
I. INTRODUCTION

The Future of Diesel Engines Seventeenth Edition is a comprehensive review of NAFTA diesel engine production by application. We consider our forecast book to be a most informative primer for diesel engine markets as well as a source of the latest published and inside information on the industry. We have found that *The Future of Diesel Engines* has become a must read for presidents to market analysts at companies involved in all areas of the vehicle, equipment, engine, powertrain, component and financial businesses.

Rhein Associates, Inc. is celebrating its 19th year in business. Our offices and staff are located in Canton, Michigan. The author of this forecast book is Thomas A. Rhein, a veteran of over 45 years in the powertrain industry, which includes 25 years with Detroit Diesel Allison Division of General Motors, 2 years with General Motors Service Parts Operations, and 2 years as senior vice president with an international consulting company based in London, England. In 1991, Mr. Rhein realized his dream when he incorporated Rhein Associates, Inc., an *independent* publications, research and consulting company.

Mr. Rhein's background and credentials for writing a diesel engine forecast book include his industry positions at Detroit Diesel Allison of sales representative, sales development coordinator, off-road market analyst & marketing manager, on-highway market analyst & marketing manager and divisional market planning & research manager. His GM experience includes not only all areas of market research, business & strategic planning, forecasting, company profiling and competitive analysis in North America; but also like projects in Europe, Brazil and the Philippines. At PRS Consulting, he was senior vice-president of consulting and newsletters assuming the responsibility for two of the three major functions of the North American office. Since the creation of Rhein Associates, Inc. (RAI), Mr. Rhein has accomplished over 100 major consulting studies worldwide, with a client base that reads like the Who's Who of the powertrain industry. Mr. Rhein has also been a contingent consultant to Presidents and Vice Presidents of OEM's and suppliers.

The major sources of information used in this five year forecast book include:

- Conversations and interviews with diesel engine manufacturers, distributors, dealers and components suppliers,
- Discussions with vehicle and equipment OEM's, analysts and industry experts,
- Industry reports, publications and analyses,
- Government data sources for economics, trends and engine information,
- Industry association contacts and reports,
- Over 45 years of industry knowledge, insights and intuition.

The intent of this report is to present understandable, logical and accurate diesel engine production forecasts. The diesel engine industry and manufacturers are not like other industries, i.e. automobiles. The information on future programs is well guarded and manufacturers like to announce new and updated programs at the last minute keeping competitors off balance. As we continue our journey through the emissions regulations era, secrecy and security have become more intense. As a result, to forecast accurately, a number of sources must be fine tuned by market trends and intuition.

“At Detroit Diesel Allison, my department was responsible to forecast the truck and off-highway equipment markets for GM using the GM Economic Staff’s model and forecast”, says the author, Tom Rhein. “We would independently put together our forecast using industry, manufacturer, supplier and user inputs. We were given an opportunity to show an empirical relationship between our numbers and the GM model. We needed to show some connection when we submitted our forecast downtown. In other words, we tried many times to model the diesel engine markets; but found each indicator would only affect a small segment of individual markets. Overall indicators were difficult to find. With experience, we found the most accurate method of forecasting the diesel engine production was looking at key economic indicators to establish a market direction, analyzing historical and current diesel engine statistics to determine a base, using the combined opinions of a number of major market experts and players to confirm trends and, finally, adding in experience and intuition to arrive at the final forecast volumes.”

RAI maintains a historical and forecast database for diesel engine production in North America. This database is the main source of data for the five year forecast book and is sold separately. Our data actually goes back to 1982, although this report only covers the 2005 to 2014 time period. We are using 2009 as the base historical year.

We analyze six major diesel engine applications in this report. They include: on-highway, off-highway mobile, industrial stationary, generator set, marine and, agriculture. With the 10th edition, we introduced automotive diesel production; however these volumes are for specific applications and do not reflect market trends.

The statistics used in this report are NAFTA (U.S., Canada & Mexico) diesel engine production, primarily U.S. production, as Canada has no diesel engine production plants and Deere and Ford are currently the only significant diesel engine producers in Mexico, except for one dedicated automotive diesel manufacturer. This production may be commercially consumed in NAFTA, used in government equipment/ vehicles or exported directly to OEM or users. The diesel engine applications analyzed include:

- On-Highway: Diesels used to propel trucks, buses & coaches
Light Duty
Medium Duty
Heavy Duty
- Off-Highway: Diesels used to propel off-road equipment
- Industrial: Diesels used to power stationary off-road equipment
- Gen Set: Diesels used to produce electric power for all industries
- Marine: Diesels used to propel boats/ships
- Agriculture: Diesels used to propel tractors, combines and harvesters
- Automotive Diesels used to propel cars and car based SUV's, etc.

