



Service Specialists Association

160 Symphony Way, Suite 2

Elgin, IL 60120

847-760-0067

Dominant Influences: Heavy Duty 2020

Most major innovation will be driven by fuel concerns

By **Bill Wade**
Wade&Partners

Good economists know the basic rule of good forecasting. “Give ‘em a date or give ‘em a result, but never both.” Since the forecast period here is set, let’s modify that rule subtly: Given the time horizon, here are some significant trends, *but very few specifics*.

In undertaking this future view, we’ll have to make some basic assumptions.

- Assume the supply of oil will be generally stable. To make that assumption, we will factor in unconventional sources of petroleum, including the virtually limitless Canadian oil sands.
- Assume (like most federal and state agencies) that the number of North American heavy-duty trucks will nearly triple, and the medium-duty trucks will almost double.
- Trucks will still haul at least 70% of all freight in North America.
- Call me optimistic, but I’m assuming that governmental policy makers will realize that that a carrot and a stick work better than a stick alone, and that they’ll institute “free bates” to reward vehicles that exceed efficiency and safety goals.
- In terms of overall economic activity, let’s fall back on the prevailing wisdom that GDP (by then measured by trading blocs like NAFTA) will regain an annual average rate of 2.5 to 3.0 %.

Now that we have some arguable parameters to hide behind, let’s face the toughest assumption... that past periods are of limited help trying to peer this far forward.

In reviewing the heavy-duty business, we find no evidence that this business has ever undergone the magnitude of change that it faces today. What’s more, never have so many external factors been so critical to the industry’s success.

That said; let’s consider the following five areas of dominant influence:

ENERGY – Most prognosticators won’t go out on a limb for the case of radical gains in m.p.g. So the question isn’t “how many miles per gallon?” The question is, “miles per gallon of what?”

Government forecasts agree that 2015-2020 will represent the peak for world oil production, with a long gradual decline following. There are only three ways to curb oil

consumption by heavy trucks: fuel efficiency, fuel substitution and a reduction in vehicle miles driven (VMD). Since the overwhelming consensus is that VMD will increase, the first two solutions merit a closer look.

Engine efficiency will be more like a step function than the long improvement curve we have experienced thus far. Emphasis will be on renewable (notably bio based or hydrogen) fuels. There will certainly be a move toward multiple hybrid designs and a variety of liquid fuels. At the moment, a diesel/electric configuration looks like a strong favorite.

Even with the extended time frame we are contemplating, very few scientists are willing to guess that the substantial technological hurdles faced by developers of hydrogen fuel cells will have been overcome. None seem certain that H₂ will have made much of a dent.

However, watch for the following developments:

- Increase of diesel thermal efficiency by at least 70%;
- Hybrids changing our focus from horsepower and m.p.g. to \$/kW;
- Parasitic power loss being attacked on every conceivable front, with achievements on the order of:
 - Aerodynamics (actively controlled) 20-40%
 - Drive train integration and control 40-50%
 - Vehicle weight reduction 15-20%

The Department of Energy estimates that these improvements (along with a nearly complete elimination of idling) will save 100,000,000 barrels of oil per day.

EMISSIONS – Nothing but the actual availability of power gets nearly the scrutiny that heavy truck emissions enjoy. Concerns about air quality shape discussion on everything from engine technology to municipal road building plans.

Interestingly, the lack of effectiveness in this area may cause hydrogen to lose some development support. If the supply of hydrogen has to be derived from natural gas, even a 50% usage by all vehicles would not significantly change greenhouse gas emission.

Stated goals for emission reductions are astounding. Today, 2% of vehicles emit 30% of all NO_x and nearly 65% of particulates. EPA regulations look to cut these numbers by over 90% by 2025. Expressed differently, that would be a reduction of 3 million tons of NO_x and over 100,000 million tons of particulates!

Off-road diesels (including even the sacred farm tractor) will be fully involved in the emission crusade soon, adding more impetus to technologies ranging from high pressure direct injection and LNG additions to advanced non-media filtration of exhaust.

INFRASTRUCTURE – A quick perusal of Internet entries covering 2020 presents the road building plans of everything from the federal government to those of tiny towns like Geneva, Illinois. In general, here's what future truck operators will find:

- **The Bad News.** Intensive funding of anything that smacks of mass transit. Every light rail, monorail or other municipal idea that assumes that people would rather take the bus than drive will siphon dollars away from road repair and development.

Inter modal gets the same kind of reverence from today's municipal planning community.

- **The Good News.** The rising health costs from traffic congestion (currently estimated to be as much as 2% of Europe's GDP) forces the mass transit crowd to look at more traditional methods of congestion mitigation as well.

From the city of Chicago to the Los Angeles planning authorities, other long-range possibilities are taking shape.

The most popular is the concept of "truckways" for the exclusive use of heavy-duty vehicles. Tech studies are already underway to study new higher capacity road surfaces and seamless toll collection for managed access, limited driver control right-of-ways.

VEHICLE TECHNOLOGY- Trying to specifically predict future approaches is impossible. However, we can be sure that advances will cluster around the following:

- **Materials.** Stronger, lighter and recyclable are the key concepts. Liquid crystal polymers, carbon/arimid type composites and ceramics look like good bets from here. Vehicles will be 100% recyclable, consisting of 70% polymer and 30% metals and ceramics.
- **Electronics.** Steer-by-wire will be replaced with steer-by-wireless. Actively managed aerodynamics will also go wireless. Organic light emitting diode (OLED) technology will completely change everything from operator interface with the vehicle to external graphics. Ferro magnetic fluids will revolutionize any application currently using friction materials (braking, clutch, etc.). All accessories will be electric or electric over hydraulic, with vehicles sporting 500-1,000 volt systems.
- **Fuel/Lubricant/Coolant.** Functional fluids will have a substantial biomass component, most derived from soybean, yellow grease (animal product), canola oil and even mustard seeds. Surprisingly, ethanol is not expected to be a major part of the heavy truck diet by 2020, due to the enormous capital required to scale up production of non-feedstock basic materials (especially cellulose).

HUMAN INTERFACE – The challenge to train and enable people in this new environment will be critical.

More functions will be transferred from the driver and technician to the truck itself. Active Driver Assistance Systems (ADAS) will coordinate advanced detection, braking, stability and collision avoidance for the driver controlling an electronically coupled caravan through a major city's truckway.

Since no truck traffic will be allowed during normal business hours, swarms of “last mile specialists” will take over from behemoth intercity truck/trains.

Creating almost a neural network, the driver will be connected with his vehicle, nearby vehicles, the external environment, shipper/receivers and even his own freight in endless combinations of communication access points.

Man and machine truly become one!