A *Back to The Future* Look at Commercial Vehicles

Saint Augustine, Florida
March 23, 2015

A *Back to The Future* Look at Commercial Vehicles

What did a Mack Fire truck look like in 1935?

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What did a Mack Fire truck look like in 1955?

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What did a Mack Fire truck look like in 1965?

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And what were your choices of engine?

In 1956 Mack introduced a new Diesel that would stay in production for 30 years!

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1995 Super Duty

460 Gas

International Diesel V8

No Turbocharger

Mechanical Fuel Injection!

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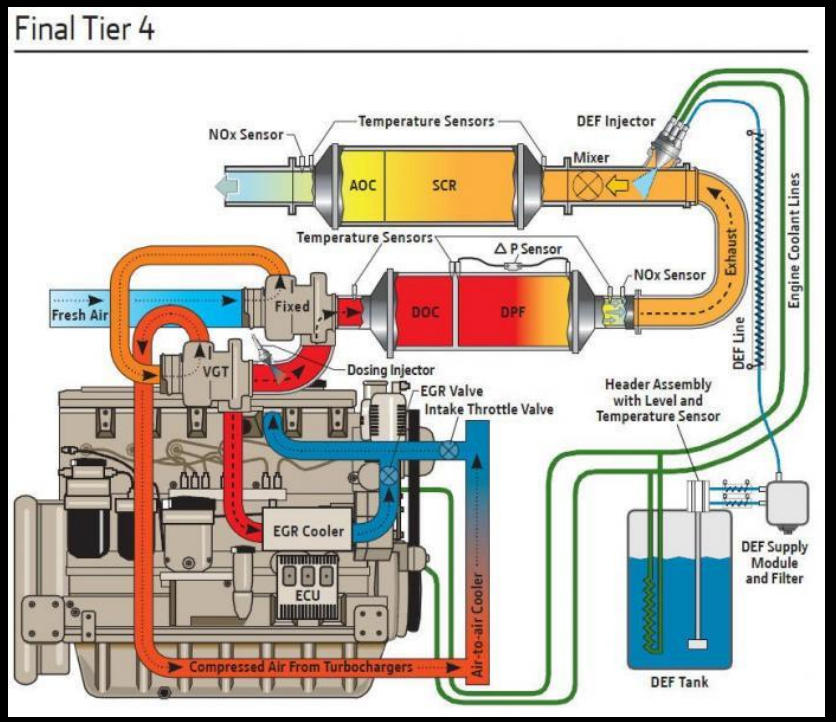
Twenty Years Later →



Its all about emission reduction!
Electronics control everything!

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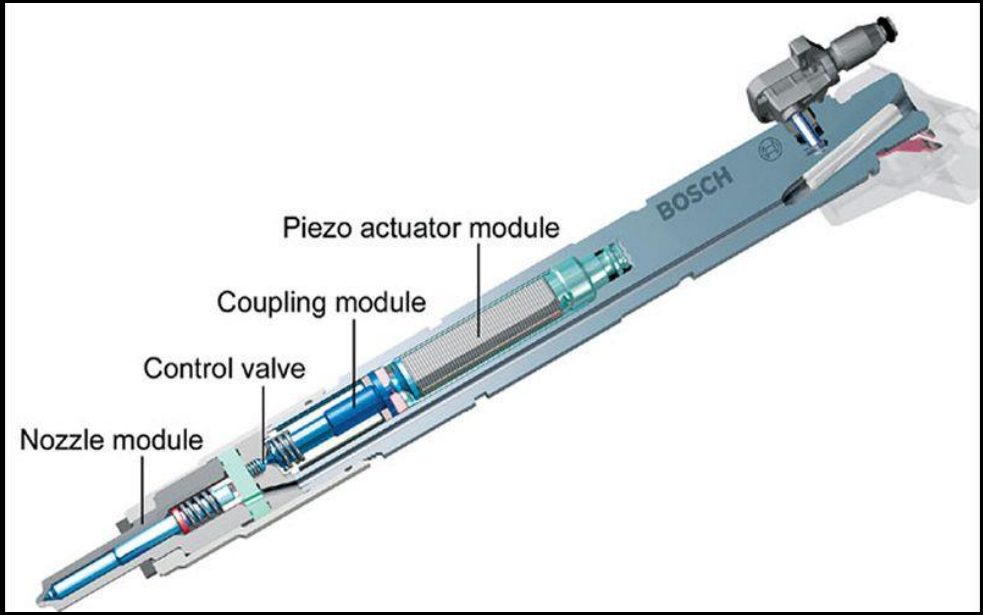
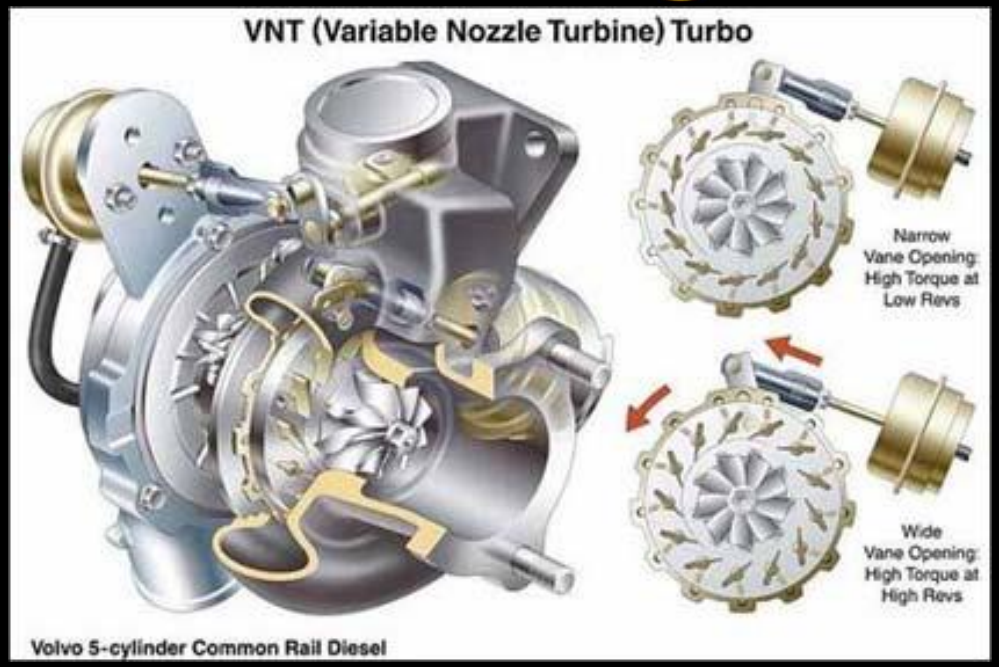
Piezo Fuel Injectors