Each of these diesel engine production applications is defined in detail in the body of the report and is analyzed by history, trends, indicators, horsepower range, major players and forecast. The five-year diesel production forecast book also has summary tables by application and engine manufacturer for each of the ten years.

We also present a brief profile of the major diesel engine manufacturers based on business relationships and insights. The final section of this report is a chronology of news items related to diesel engine manufacturers over the last year.

We hope you will find *The Future of Diesel Engines* provides essential information for not only the casual diesel engine analyst, but also the seasoned diesel engine professional. Our corporate objective is "to assist our clients in developing and executing successful business plans." This forecast is just one tool in the process. Our monthly newsletter, *The Rhein Report: Powertrain Products*, is the leading powertrain newsletter (hard copy or e-mail form) in the industry and provides essential data for powertrain analysis.

All newsletter subscribers are offered discounts on other products including this five-year forecast book. Please call, fax or e-mail us if we can provide additional help through our consulting activities, publications or databases.

The assumptions, volumes and trends presented in this report are the property of and opinion of Rhein Associates, Inc. The content of this report represents our interpretation or analysis of information generally available to the public or released by individuals in the subject companies, but is not guaranteed as to accuracy or completeness. It does not contain material provided to us by clients or proprietary information gained during a consultation or research contract. The information is not furnished in connection with a sales or offer to sell securities, or in connection with the solicitation of an offer to buy securities.

III. OVERALL MARKET TRENDS

The 17th edition of *The Future of Diesel Engines* is based on NAFTA diesel engine production, which includes Canada, Mexico and the United States. Our policy is to change production volumes whenever an improved data source is found. For this reason, historical data may be altered slightly. Any significant historical revisions will be highlighted.

The major changes since the 16th edition of *The Future of Diesel Engines* include the following:

- The medium duty and heavy duty diesel engine production pre-buy in 2009 ahead of the 2010 emissions regulations turned out to be greater than anticipated. As a result, the 2009 production increased and the 2010 production was lowered.
- The economic stimulus does not appear to have had much effect to date. Housing starts are stagnant at best and truck orders are being highly publicized without regard to actual shipping dates – typical marketing ploy to prime the order pump. We do see a gradual improvement in most markets, which we expect to continue if the government does not interfere. Basically, we have move the forecast out one year with anticipation of a real recovery by the second half of 2011.
- We have reviewed our off-road forecasts with regard to emissions years and revised the volumes upward in the pre-buy years. Generally, the off-road Tier IV will be similar to heavy truck 2007 with Tier V similar to 2010. In both cases, we expect the off-road engine cost increase to be higher than the truck increases.
- All diesel engine programs for the 8500 GVW and below trucks have been delayed indefinitely due to lack of volume.
- The Caterpillar-Navistar truck joint venture, NC², will use Navistar medium and heavy duty diesels for vocational trucks to be serviced by Caterpillar dealers. Initially, the business is overseas with NAFTA to follow in 2011. Total volume is expected to peak below 1,000 trucks annually.
- Paccar is producing its MX at 12.9L in Columbus, Mississippi replacing imports from DAF in the Netherlands. The TRX at 10.8L is expected in 2013. Plans to produce a 16L diesel have been delayed until at least 2015 as Paccar will use the Cummins ISX in the interim.

- In the 16th edition, we reported that International will use the Caterpillar 15L block to build a new MF15 engine to be introduced in 2011. We now expect it to be built in late 2010.
- The burying of the Caterpillar truck models was a bit premature as Cat continues to enjoy export volume greater than anticipated – both on and off-highway applications are affected. Cat's off-highway volume has also been increased based on military truck contracts extending for the next five years assuming extensions.

The major overall trends affecting most markets continue to be manufacturer/ supplier consolidation, emissions regulations and alternative fuel engines.

1. **Manufacturer/Supplier Consolidation:**

Our expected truck engine by truck model line up continues to change. We are finding a shorter lead time from engine selection to actual production. This could be due to the integration of more captive engines which leaves the truck fleet/user dubious of in-product testing and resultant reliability - one more reason for the strength of pre-buys and the increase in fleet age.

Globalization, stockholder return, economy of scale and engines tailored to exact power and physical size requirements are the major reasons for increases in company consolidations. The cost of developing new or updated engines is a key factor as adequate volumes must be maintained to write off R&D expense. We continue to forecast a move to integrated powertrains for all truck sizes similar to the European market.

