2013 Western States Highway Equipment Manager's Association

Salt Lake City

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Emissions

How is the US doing?

One Charbroiled Burger Pollutes As Much As An 18-Wheeler Driving 143 Miles Says Study

Agenda

Emissions Regulation Overview

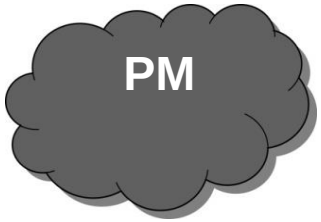
John Deere Building Block Technology

Interim Tier 4 Experience

Final Tier 4 Technology

Final Tier 4 Operating Costs

Regulated Pollutants:



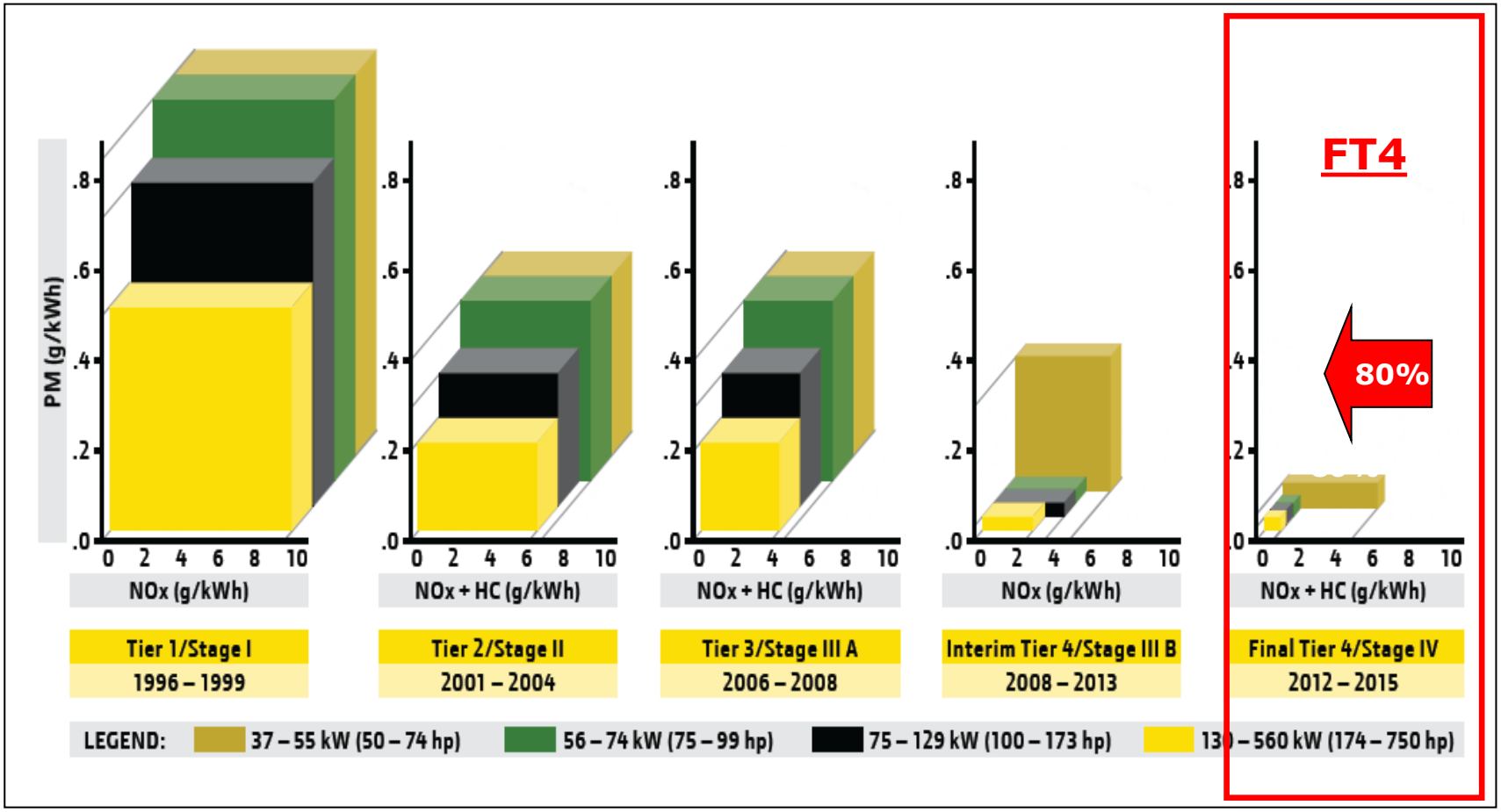
PM (Particulate Matter)

- A solid form of unburned diesel fuel
- A fine powder or dust

NOx (Nitrogen Oxides)

- A unwanted by-product of combustion: nitrogen + oxygen
- Low level ozone/smog
- Acid Rain