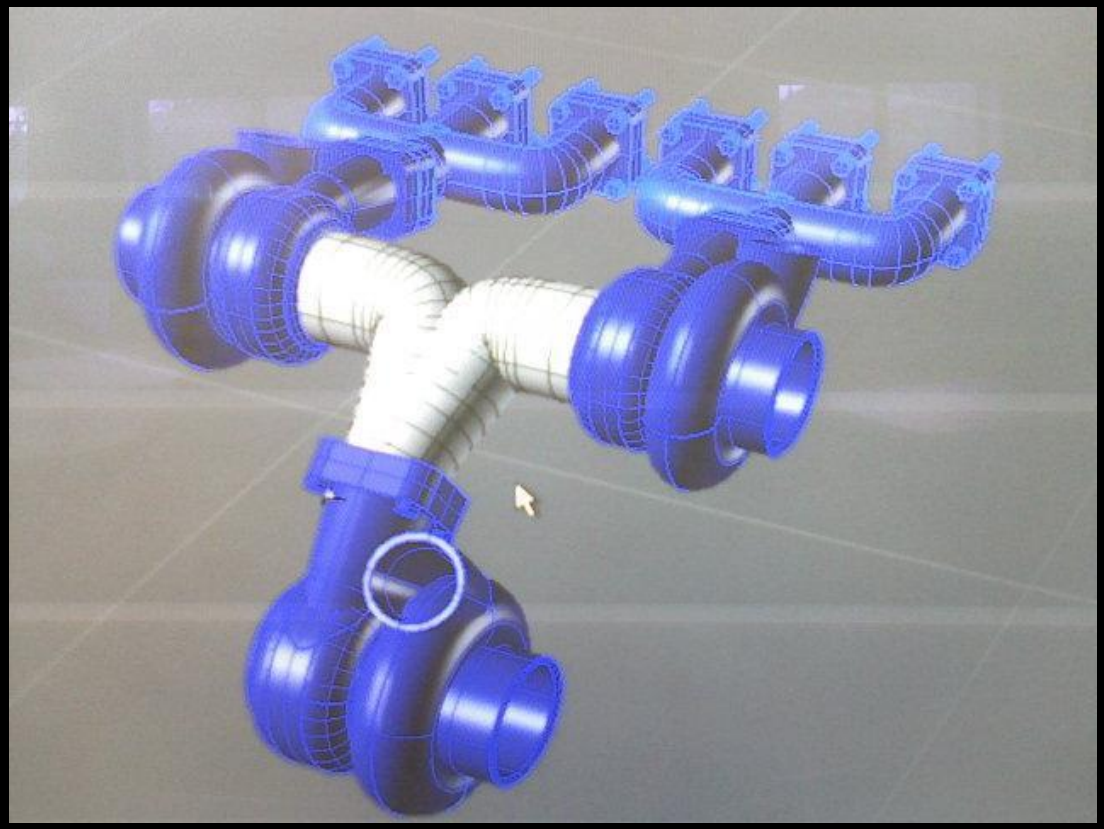
Provides fine control of fuel quantity, timing, pre and post injection

Variable Geometry Turbochargers



Compound Turbochargers

Three Turbochargers !



Big Turbochargers

The Cost of Progress

A Host of New Terms Were Introduced…….