North American Truck and Engine Ownership/Affiliations 2009

<u>Truck Manufacturer</u>	<u>Truck Brands</u>	<u>Diesel Engines Available</u>
Daimler		
Medium Duty:	Freightliner Sterling Mitsubishi Fuso	Caterpillar Cummins Mercedes Benz (captive import) Mitsubishi (captive import)
Heavy Duty:	Freightliner Sterling Western Star	Caterpillar Cummins Detroit Diesel (captive) Mercedes Benz (captive import)
Dodge		
Light Duty	Dodge	Cummins
Medium Duty	Dodge	Cummins

Ford

Light Duty:	Ford	International
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Medium Duty:	Ford	Caterpillar Cummins
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**North American Truck and Engine Ownership/Affiliations
2009**

<u>Truck Manufacturer</u>	<u>Truck Brands</u>	<u>Diesel Engines Available</u>
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General Motors

Light Duty:	Chevrolet GMC	Duramax (captive) Isuzu (Import)
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Medium Duty:	Chevrolet GMC	Caterpillar Duramax (import)
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Hino

Medium Duty	Hino	Hino (captive import)
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International Truck

Medium Duty:	International	International (captive)
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Heavy Duty:	International	Caterpillar Cummins International (captive)
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Paccar

Medium Duty:	Kenworth Peterbilt	Cummins
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Heavy Duty:	Kenworth Peterbilt	Caterpillar Cummins Paccar (captive import)
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Volvo

Heavy Duty:	Volvo Mack	Cummins Volvo (captive US built and import)
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Our analysis of each of the truck companies follows.

Daimler Truck

Daimler dropped its Sterling product line in 2009 leaving the Freightliner and Western Star brands as Daimler's medium and heavy truck lines. Plans for Sterling to market the Mitsubishi Fuso LCF truck (360 program) and brand the Dodge Sprinter (Bullet) are dead. Mitsubishi Fuso will continue to market its LCF truck through its dealer network which is

expanding and the Sprinter line will be abandoned by Freightliner as the last connection with DaimlerChrysler is dissolved.

Caterpillar diesels will no longer be available as of 2010, so Freightliner LLC has contracted with Cummins to supply diesels through 2013. This means both medium and heavy duty trucks will offer only Cummins and captive Detroit Diesel engines in 2010.

For medium duty, Cummins will be the only diesel engine available starting in 2010. The MBE 900 imported for Freightliner medium duty trucks was not certified for 2010. A replacement for the MBE 900 is not expected until after 2014.

For heavy duty, the Detroit Diesel 15.6L upgrade of the 14.8L started in production in 2009. A replacement diesel for the imported MBE 4000 at 10.6L is expected in 2011 but will be built in Brazil or Germany. DDC also began 12.8L diesel production in 2009.

By 2013, most of the engine integration should be done but high horsepower applications with Cummins will still be needed. Cummins will also be available for medium duty dependent on Freightliner's ability to provide a MBE 900 series replacement beyond 2014.

Dodge/Fiat

The Dodge RAM has now been renamed the RAM series by Chrysler's new owner, Fiat. The light duty RAM truck, 2500/3500, has both gasoline and diesel engines available with Cummins the exclusive diesel (B series). We expect the RAM series to continue to offer Cummins exclusively in the 2500/3500 RAM through 2014 and beyond. The RAM series has upgraded into the class 4/5 market where it offers the Cummins B series as well. A new RAM 1500 diesel model was expected in 2011MY with a new Cummins V8 5.0L but now this engine has been delayed indefinitely

Fiat could use Fiat engines (Iveco) in RAM trucks in the future but Dodge recently extended the Cummins contract indefinitely. Since the Cummins name has been given credit for much of the success of the Dodge RAM truck, a switch to Fiat diesels could be a marketing problem. We expect to see Cummins as the supplier over the next five years and beyond.

Ford

Ford has delayed its new 4.4L diesel for light duty F150 and F250 indefinitely due to low volume. The Ford V8 6.7L started Mexican production in 2010 replacing the International 6.0L/6.4L.

Ford currently offers Caterpillar, Cummins and International in their medium duty trucks. The Blue Diamond joint venture International/Ford chassis started in 2004 and will continue for the conventional class 6/7 trucks. In 2009, Ford uses its own cab and offers Caterpillar,

Cummins and International VT365 (6.0L) diesels while International offers only International diesels. The LCF cab-over Ford trucks will be discontinued in 2010. With Caterpillar leaving the market and Ford building its own 6.7L, Ford will have only Cummins and its own diesels in 2010 for medium duty.

IV. DIESEL ENGINE PRODUCTION & FORECAST

OFF-HIGHWAY MOBILE

Off-highway mobile diesel engine production in NAFTA includes propulsion engines used for construction, mining and related vehicles. Any diesel production used for a vehicle that is not licensed for over the road operation and is not designed specifically for agriculture would be considered off-highway. The most common applications are:

bottom dump haulers	compactors/rollers	crane carriers
crawler loaders	crawler tractors	ditchers/trenchers
excavators	industrial tractors	lift trucks
loader backhoes	log skidders	log stackers
military vehicles	mining haulers	mobile cranes
motor graders	oil well servicing rigs	pavers
portable drill rigs	skid steer loaders	scrapers
straddle carriers	tow tractors	tree harvesters
underground mining	wheel loaders	

The off-highway mobile category becomes a catch all for many small OEM vehicle applications. These vehicles are used in almost all industries including construction, logging, material handling, mining and oil field. In the past, there was a relationship between housing starts, on-highway diesel production and off-highway diesel production. Off-highway diesel production usually lags on-highway diesel production by 3 to 6 months and housing starts, consequently, by 9 to 15 months. We now feel the lead-lag relationship for off-highway mobile diesels has been tainted by the effects of truck emissions regulations.

