DuraStar medium truck and IC buses
- Ford will replace the Cummins ISB6.7 liter engine with the Ford 6.7 liter engine on the F-650/F-750
- Ford is ending the Blue Diamond JV with Navistar
North America

Engine Manufacturers Trends

- Daimler and Ford are installing fewer Cummins engines
  - Freightliner Evolution
  - Ford Mfg. 6.7 liter Diesel
- Navistar is expected to improve by 5% in 2014
  - Offering the Cummins ISX and ISB engines
- Daimler will introduce their DD5 & DD8 medium engines to North America in 2016
- PACCAR gaining share with the MX13 liter engine
  - MX11 scheduled for 2015
North America

Navistar Engine Prospects

• MF engines range include 6.36L, 7.6L, 9.3L and 12.4L
• No longer producing the MF11 & MF15
• Power was increased on the 9.3 liter (MF10)
• Cummins ISX15 available
• Navistar has no plans to exit the engine business
  ▪ Consolidated engine plants
    • Mid range engines to Melrose Park, IL
    • Reduced employees at Huntsville, AL

![Engine Installations Chart]

<table>
<thead>
<tr>
<th></th>
<th>CY 2013</th>
<th>FCST 2014</th>
<th>FCST 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cummins</td>
<td>13,400</td>
<td>25,900</td>
<td>35,700</td>
</tr>
<tr>
<td>Navistar</td>
<td>66,000</td>
<td>69,300</td>
<td>93,400</td>
</tr>
</tbody>
</table>
North America

Cummins Class 8 Engines

- Cummins offers a 12 liter natural gas engine
- Put the 15 liter gas on hold
- Cummins and Eaton JV on AMT’s
- The ISB 6.7 liter engine will be superseded by Ford next year in the F-650/F-750
- Navistar is the only OEM forecasted to increase Cummins engine installations in 2020 compared to 2013.
North America

Class 8 Engine Installations

- Cummins
- Detroit
- Navistar
- Other
- PACCAR
- Volvo

Cummins share decreasing over CY 2013 to CY 2020.

Cummins:
- CY 2013: 45.0%
- CY 2020: 25.0%

Other:
- CY 2013: 15.0%
- CY 2020: 20.0%

PACCAR:
- CY 2013: 5.0%
- CY 2020: 10.0%

Detroit:
- CY 2013: 25.0%
- CY 2020: 30.0%

Navistar:
- CY 2013: 10.0%
- CY 2020: 15.0%

Volvo:
- CY 2013: 0.0%
- CY 2020: 5.0%
North America

Natural Gas - MHCV

- Westport-Cummins is the only significant supplier
- 9 and 12 liter engines dominate the market
- The ISB 6.7 liter NG engine to be introduced in 2015
- Approximately 14,600 natural gas engines to be installed this year.

![Natural Gas Engine Installations](chart)
North America

Natural Gas Engine Installations

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<thead>
<tr>
<th>Year</th>
<th>Count</th>
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<td>CY 2017</td>
<td>24,500</td>
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<td>CY 2018</td>
<td>27,000</td>
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<tr>
<td>CY 2019</td>
<td>28,000</td>
</tr>
<tr>
<td>CY 2020</td>
<td>28,500</td>
</tr>
</tbody>
</table>
North America

Automated Manual Transmissions – AMT’S

- Currently, one-third of class 8 trucks are equipped with AMT’s.
- Volvo/Mack, Detroit have captive AMT powertrains.
- Cummins partnership with Eaton.
- Navistar MF 13 and PACCAR MX 13 engines are primarily mated with Eaton transmissions.
- The OEM’s estimate a 5% improvement in fuel economy with AMT’s compared with tradition manual transmissions.
North America

Engine Displacement Trends

- Market is shifting from higher displacement engines
- Expect a modest shift from 15 liter to 13 liter engines driven in part to the GHG emission regulations
- Higher hp. 13 Liter engines continue to gain popularity
- With the expansion of the Panama Canal, expect more regional distribution of goods
- However, 15 liter engines will always play a significant role in class 8 applications