And it's not just about Diesel

Gasoline Engine Fuel Delivery

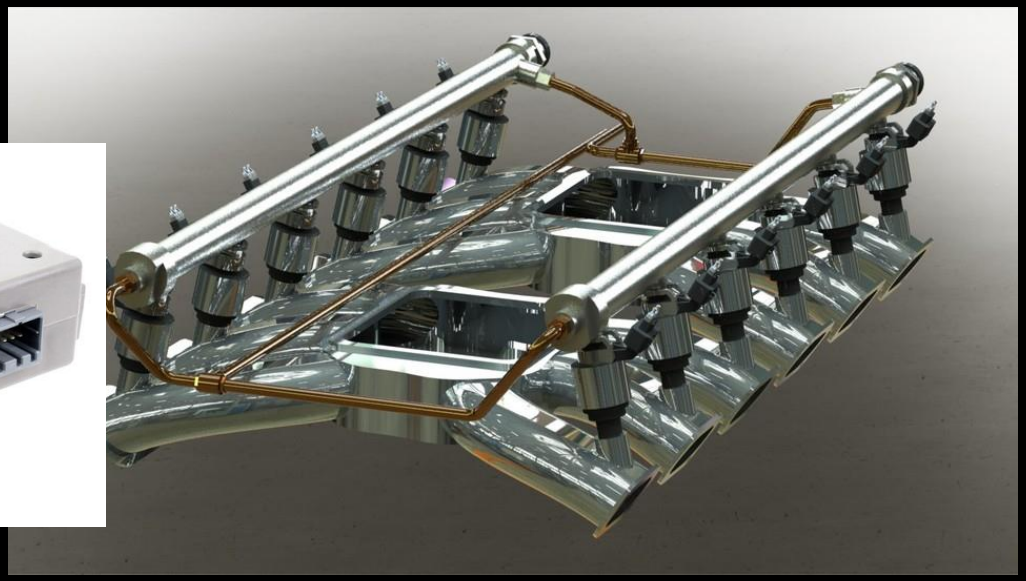
Carburation: Into the 1980's

Gasoline Engine Fuel Delivery

Throttle Body Fuel Injection:
1980's / 1990's

Interim "Stop Gap" Nightmare Technology

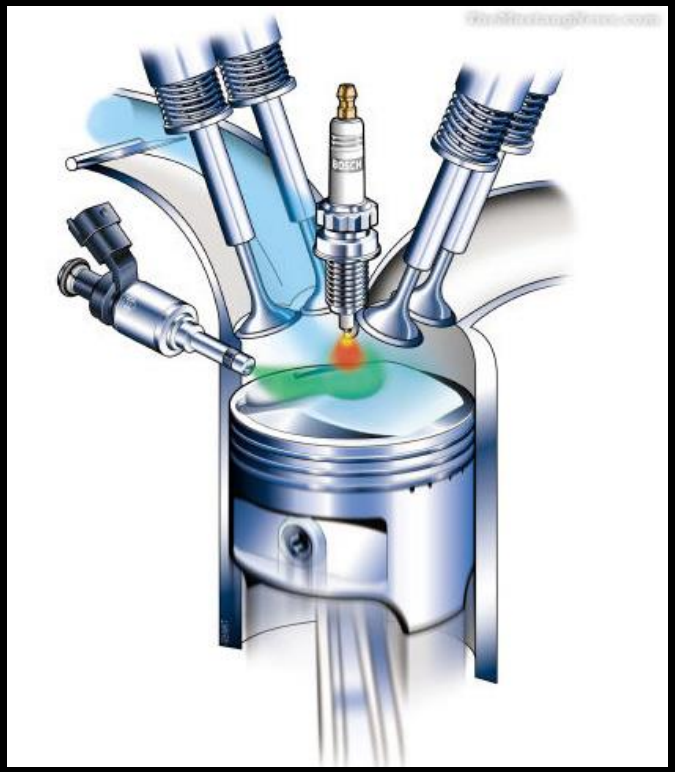
Gasoline Engine Fuel Delivery



Multipoint Fuel Injection
2000's

Very Significant Improvement

Gasoline Engine Fuel Delivery



Gas Direct Injection

2015

As good as it gets for NOW!

What About Hybrid ?

Another interim step……high cost.
Low take rate.

More Alternatives……

Propane

Natural Gas

Hydrogen

"Mr. Fusion"

So…. Where do we go from here?

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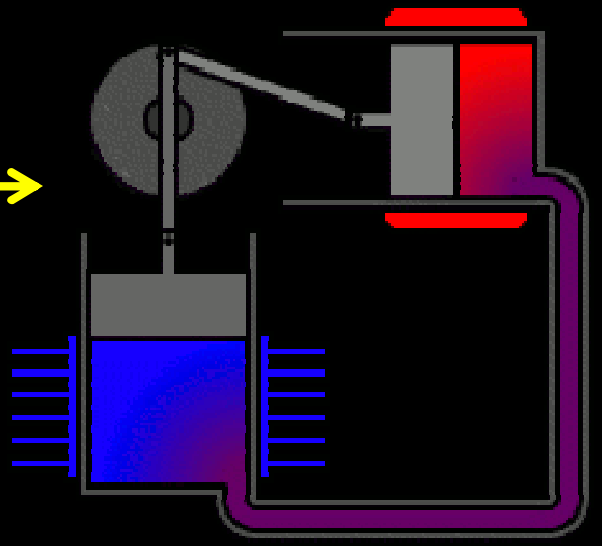
Fuel cells?
Stirling Cycle?
Hydraulic Hybrid?
Gas?
Diesel?