Off-highway emissions regulations have different enforcement years than truck regulations. The off-road regulations are based on horsepower range and have a lower volume to write off hardware and software needed to meet the new emissions levels. Meeting the regulations creates a similar but lower volume pre-buy than what we saw in the truck market.

The high volume under 200 HP diesel market is closely tied to housing or residential building. These markets were being taken over by imported diesels except for small diesel plants in Mexico by Deere and in Georgia by Caterpillar/Perkins. The value of the US dollar also affects domestic production. The higher horsepower, traditional

North American production, continues to be affected by non-residential or non-building construction, which lags housing activity and exports.

The following section will show the various industries by segment and trend.

CONSTRUCTION

There are 3 basic types of construction that use off-highway mobile diesels.

Residential Building Construction is the highest volume user and relates primarily to low horsepower, small contractor equipment. Residential building, like housing starts, is on a steady decline since 2006. When you compensate for inflation, residential building construction shows significant real growth through 2005 starting down in 2006. For example, if we assume inflation at 4% through 2007 and 3% for 2008 - 2010, the real growth is:

<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010 est</u>
+15.4%	+10.8%	-3.0%	-23.8%	-31.9%	-33.1%	-3.6%

Many experts are now saying housing starts and likewise residential construction will not actually start to recover until late 2011. Housing does appear to be showing a slight gradual increase until lately. We expect a strong housing market in 2012 but are skeptical of 2011 due to the foreclosure fiasco.

Housing and related activities like pipelaying and utilities are the primary users of loader backhoes, ditchers and trenchers, small wheel loaders, skid steer loaders and small crawlers. Most of these applications are below 200 HP and many use imported diesel engines. Still, this is the highest volume user of off-highway mobile equipment and diesel production by far.

Non-Residential Building Construction includes office buildings, schools, plants and all types of buildings not considered residential. Non-residential buildings are generally larger than residential buildings and require larger equipment while needing the same types of infrastructure like utilities and drainage. Non-residential buildings have a longer lead time from concept to production versus residential. Non-residential equipment diesels lag housing starts and residential construction. Once the economy turns down, non-residential buildings in progress may not physically be under construction with the final concept phases yet to be built. This is why non-residential buildings lag the general economy or housing starts by at least one year.

The following is real non-residential building growth since 2004, assuming 4% historic inflation through 2007 and 3% for 2008 /2009.

<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010 est</u>
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-0.2% +3.8% +12.2% +15.5% +12.0% -17.1% -26.3%

It is apparent that non-residential delays residential. The 2009/2010 declines are expected to continue into 2011. The office building bubble seems to be much smaller than housing but it is just starting to be realized.

Non-Building Construction is the construction and repair of highways, bridges, dams, and petrochemical and nuclear plants. The major segment in North America is highway and bridge repair and road construction. Dam building is an overseas activity primarily in the third world countries.

Federal funding for highways, streets and bridges is paid by fuel taxes and used to be one of the few government subsidies collected in advance. States must have matching funds to use the subsidy, which works against poorer states or those with deficits. Federal funding has been strong over the last ten years with real growth as follows:

<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010 est</u>
-1.7%	+4.9%	+8.1%	+2.0%	+2.8%	-2.0%	-3.9%

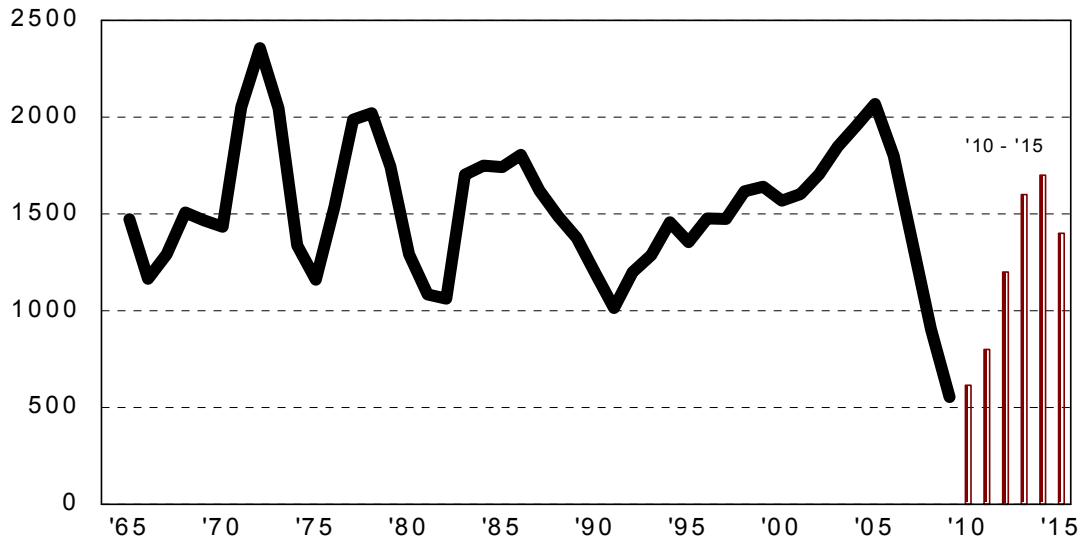
Federal highway funding is strong; but that is only part of the story. To get the federal funds, a state must have matching funds. With the drastic financial condition of most states, matching funds are hard to come by. Even when matching funds are available, the additional state and municipal funds for road and bridge work are not there.