Class 8 By Engine Displacement

- 13 Liter: 45.5%, 43.3%, 49.9%
- 15 Liter: 54.5%, 56.7%, 50.1%

Power Systems Research
Powerful Possibilities™
North America

Class 8 Engine Displacement Trends

<table>
<thead>
<tr>
<th>Year</th>
<th>13 Liter</th>
<th>15 Liter</th>
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<tbody>
<tr>
<td>CY 2013</td>
<td>45.5%</td>
<td>54.5%</td>
</tr>
<tr>
<td>CY 2014</td>
<td>43.3%</td>
<td>56.7%</td>
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<td>CY 2015</td>
<td>45.6%</td>
<td>54.4%</td>
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<td>CY 2016</td>
<td>46.8%</td>
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<td>CY 2017</td>
<td>48.7%</td>
<td>51.3%</td>
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<td>CY 2018</td>
<td>49.0%</td>
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</tr>
<tr>
<td>CY 2019</td>
<td>49.4%</td>
<td>50.6%</td>
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<tr>
<td>CY 2020</td>
<td>49.9%</td>
<td>50.1%</td>
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Europe
Europe

Medium & Heavy Vehicle Production and Forecast

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<td>600K</td>
<td>650K</td>
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Europe

Medium & Heavy Vehicle Production and Forecast Market Share

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<th>Company</th>
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<th>CY2014</th>
<th>CY2019</th>
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<td>DAF</td>
<td>9.4%</td>
<td>9.0%</td>
<td>9.0%</td>
</tr>
<tr>
<td>Iveco</td>
<td>11.8%</td>
<td>10.6%</td>
<td>10.0%</td>
</tr>
<tr>
<td>KAMAZ</td>
<td>8.1%</td>
<td>7.4%</td>
<td>8.5%</td>
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<tr>
<td>MAN</td>
<td>14.1%</td>
<td>14.0%</td>
<td>14.2%</td>
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<tr>
<td>Mercedes</td>
<td>22.0%</td>
<td>21.0%</td>
<td>20.0%</td>
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<tr>
<td>Other</td>
<td>13.7%</td>
<td>11.6%</td>
<td>11.7%</td>
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<tr>
<td>Renault</td>
<td>7.9%</td>
<td>5.4%</td>
<td>5.9%</td>
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<tr>
<td>Scania</td>
<td>8.3%</td>
<td>8.9%</td>
<td>9.4%</td>
</tr>
<tr>
<td>Volvo</td>
<td>10.6%</td>
<td>10.2%</td>
<td>10.0%</td>
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Europe

MHCV Engine Installations

- **Cummins**: CY2009 - 4.6%, CY2014 - 4.5%, CY2019 - 4.6%
- **Daimler**: CY2009 - 21.5%, CY2014 - 20.5%, CY2019 - 21.9%
- **FPT Industrial**: CY2009 - 18.8%, CY2014 - 18.8%, CY2019 - 22.6%
- **Kamaz Inc.**: CY2009 - 2.7%, CY2014 - 7.6%, CY2019 - 7.4%
- **Other**: CY2009 - 12.2%, CY2014 - 10.9%, CY2019 - 15.7%
- **PACCAR (DAF)**: CY2009 - 10.4%, CY2014 - 10.4%, CY2019 - 15.4%
- **Volvo**: CY2009 - 7.6%, CY2014 - 7.6%, CY2019 - 7.2%
- **VW (MAN/Scania)**: CY2009 - 9%, CY2014 - 9%, CY2019 - 15.9%
- **Yaroslavl**: CY2009 - 4.6%, CY2014 - 4.1%, CY2019 - 4.1%
Europe

Manufacturers Trends

• With the acquisition of both MAN and Scania, Volkswagen is the largest heavy truck manufacturer in Europe
• Kamaz is currently installing Euro IV Daimler 13 liter engines under their JV agreement. Kamaz plans to self manufacture the 13 liter engine using Leibherr technology for Euro V
• OEM’s such as Iveco are consolidating operations to eliminate redundancies within their manufacturing operations
• The OEM’s will continue to shift production from Western Europe closer to their export markets and low cost production countries
Europe

Manufacturers Trends

• Global vehicle and engine platforms will continue to be developed to create a modular system of production and common components
• A number of OEM’s have developed “low cost” truck platforms to penetrate highly competitive emerging markets
• The next round of emission regulations for Western Europe will likely to be fuel reduction targets, similar to the United States
India
India

Medium & Heavy Vehicle Production and Forecast
India

Medium & Heavy Vehicle Production and Forecast Market Share

- Tata’s share has steadily declined.
India

MHCV Engine Installations

- **Ashok Leyland**: CY 2009: 22.2%, CY 2014: 23.1%, CY 2019: 22.2%
- **Eicher Motors**: CY 2009: 16%, CY 2014: 13.5%, CY 2019: 12.7%
- **Mahindra**: CY 2009: 8.4%, CY 2014: 2.4%, CY 2019: 2.8%
- **Other**: CY 2009: 7.0%, CY 2014: 5.8%, CY 2019: 7.2%
- **SML Isuzu Limited**: CY 2009: 1.3%, CY 2014: 3%, CY 2019: 3%
- **Tata Cummins**: CY 2009: 33.0%, CY 2014: 27.5%, CY 2019: 31.9%
- **Tata Motors**: CY 2009: 30.2%, CY 2014: 23.9%, CY 2019: 21%