ALL of the Above

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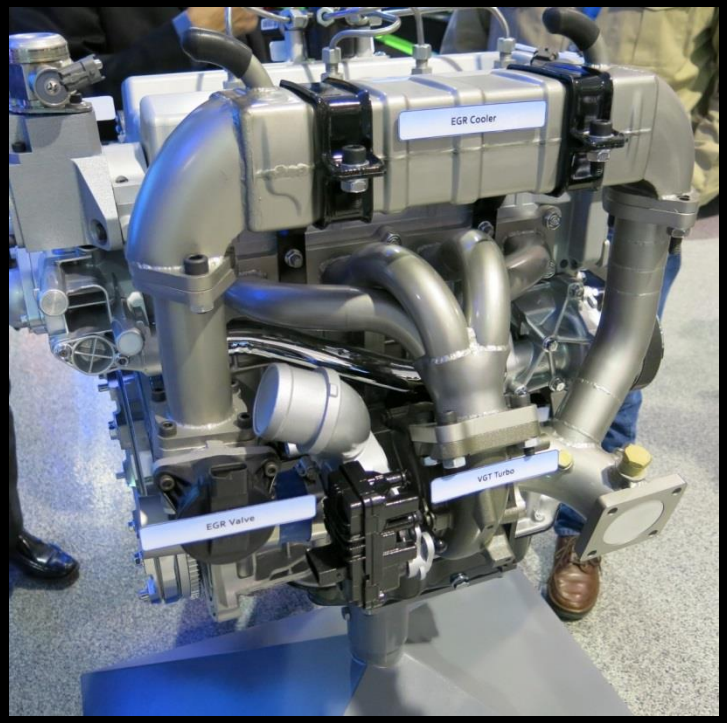

Compression Ignition GAS Engine

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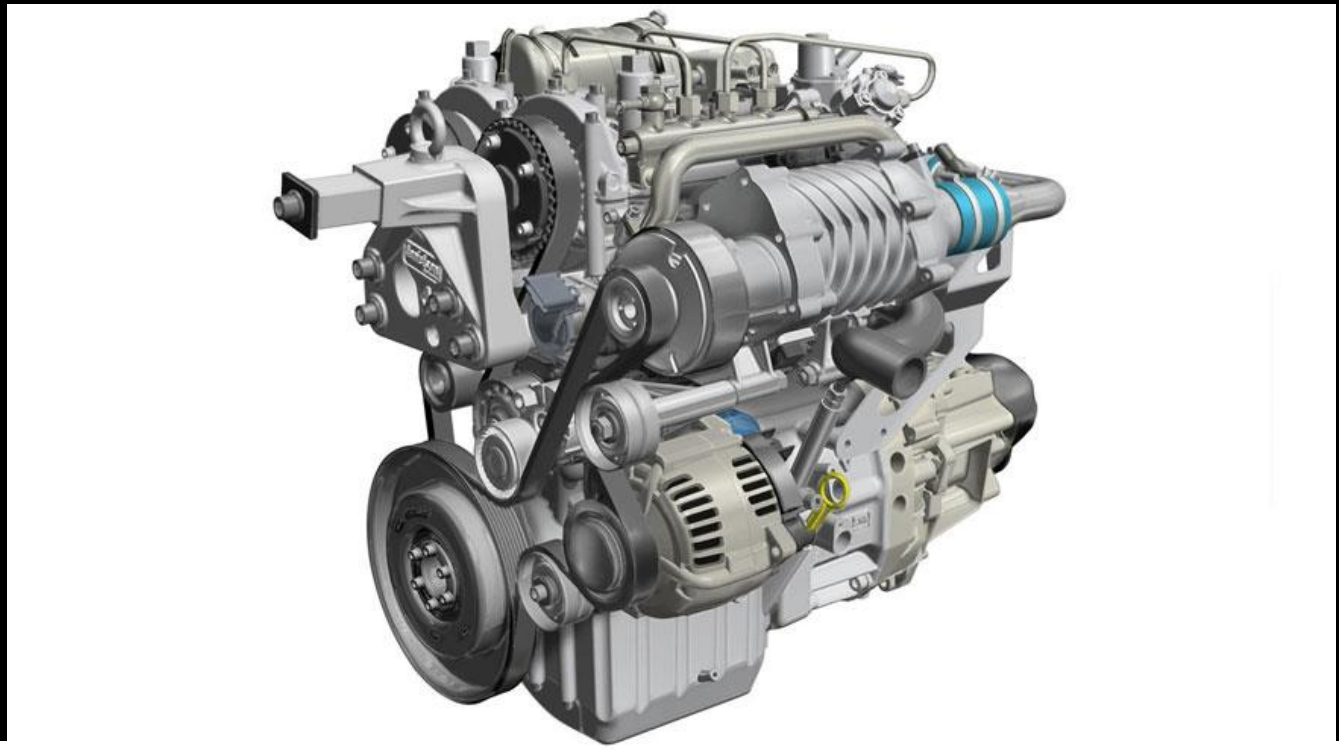
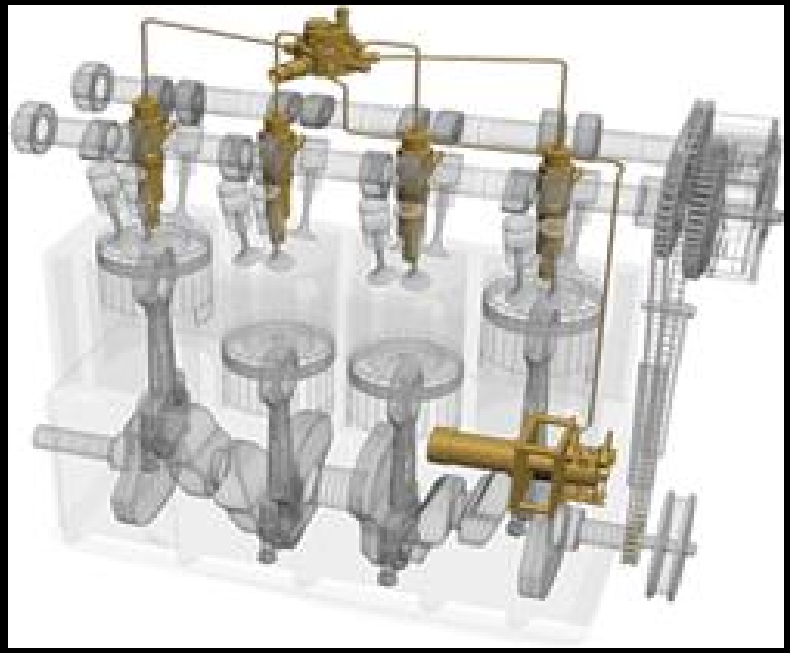