We expect to see highway and bridge programs to rise dramatically starting in 2011 due to the government stimulus program. Unfortunately, it takes time for the funds to work through the system. We expect to see accelerated real funding growth in 2011 through 2013. These dollars will certainly add to the state and local economy but will most likely be felt in late 2011 and later when the recovery is already in place. The benefits could easily lead to higher inflation.

LOGGING

The logging industry is a major user of diesel engines for log skidders, harvesters, processors and specialized vehicles and is dependent on demand for lumber and pulp for buildings and paper. Buildings follow housing starts while paper demand continues to grow despite our "paperless" society.

U.S. Housing Starts 1965 to 2015



Source: NHBA & Rhein Associates, Inc.

The housing market was strong reaching a 33 year high in 2005 (2.068M starts). 2006 started the downturn (-12.9%) and 2007, 2008 and 2009 continued the slide (-24.8%, -33.2% and -39.0% respectively). We have experienced a gradual increase during 2010 and look for a stronger rebound by late 2011. Our annual housing forecast is for a stable but gradual recovery to 1.7M starts by 2014 turning down in 2015 (the last half of 2014).

Housing uses small equipment that have a high percentage of imported diesels. Still, the continuing move to the suburbs and suburbs of suburbs demands infrastructure development and larger equipment as well.

MINING

Mining production in the U.S. has been on the decline in real dollars since 1997 as has iron and steel production. The mining production index for the U.S. increased in 2000/2001 to be followed by a decline through 2005. The U.S. mining production is up in 2006 through 2007 as is iron and mining production. The world demand for commodities by China and India has even revitalized stagnant U.S. demand. However, the world economic recession has adversely affected commodities in 2009, which are now recovering. Gold mining, however, continues to grow reflecting the volatile U.S. dollar value and inflation fears.

China, India and Far East manufacturing will continue to create a stronger than normal commodity demand following a short pause in 2008 through 2010. Unfortunately for the U.S., most mining activity is done in third world countries. Fortunately, for North America, mining equipment is high horsepower and built in North America.

Iron and steel production in the U.S. is generally a function of world demand. World demand has been high with the strong economies in China and India. Large equipment is required to move the iron overburden and ore, which means high horsepower diesels like produced in the U.S. The credit meltdown in the last half of 2008 and the world recession have adversely affected iron and steel, which is expected to rebound in 2011/12.

The weakening U.S. dollar has worked in favor of U.S. diesel engine exports in competition with Europe and Japan. Regardless of the sorry state of the U.S. economy, it is still a better place to invest than other choices. Through 2014, we expect a volatile dollar that will end up weaker in both the long and short run despite efforts made by the third world countries who want to see a strong dollar to keep import prices low.

OIL FIELD

Oil field activity is dependent on oil and natural gas prices. Recently, the light sweet crude oil price has gone from over \$145 per barrel (2002 price was \$26 per barrel) to \$40 a barrel and then back to almost \$90 a barrel. Diesel fuel prices are higher than gasoline without incentives. Today, despite the low demand for oil and high inventories, oil price is back to over \$80 a barrel and gasoline is over \$3.00 a gallon.

One of the major influences on supply and demand is the threat of supply disruption in the Middle East, Russia, Africa and Venezuela. Others are the dollar value and speculation. We expect the oil price to continue volatile but high due to the fragility of supply and the weak dollar.

The U.S. need to be more energy independent has been a goal since the oil shortages of the early 1970's. President Obama ran on the platform of reduced fossil fuel demand, less oil drilling and a drastic increase in alternative energy. The world recession has taken a lot of the pressure off the oil prices and the need to move quickly away from imported oil. It also has reduced the funds that will be available for alternative energy incentive programs.