- **Tata Engine Shift to Tata Cummins**
- **Replaced Hino Supplied Engines**
India

Manufacturers Trends

• Foreign OEMs have been establishing production plants in India through joint ventures during the past ten years.
  • Volvo Eicher Commercial Vehicles (VECV)
  • Bharat-Benz
  • Mahindra Navistar (Navistar exited last year)
  • Tata Cummins
  • Beiqi Foton plans to assemble vehicles shortly
• The joint ventures allow the foreign OEMs a low cost manufacturing base
• Currently, the majority of production is for local demand but export demand will increase significantly, moving forward
Major Engine Models launched

• **Ashok Leyland**
  - Introduced the 5 and 8 litre “Neptune” engine in 2012.

• **Tata Cummins**
  - Produce 5.9 liter B series engines.
  - Will likely upgrade to the ISB 6.7 liter during the next few years.

• **Daimler**
  - The 6.4 litre OM906 assembled and installed on Bharat-Benz trucks.

• **Volvo (VECV)**
  - Global medium engine platforms.
  - Produce the 5 and 8 litre engines.
South Asia
South Asia

Medium & Heavy Vehicle Production and Forecast

<table>
<thead>
<tr>
<th></th>
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</table>
South Asia

Medium & Heavy Vehicle Production and Forecast Market Share
South Asia

MHCV Engine Installations

<table>
<thead>
<tr>
<th>Company</th>
<th>CY 2009</th>
<th>CY 2014</th>
<th>CY 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daimler</td>
<td>3.8%</td>
<td>3.6%</td>
<td>3.6%</td>
</tr>
<tr>
<td>Hino Motors</td>
<td>35.5%</td>
<td>33.6%</td>
<td>33.7%</td>
</tr>
<tr>
<td>Isuzu Motors</td>
<td>20.3%</td>
<td>16.6%</td>
<td>16.4%</td>
</tr>
<tr>
<td>Mitsubishi Motors</td>
<td>23.7%</td>
<td>32.7%</td>
<td>32.6%</td>
</tr>
<tr>
<td>Other</td>
<td>10.9%</td>
<td>7.9%</td>
<td>7.6%</td>
</tr>
<tr>
<td>Volvo Group</td>
<td>5.8%</td>
<td>5.7%</td>
<td>6.1%</td>
</tr>
</tbody>
</table>
South Asia

Manufacturers Trends

• Significant countries include, Australia, Indonesia, Malaysia, Philippines and Thailand.
• Low cost countries where production is starting to serve various export markets as opposed to local assembly only.
• New truck platforms recently introduced include:
  ▪ Hyundai Xcient
  ▪ UD Quester.
  ▪ Ashok Leyland U truck
  ▪ Tata Prima
• The majority of the brands produced are from Japan and South Korea.
China
Greater China

Medium and Heavy Vehicle Production Forecast

<table>
<thead>
<tr>
<th>Year</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY2009</td>
<td>800,000</td>
</tr>
<tr>
<td>CY2010</td>
<td>1,200,000</td>
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<td>CY2011</td>
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<td>CY2012</td>
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<tr>
<td>CY2013</td>
<td>950,000</td>
</tr>
<tr>
<td>CY2014</td>
<td>1,000,000</td>
</tr>
<tr>
<td>CY2015</td>
<td>950,000</td>
</tr>
<tr>
<td>CY2016</td>
<td>1,000,000</td>
</tr>
<tr>
<td>CY2017</td>
<td>1,050,000</td>
</tr>
<tr>
<td>CY2018</td>
<td>1,100,000</td>
</tr>
<tr>
<td>CY2019</td>
<td>1,150,000</td>
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Euro IV Enforcement?