Turbocharged / Supercharged
TWO stroke Diesel.

Super Critical Fuel Injection



Can even include combustion sensors right in the injectors……

What about Transmissions?

Conventional Hydraulic with T/C

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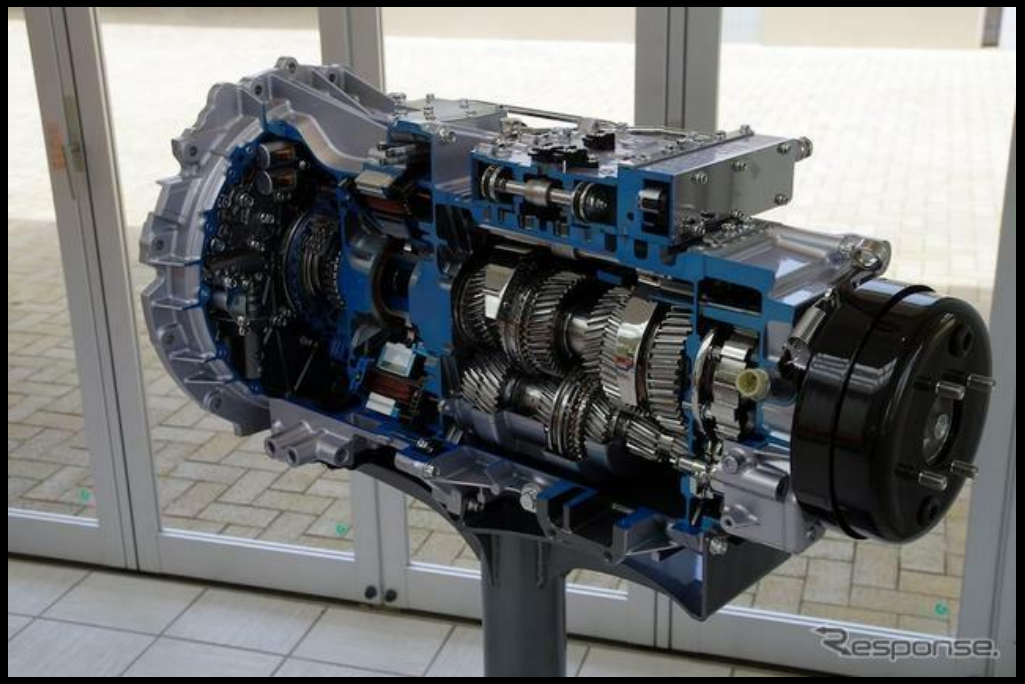

Automated Mechanical (Light Duty Truck)

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Automated Mechanical
(Heavy Duty Truck)

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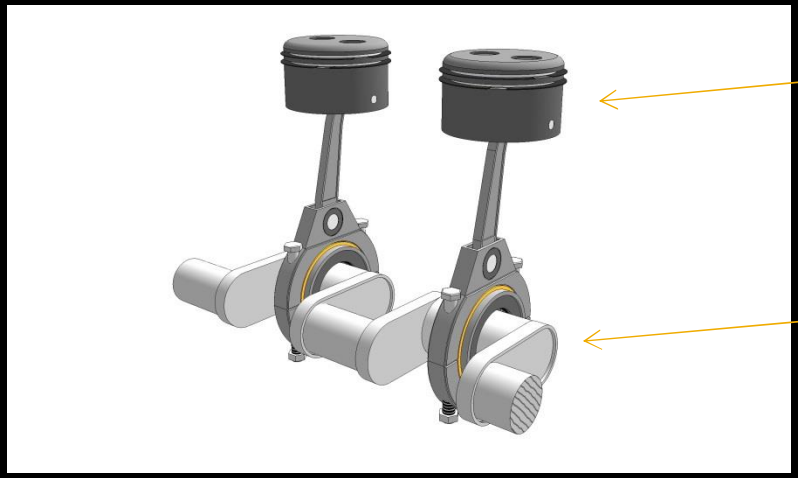
2015 results: Better matching of engine to transmission

History of the Modern Piston Engine



Piston: Gas Engine w/o Compression: 1863 (Otto)

Crankshaft and Connecting Rod : 3rd Century Romans

Solving every problem with the same solution for 162 years!

Continue down this road?

OR…. get rid of the piston altogether!!

Which brings us to?

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Yes it is.