Two new initiatives, cap & trade and carbon footprint, mean greater costs for energy and higher prices to the consumer. We are assuming that the cap & trade legislation will not be passed and carbon footprint will be watered down. If not, we could see the start of more economic problems before 2014. The one factor that can skyrocket gasoline prices to the consumer that I failed to mention is politics. Restricting oil supply with drilling bans, while worldwide demand rises with a recovery, inflates gasoline prices.

The increase in oil field activity is a major factor in the demand for large drilling and servicing equipment. Our forecast assumes there will be no major Middle East wars beyond our current situation and North America will not be boycotted by the Arab countries. In fact, in the long term, we expect to see more US oil and overall energy demand while increasing other sources as well. When the world economy rebounds, oil prices are expected in the \$80 to \$125 per barrel range, but an unusually weak dollar could put the price much higher.

EMISSIONS

Tier I regulations were easily met with minor combustion changes. Tier II is another story and required new technology, combustion changes and/or exhaust treatment. Tier III requires aftertreatment and improved combustion, as well as adequate volume to recover R&D costs. All the major diesel engine suppliers are expected to meet Tier III levels with existing models or variations of existing models. Tier IV and Tier V; however, will require more costly approaches like particulate filters, cooled EGR and SCR. The cost for Tier IV is expected to be higher than the 2007 on-highway costs with Tier V similar to 2010. This means at least \$10,000 per diesel above 200 HP for each of the emissions years. The five year forecast will reflect some pre-buy by HP range.

EXPORTS/IMPORTS

The weakening of the U.S. dollar offers potential for exports and the engine manufacturers are taking advantage of it in 2007/2008. The off-highway mobile equipment export percentages are estimated as follows.

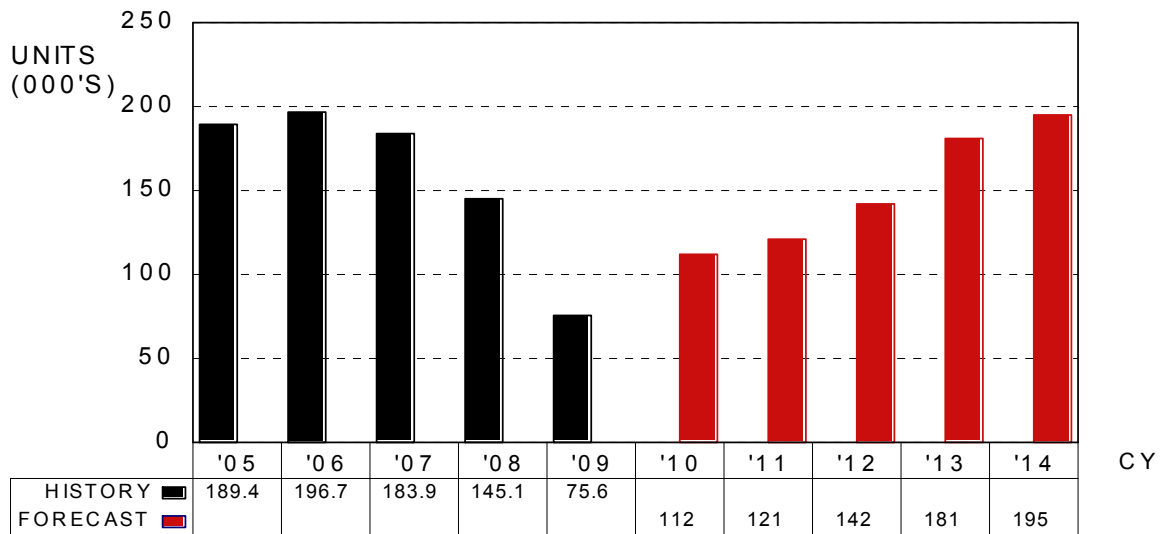
	<u>2002</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010 est</u>
>500 HP	20%	35%	40%	41%	45%	48%
Total	8%	12%	15%	16%	19%	20%

These are the loose engine exports and do not include equipment built in NAFTA and exported, a much larger export number, particularly above 500 HP. With a weakening dollar value, we expect the larger equipment exports to continue high for 2010 through 2014 with loose engines increases as well.

Imports for the off-road markets have declined with the recession but are still strong. We forecast that over the next five years, increased imports will come from all diesel producing countries, particularly Japan, Europe, South America, China and India.

The diesel engine imports are not only from overseas-based companies but are expected from U.S.-based multinational companies producing overseas. In addition to Deutz, Isuzu, Kubota, MTU, Yanmar, VW, etc., we expect increasing imports from Caterpillar (Japan, Belgium & Perkins) and Cummins (UK & overseas JV's).

NAFTA OFF-HIGHWAY DIESEL PRODUCTION 2005 - 2014



SOURCE: RHEIN ASSOCIATES, INC.