Certification Milestones



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Emission Equivalency

Final Tier 4

Tier 0

= 36 Particulate Matter (PM)

= 31 Nitrogen Oxides (NOx)

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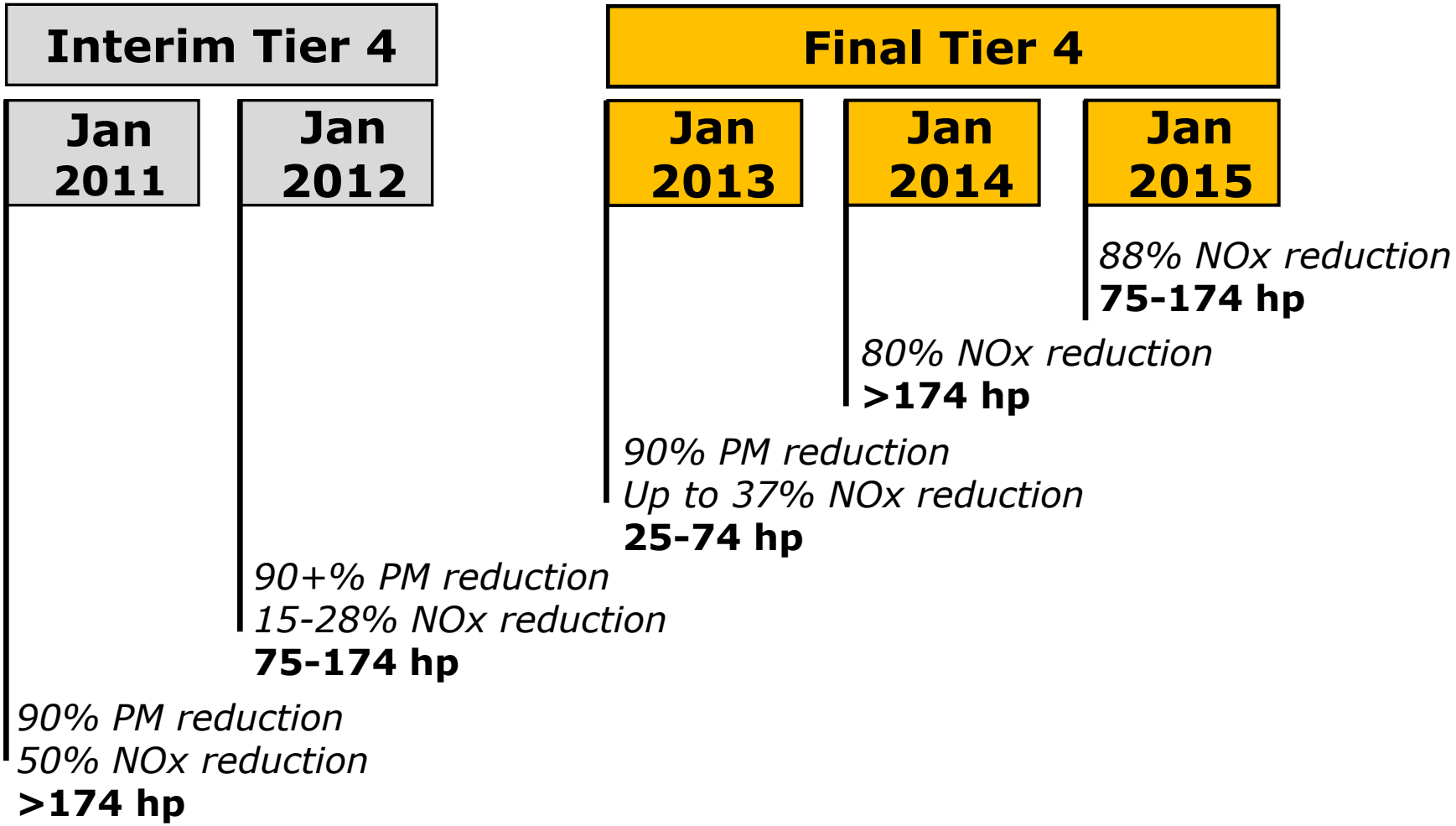
Off Road Emission Regulation Dates



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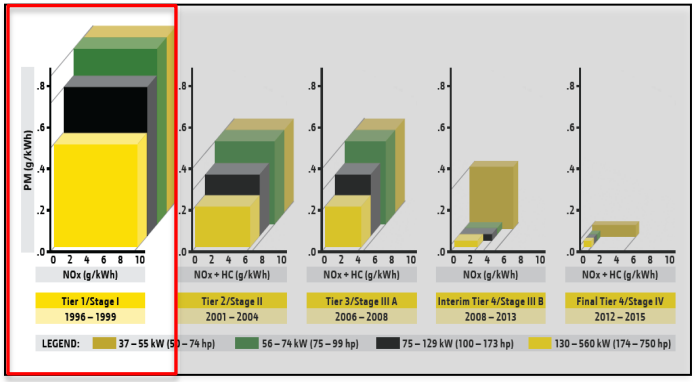
John Deere Building Block Technology