Euro V?
Greater China

Medium and Heavy Vehicle Production Forecast Market Share

<table>
<thead>
<tr>
<th>Company</th>
<th>CY 2009</th>
<th>CY 2014</th>
<th>CY 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anhui Hualing</td>
<td>2.0%</td>
<td>4.8%</td>
<td>5.7%</td>
</tr>
<tr>
<td>Anhui Jianghuai (JAC)</td>
<td>1.9%</td>
<td>4.9%</td>
<td>4.9%</td>
</tr>
<tr>
<td>CNHTC</td>
<td>13.2%</td>
<td>23%</td>
<td>15.3%</td>
</tr>
<tr>
<td>Dongfeng</td>
<td>13.4%</td>
<td>20.8%</td>
<td>13.2%</td>
</tr>
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<td>FAW</td>
<td>19.9%</td>
<td>17.5%</td>
<td>17.4%</td>
</tr>
<tr>
<td>Foton</td>
<td>13.3%</td>
<td>11.9%</td>
<td>12.1%</td>
</tr>
<tr>
<td>Other</td>
<td>11%</td>
<td>11%</td>
<td>11%</td>
</tr>
<tr>
<td>Saic-Iveco</td>
<td>2.5%</td>
<td>2.5%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Shaanxi</td>
<td>0.0%</td>
<td>7.5%</td>
<td>10.5%</td>
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</table>
Greater China

MHCV Engine Installations

<table>
<thead>
<tr>
<th>Year</th>
<th>Dongfeng</th>
<th>Dongfeng Cummins</th>
<th>FAW</th>
<th>CNHTC</th>
<th>Jiangxi (JMC)</th>
<th>Jiangling (JMC)</th>
<th>Other</th>
<th>Shanghai Diesel (SDEC)</th>
<th>Weichai Power</th>
<th>Yuchai</th>
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<tbody>
<tr>
<td>CY 2009</td>
<td>7.2%</td>
<td>9.5%</td>
<td>15.2%</td>
<td>10.6%</td>
<td>2.8%</td>
<td>1.7%</td>
<td>7.5%</td>
<td>3.9%</td>
<td>27.5%</td>
<td></td>
</tr>
<tr>
<td>CY 2014</td>
<td>9%</td>
<td>11.9%</td>
<td>14%</td>
<td>15%</td>
<td>1.9%</td>
<td>4.3%</td>
<td>7.5%</td>
<td>3.6%</td>
<td>23.0%</td>
<td></td>
</tr>
<tr>
<td>CY 2019</td>
<td>9.2%</td>
<td>15.2%</td>
<td>6.5%</td>
<td>4.3%</td>
<td>8.2%</td>
<td>8.2%</td>
<td>4.3%</td>
<td>3.6%</td>
<td>21.1%</td>
<td></td>
</tr>
</tbody>
</table>

Power Systems Research
Powerful Possibilities™
Greater China

Manufacturers Trends

• Installations of natural gas engines within the MHCV segment has grown significantly.
  ▪ Approximately 50k buses and 40k trucks are expected to be produced with natural gas engines in 2014.
  ▪ 97% of the natural gas engines are CNG.
• Euro IV emission regulations for diesel powered trucks have been implemented, however only around 10% of new vehicles meet the standards.
  ▪ Higher cost of emission technology.
  ▪ Availability of low sulfur fuel.
• Smaller OEM’s will not survive over the longer term.
South America
South America

Medium and Heavy Vehicle Production Forecast

[Bar chart showing production forecast for CY 2009 to CY 2019.]
South America

Medium & Heavy Vehicle Production and Forecast Market Share

<table>
<thead>
<tr>
<th>Year</th>
<th>Chevrolet</th>
<th>Ford</th>
<th>Ivec</th>
<th>Mercedes-Benz</th>
<th>Other</th>
<th>Scania</th>
<th>Volkswagen</th>
<th>Volvo</th>
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<tbody>
<tr>
<td>CY 2009</td>
<td>6.9%</td>
<td>19.0%</td>
<td>5.7%</td>
<td>25.5%</td>
<td>1.4%</td>
<td>12.2%</td>
<td>27.3%</td>
<td>13.6%</td>
</tr>
<tr>
<td>CY 2014</td>
<td>1.8%</td>
<td>12.3%</td>
<td>9.4%</td>
<td>23.5%</td>
<td>3.5%</td>
<td>12.9%</td>
<td>23.0%</td>
<td>7.4%</td>
</tr>
<tr>
<td>CY 2019</td>
<td>1.4%</td>
<td>9.5%</td>
<td>4.7%</td>
<td>23.1%</td>
<td>6.8%</td>
<td>12.6%</td>
<td>23.2%</td>
<td>13.2%</td>
</tr>
</tbody>
</table>
South America

MHCV Engine Installations

Cummins
Daimler
Foton Cummins
FPT Industrial
MAN Latin America
MWM
Other
Scania
Volvo