Not all the effect of the growing imports below 200 HP was offset by the new, low HP diesels from Deere and Caterpillar models built in NAFTA. The world economic recession is apparent in 2008/09/10 with 2011 - 2014 increasing due to the economic recovery and showing some pre-buy for emissions years (i.e. 2010 ahead of 2011).

NAFTA OFF-HIGHWAY MOBILE DIESEL GROWTH RATES

2005-2009

-60.1%

2009-2010

+48.2%

2010-2014

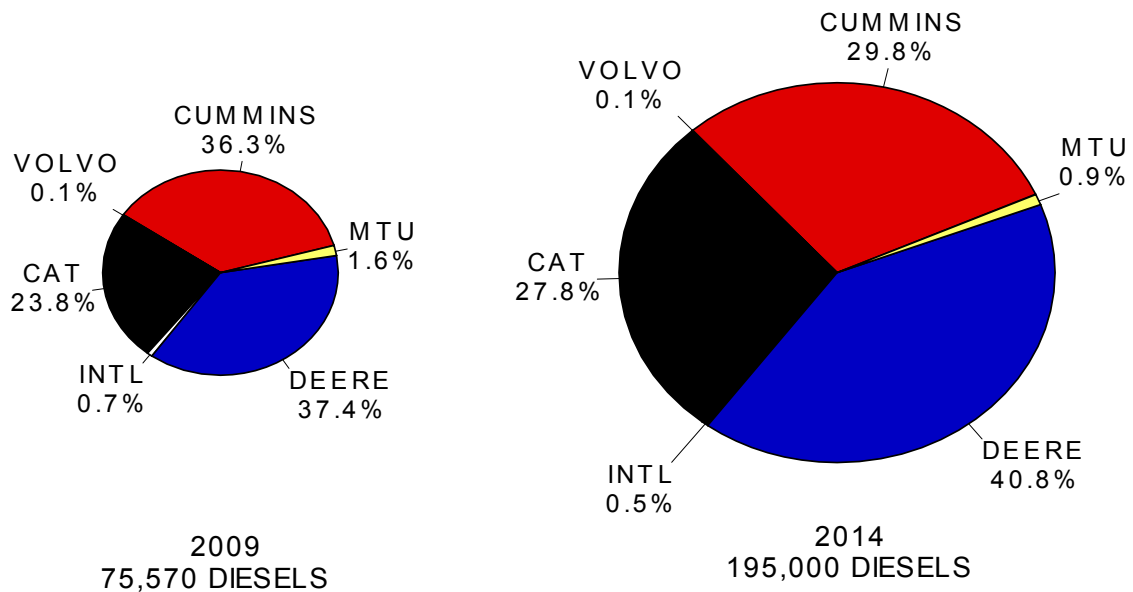
+74.1%

2005-2014

+3.0%

Deere is the largest diesel engine manufacturer in 2009 and 2014 with both captive and outside volumes. Cummins is the major independent diesel engine supplier and has the second largest share. Caterpillar's new plant opened in 2004 for low horsepower diesels. New purchases of companies by the large integrated manufacturers, like Caterpillar of Bucyrus, will add additional captive engine volume.

NAFTA OFF-HIGHWAY DIESEL PRODUCTION MARKET SHARE



SOURCE: RHEIN ASSOCIATES, INC.

In 2014, the captive market is expected to increase with Cummins losing some market share. Deere is expected to increase with its small diesel engine production in Mexico, while Caterpillar will increase volume and share thanks to increased exports and military vehicle contracts. MTU offers its 2000/4000 products to the large diesel markets.

The off-highway rule of thumb is that the under 200 HP range is 80% of the volume and 20% of the profit. This is probably understated when including the imports. Looking just at diesel engine production in NAFTA, the under 200 HP range was 55.1% in 2009 and forecasted at 43.4% in 2014. The increased exports and military vehicle demand are the major reasons for growth over 200 HP.

NAFTA Off-Highway Diesel Engine Production

Horsepower Range	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
0-50	5860	7300	7425	5950	2310	2410	3050	6310	6435	7725
51-100	39630	40900	37700	29650	9745	10160	14200	27935	30250	37600
101-150	42450	42480	32850	28830	11610	11890	20930	20825	34135	35845
151-200	44030	46455	44535	35785	17975	19480	21615	21385	33750	35510
201-250	26340	27670	31950	23255	14240	16565	17030	17555	23985	25775
251-300	7935	8760	7070	4870	3075	3660	2025	2110	2775	2920
301-350	4900	4710	4200	3270	5760	17775	13270	15510	16285	16425
351-400	1655	1570	1355	1085	1675	3820	2410	2470	2620	2660
401-500	7770	6110	5015	3740	3855	13835	15055	15630	16465	15650
501-600	3055	1830	1560	1175	780	1145	1325	1440	1875	2030
601-800	4490	7045	8460	5990	3460	9810	8400	8935	9735	9940
801-1000	250	420	500	410	285	385	470	525	750	800
1001-1500	380	480	355	225	165	235	260	320	455	505
1501-2000	410	605	540	475	355	460	585	630	890	960
Over 2000	250	395	425	360	280	370	375	420	595	655
Total	189405	196730	183940	145070	75570	112000	121000	142000	181000	195000