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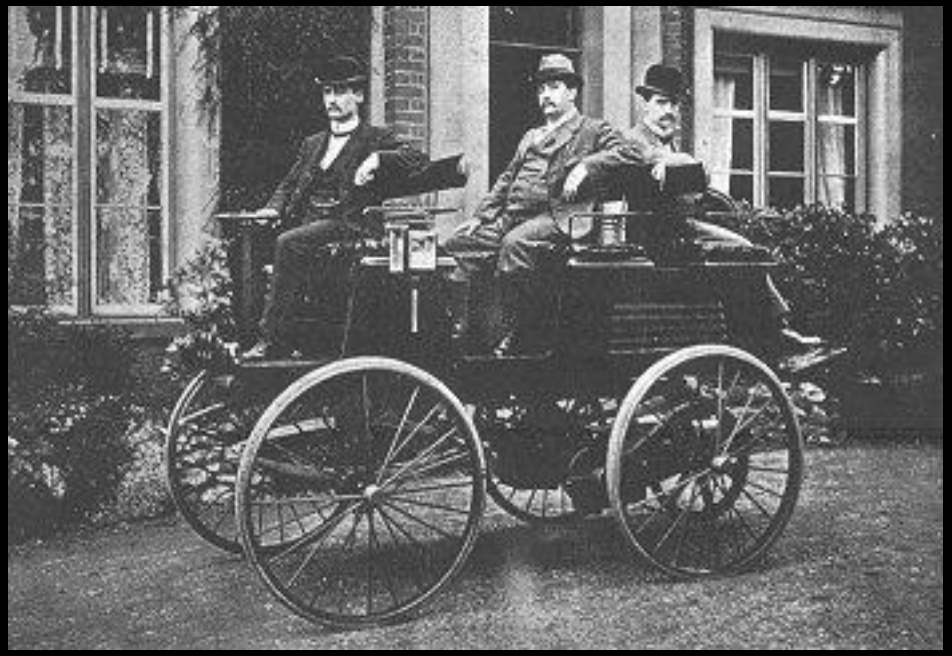

Commercially produced in England. 1884.

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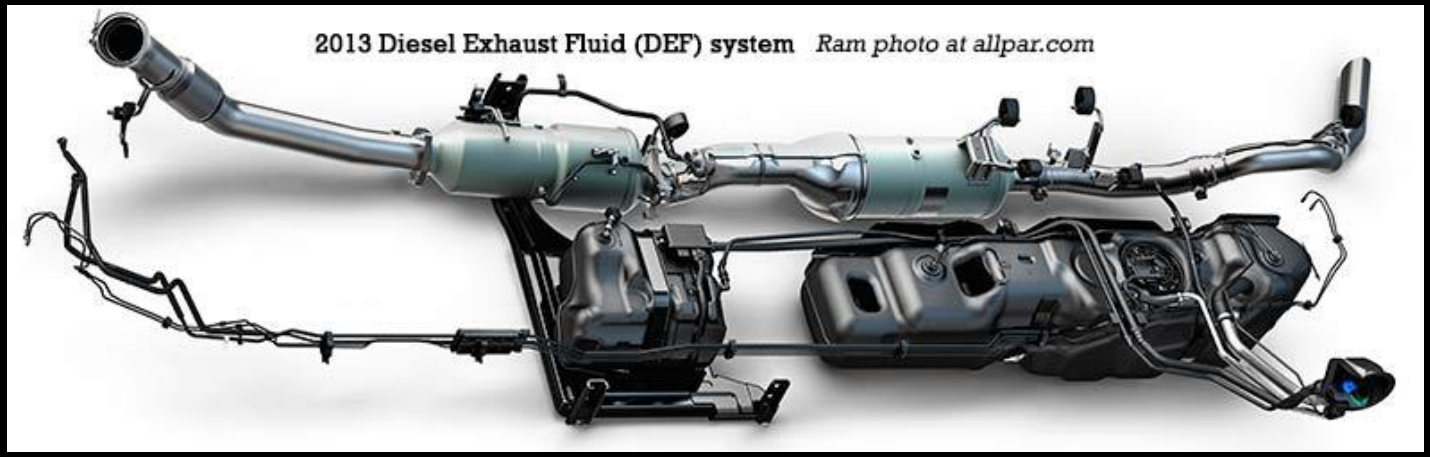
Todays challenge is the SCR/DPF system



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Tomorrows challenge is:

The Battery Pack!

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COURTESY: NAVISTAR

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Near Term…..

Greenhouse Gas Emission Requirements

Air bags

Stability Control

Rear Vision Camera's

And even more complex electrical systems!