CY 2009
CY 2014
CY 2019
South America

Manufacturers Trends

• A number of Chinese OEM’s plan to establish manufacturing in Brazil starting next year. The OEM’s include Foton, CNHTC (Sinotruck) and Shaanxi (Shacman). JAC is also assembling heavy trucks in Venezuela.
• MAN Latin America now produces the VW branded trucks which include the MAN D08 engine produced by MWM Motors
• VW also installing the Foton Cummins ISF engines sourced from China.
Japan/South Korea
Japan & Korea

Medium and Heavy Vehicle Production Forecast

<table>
<thead>
<tr>
<th>Year</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY 2009</td>
<td>160,000</td>
</tr>
<tr>
<td>CY 2010</td>
<td>220,000</td>
</tr>
<tr>
<td>CY 2011</td>
<td>280,000</td>
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<tr>
<td>CY 2012</td>
<td>340,000</td>
</tr>
<tr>
<td>CY 2013</td>
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<td>CY 2014</td>
<td>460,000</td>
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<td>CY 2015</td>
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<td>CY 2016</td>
<td>580,000</td>
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<tr>
<td>CY 2017</td>
<td>640,000</td>
</tr>
<tr>
<td>CY 2018</td>
<td>700,000</td>
</tr>
<tr>
<td>CY 2019</td>
<td>760,000</td>
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</table>
Japan & Korea

Medium & Heavy Vehicle Production and Forecast Market Share

<table>
<thead>
<tr>
<th>Brand</th>
<th>CY 2009</th>
<th>CY 2014</th>
<th>CY 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daewoo</td>
<td>2%</td>
<td>2.9%</td>
<td>3%</td>
</tr>
<tr>
<td>Hino</td>
<td>25.6%</td>
<td>25.9%</td>
<td>28%</td>
</tr>
<tr>
<td>Hyundai</td>
<td>5.9%</td>
<td>3.4%</td>
<td>3%</td>
</tr>
<tr>
<td>Isuzu</td>
<td>37.7%</td>
<td>41%</td>
<td>41%</td>
</tr>
<tr>
<td>Mitsubishi</td>
<td>20.3%</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Fuso</td>
<td>19.7%</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>0.8%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Toyota</td>
<td>1.9%</td>
<td>0.7%</td>
<td>1%</td>
</tr>
<tr>
<td>UD Trucks</td>
<td>6.3%</td>
<td>5.4%</td>
<td>5%</td>
</tr>
</tbody>
</table>
Japan & Korea
MHCV Engine Installations

<table>
<thead>
<tr>
<th>Company</th>
<th>CY 2009</th>
<th>CY 2014</th>
<th>CY 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doosan</td>
<td>4.1%</td>
<td>3.6%</td>
<td>3.5%</td>
</tr>
<tr>
<td>Hino</td>
<td>32.4%</td>
<td>29.4%</td>
<td>30.3%</td>
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<tr>
<td>Hyundai</td>
<td>8.3%</td>
<td>5.2%</td>
<td>4.7%</td>
</tr>
<tr>
<td>Isuzu</td>
<td>35.4%</td>
<td>35.2%</td>
<td>35.4%</td>
</tr>
<tr>
<td>Mitsubishi Fuso</td>
<td>15.3%</td>
<td>17.8%</td>
<td>17.3%</td>
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<td>Nissan</td>
<td>4.3%</td>
<td>4.3%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Other</td>
<td>0.2%</td>
<td>0.4%</td>
<td>0.4%</td>
</tr>
<tr>
<td>UD Trucks</td>
<td>4.2%</td>
<td>3.8%</td>
<td>4.4%</td>
</tr>
</tbody>
</table>

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Japan & Korea

Manufacturers Trends

• Establish assembly closer to traditional export markets.
  ▪ Avoid local tariffs.
  ▪ Low cost manufacturing.
  ▪ Increasing export competition from China.
• Developing low cost trucks.
  ▪ UD Quester
  ▪ Hyundai Xcient
• Global vehicle and engine platforms.
  ▪ Daimler
  ▪ Volvo
Global Truck Market will continue to innovate through to 2020

- Global Medium and Heavy Truck market will grow at a slow and steady pace of 2%
- Growth by gross vehicle weight will vary affected by economic conditions, regulation and fleets rightsizing to meet regional demands
- Further consolidations and collaborations expected across the supply chain to reduce research, development and manufacturing costs
- Improvements in reducing the total cost of ownership will begin to bear fruit as engine, equipment and component manufacturers provide innovative technology solutions
- Diesel power expected to dominate although natural gas and alternative fuels will grow

Power Systems Research
Powerful Possibilities™
Thank You!

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The End