NAFTA DIESEL ENGINE PRODUCTION VOLUMES 2007

MANUFACTURER	AUTO	AGR	OFF	GEN	IND	MAR	ON	TOTAL
AM GENERAL							33,000	33,000
CATERPILLAR		4,180	31,210	18,845	9,415	3,110	52,431	119,191
CUMMINS		22,110	64,755	14,350	4,240	2,225	307,638	415,318
DEERE		63,100	84,250	11,120	18,670	820		177,960
DETROIT							26,059	26,059
DURAMAX						55	198,000	198,055
GE				30	325			355
INTERNATIONAL		610	1,255	50	300	520	286,400	289,135
LINAMAR	1,000							1,000
MTU			2,340	3,085	1,010	615		7,050
VOLKSWAGEN	62,000							62,000
VOLVO			130	0	80	65	22,494	22,769
GRAND TOTAL	63,000	90,000	183,940	47,480	34,040	7,410	926,022	1,351,892

NAFTA DIESEL ENGINE PRODUCTION VOLUMES 2008

MANUFACTURER	AUTO	AGR	OFF	GEN	IND	MAR	ON	TOTAL
AM GENERAL							28,000	28,000
CATERPILLAR		3,900	23,615	18,190	8,940	2,295	32,556	89,496
CUMMINS		20,895	51,545	12,955	3,930	1,645	259,184	350,154
DEERE		59,605	66,995	9,950	15,270	590	0	152,410
DETROIT							38,691	38,691
DURAMAX						45	132,000	132,045
GE				30	355			385
INTERNATIONAL		600	930	45	325	400	212,765	215,065
MTU			1,870	2,830	1,070	475		6,245
VOLKSWAGEN	113,244							113,244
VOLVO			115		85	50	24,414	24,664
GRAND TOTAL	113,244	85,000	145,070	44,000	29,975	5,500	727,610	1,150,399

DETROIT DIESEL/MTU INSIGHTS

Detroit Diesel Corporation is owned by Freightliner/Daimler Truck and produces heavy duty truck diesels and high HP off-road diesels in North America. DDC use to rent facilities to MTU/Tognum to produce 2000/4000 series but now MTU has moved out of the DDC facility in Redford, Michigan to Aiken County, South Carolina. DDC is a supplier to Freightliner LLC trucks and, as a secondary product, markets its Series 60 diesels (specialty on-highway and off-highway) through MTU/Tognum.

MTU produces a limited number of 2 cycle diesels for military and specialized applications. In 2011, MTU will no longer have the Series 60 diesel available for off-road applications. A new MTU 1600 series diesel is being produced in Germany as a substitute. Daimler sold MTU to Tognum (Swedish investment company) and now Daimler has bought back controlling interest in MTU/Tognum.

The DDC distributors are independent businessmen who make up the North America Distribution Council. They have an ongoing servicing agreement with Freightliner and separate marketing agreements with MTU/VM and Allison. The NADC has approximately 27 North American distributors who provide warehousing, parts and training for some 2,000 authorized dealers who act as sales and service outlets.

As a result of settling their union contract with the UAW, DDC manufactures the DD13 (12.8L), the DD15 (14.8L) and the DD16 (15.6L) in Redford, Michigan. Amid speculation that DDC might also move south, the State of Michigan has provided incentives for DDC to stay. As a result, Daimler recently invested \$194M to update Redford. DDC use to assemble the MBE 900 series for Daimler medium duty trucks but the decision was made not to meet 2010 emissions regulations until a replacement diesel could be developed. Until the entire DDC product line is updated, Cummins will continue to be offered in Daimler medium and heavy duty trucks.

Recent activities include:

1. MTU/Tognum relocated its 2000/4000 series production to a new plant in Aiken County South Carolina.
2. MTU is producing a new 1600 series, Series 60 replacement, in Germany.
3. DDC assembly of MBE 900 will cease in 2010 without a replacement until at 2015+.
4. DDC made a commitment to continue production in Redford, Michigan with a \$194M facilities update.
5. Daimler will continue to offer Cummins ISX diesels under a signed agreement through 2013.
6. Cummins is the only diesel engine offered in Daimler medium duty trucks.

Our Opinion/Speculation:

1. DDC, as part of Daimler, will continue to develop its diesel engine line and
2. eventually replace Cummins options by 2015.
3. MTU will market a low HP engine line complementary to its high HP line for off-road applications.
4. Freightliner and Western Star will continue to offer DDC in additional models as they gradually phase out Cummins.