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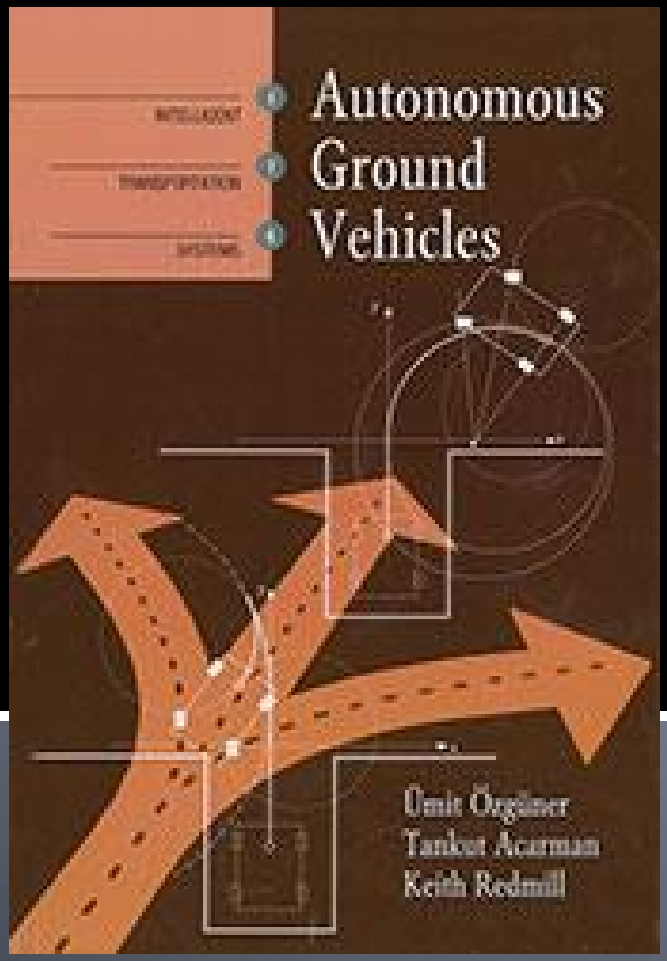

Long term ?

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Vehicle Auto-Pilot

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What Drives Technological Development?

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What Drives Technological Development?

Competition?

Ability? Show what we can do?

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What Drives Technological Development?

GOVERNMENT!

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What drives manufacturing regulations?

GOVERNMENT!

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What factors are driving "us" now?

Environment

Dependency

Safety

So…….How do we deal with this?

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The best medicine is that taken before you get sick……..

Out think the thinkers

Think tank…….(This organization)

So, what are you going to do?

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How will you survive this?

AMERICAN INGENUITY AWARDS

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Your wheels must turn

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Chassis manufactures will work with you as much as they can

Government will accommodate you as well as they can

BUT

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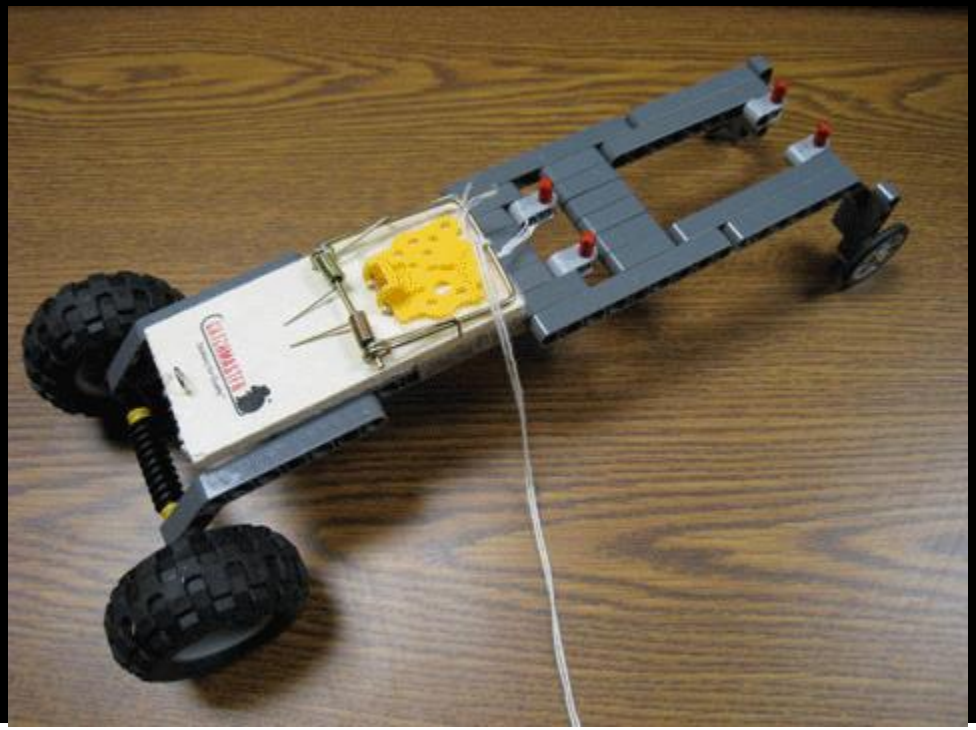

You will build the better mouse trap!

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Look for new ideas!

Solar Auxiliary Power
Early adopters are doing this now!

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Atomic Number 13

Chemical Element in the Boron Group

Most abundant mineral in the Earths crust

8 percent by weight of the earths solid surface

Symbol AL

Material changes now and in the future

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Most extensive use of aluminum
in a pick-up..... Ever.
700 pound weight reduction!

