

The Future of Heavy-Duty Powertrains: 2007 to 2020

An Overview

In the next 15 years, the heavy-duty truck powertrain will change significantly. Driven by substantially stricter emissions regulations, continued pressure on operating costs, increased traffic congestion, and a shortage of skilled drivers, these changes will take place in the engine, the exhaust gas treatment system, and the transmission, as well as in the utilization of several forms of hybridization.

The pace of change will also be dramatic. For example, some of the exhaust treatment technologies only now appearing on the horizon are expected to become obsolete, or nearly so, by 2020, as engines move from conventional diesel operation towards homogenous charge compression ignition (HCCI) under ever-increasing emissions constraints.

These are the overriding conclusions of "The Future of Heavy-Duty Powertrains," which explored the next generation of powertrain technologies for heavy-duty (5+ tons GVWR) commercial vehicles being developed and produced in Western Europe, Japan, and North America.

The study was designed to assist major component suppliers, OEMs, and policy makers develop future technology strategies and business plans. The study is based upon three plausible, internally consistent scenarios of emissions regulations and crude oil prices and availability. For each scenario, the mix of powertrain (engine type, exhaust gas treatment system, and transmission) technologies in each geographic region was forecast based on technical performance criteria and the expected impact on vehicle life-cycle costs. The technical barriers to the commercialization of advanced diesel engines, competing internal combustion engine types, hybrid powertrains, and fuel cells, as well as the various forms of advanced transmissions, exhaust cleanup, and alternative fuels were identified and assessed. These assessments determined if and when each technology could become a cost-effective solution to meet the ever-more stringent requirements in each scenario.

Market share forecasts indicate that the most likely scenario can be met with a mix of primarily diesel-fueled engine types (conventional, but highly evolved diesel, advanced bottoming-cycle diesel, and evolving HCCI technologies), complemented by spark ignition engines fuelled by natural gas for certain niche applications. Due to the diverse requirements in each region and the differing characteristics of the vehicle fleets, the mix of technologies varies significantly among regions, even in the most likely, baseline scenario.

Global Market Shares of Engine Technologies Baseline Scenario 2020

Conventional but Highly Evolved Diesel	Advanced, Bottoming-Cycle Diesel	Mixed-Mode HCCI	Full HCCI	Spark Ignition
30%	25%	15%	25%	5%

Fuel cell powertrains are currently in the early stages of technology integration, and significant improvement is needed to produce market competitive fuel cell powertrains. As that technology develops, we may see increased demonstration fleet activities by 2020. Fuel cells are more likely to be useful for certain related applications such as auxiliary power units for trucks operated remotely from a truck-stop infrastructure (e.g., military vehicles).

Battery electric vehicles were not found to be substitutes for more conventional commercial vehicles. They will meet zero emissions vehicle requirements and are likely to see further service in niche applications, such as delivery/collection vehicles for closed communities and city centers.

The study forecasts are segmented by region and by scenario, and the expected ramp-up of the key power unit technologies are defined. Market shares of different transmission types are derived, exhaust gas treatment systems are assessed, and overall performance trends and characteristics are discussed, as is the likely contribution of improvements in related areas of the vehicle, such as aerodynamics and low rolling resistance tires.

Two forms of hybridization will appear. Power unit hybridization will employ exhaust gas energy to power auxiliary systems and provide some torque boost. Driveline hybridization will employ regenerative braking and thereby reduce overall operating costs and capture an important share of the market for some vocations.

Global Market Shares of Hybridization Baseline Scenario, 2020

Power Unit Hybridization	Driveline Hybridization
25%	20%

Transmissions are treated in a similar manner.

The seven-volume study concludes with insights that will help a wide range of powertrain and electrical component suppliers identify and understand long-term business opportunities that are likely to enjoy high market share.

About TIAX LLC

TIAX LLC (pronounced Ty-ax) is a leading collaborative product and technology development firm that accelerates innovation to help its clients create an impact in the market—and in people’s lives. We integrate business, industry, and hands-on technology expertise to transform ideas into products and problems into solutions. Formed out of Arthur D. Little's Technology & Innovation business, TIAX (www.tiaxllc.com) builds on more than a century of breakthrough innovation and client success using collaborative R&D. TIAX was selected as a Technology Pioneer 2003 by the World Economic Forum and is ISO 9001 certified with more than 50 research and development laboratories.

About Global Insight, Inc. (<http://www.globalinsight.com/>) is a privately held company formed to bring together the two most respected economic and financial information companies in the world, DRI and WEFA. Global Insight provides the most comprehensive economic and financial coverage of countries, regions, industries and markets available to support planning and decision-making. The company has over 3,800 clients in industry, finance and government with revenues in excess of \$80 million, over 600 employees and 23 offices in 12 countries covering North and South America, Europe, Africa, the Middle East and Asia.

Global Insight's Automotive Group provides vehicle and component manufacturers, and others involved with the automotive industry worldwide with the expertise necessary for the development of their product and business strategies. The Automotive Group consists of over 50 dedicated automotive experts with credentials in engineering, finance, marketing, sales, product strategy, and market research, with access to the over 300 Global Insight analysts worldwide. This multi-lingual, multi-national team understands the forces at play — market, product, technology, economic, financial, trade, transportation, energy, regulatory, demographic, and political — and the ways they interact to influence automotive industry growth and market opportunities.

###

For more information contact:

Phil Gott

Global Insight, Inc.

781-301-9141

philip.gott@globalinsight.com

Twig Mowatt

TIAX LLC

(617) 498-7366

mowatt.twig@tiaxllc.com