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"Plastics"

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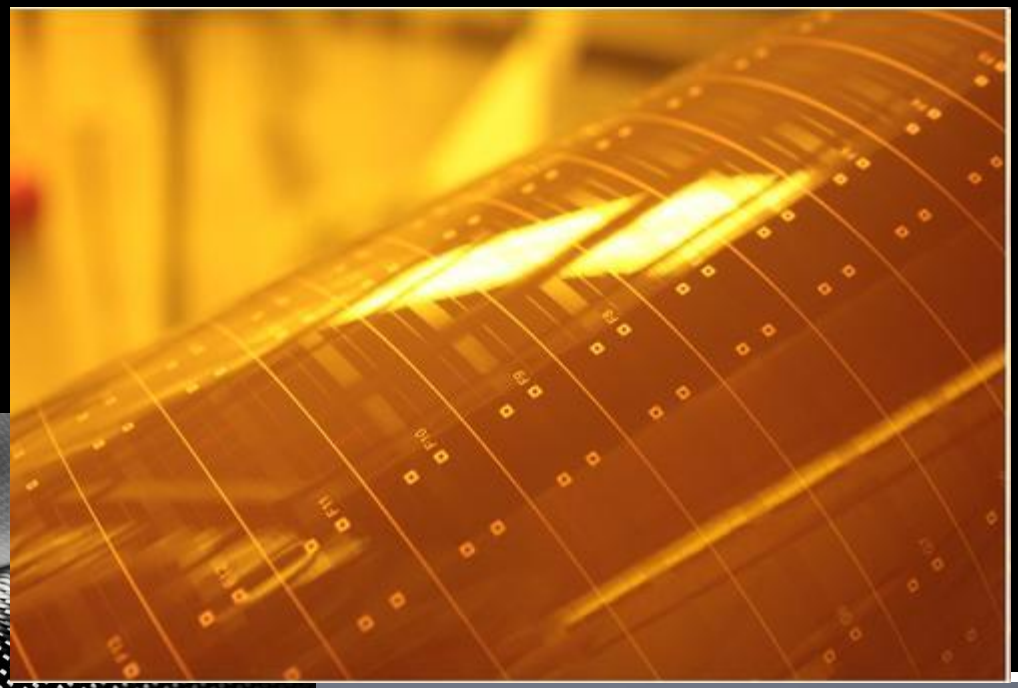

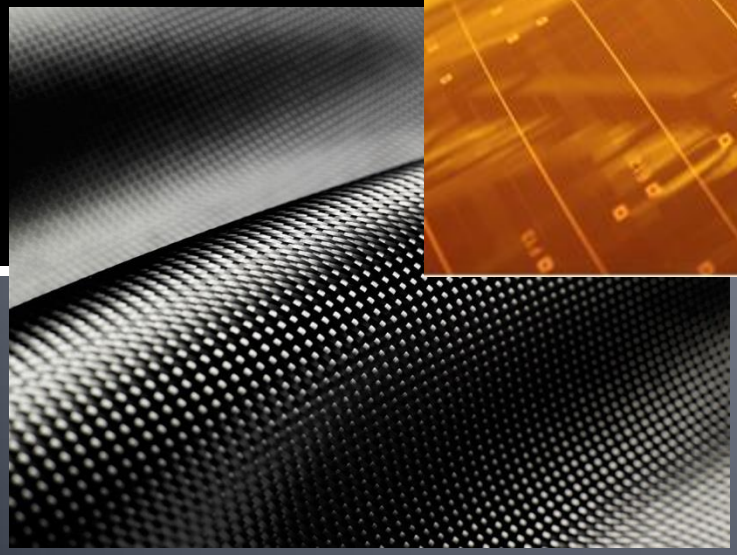

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Incredible Computer Development

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Moore's Law……..

"…the number of transistors in a dense integrated circuit DOUBLES ever two years……."

Will slow down in the near future to doubling every three years……

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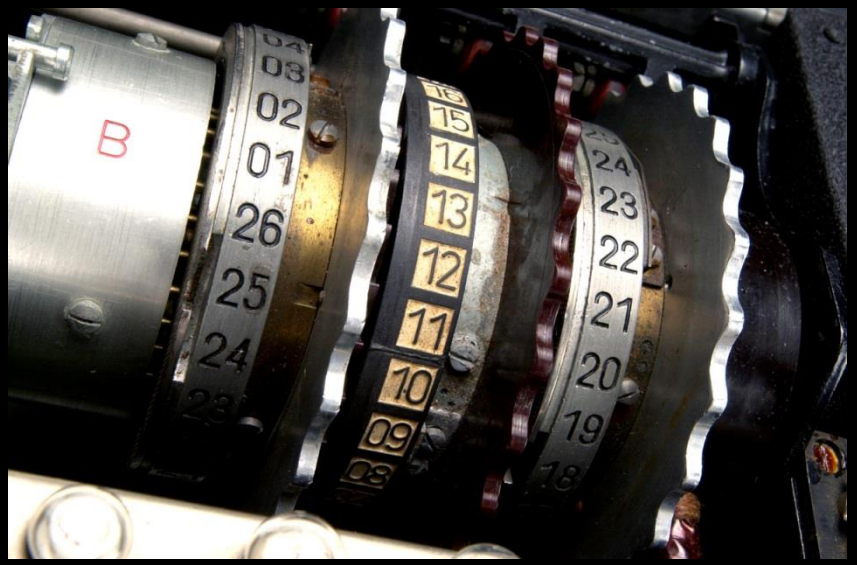

Enigma Code Devise

Late 1930's Germany

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The British "Bombe" of the 1940's.

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Your business will survive the future if……

You Pay attention; NO SURPRISES

You hire, train, and RETAIN good people

You become the inventor and not just the adopter

You MUST network

Within your own organization

With Washington

With NHTSA / SAE

With EPA / CARB

With Federal Motor Carrier Safety Administration

Chassis manufactures will work with you as much as they can

Government will accommodate you as well as they can

But in the end it all comes down to you…….

What will the vehicle of 2035 look like?

Thank you very much!