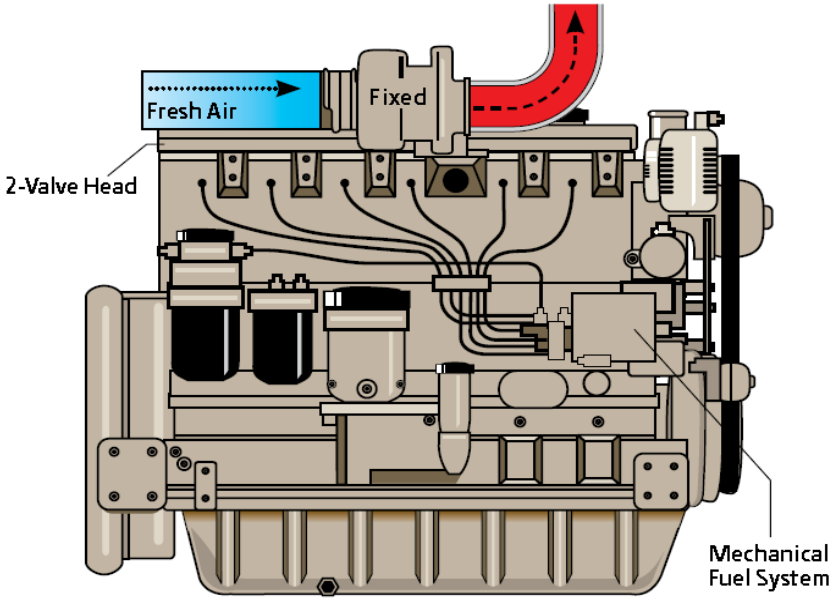
John Deere Technology Progression



Tier 1

Technology

Calibration



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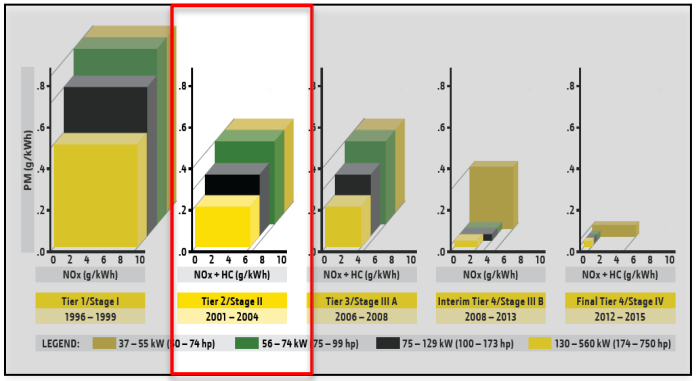
John Deere Technology Progression

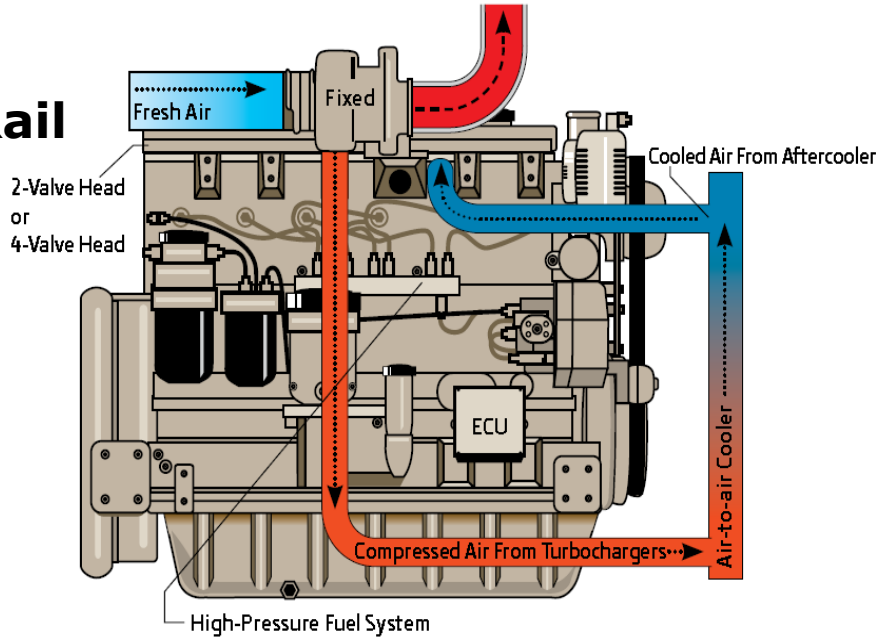


Tier 2

Technology

Calibration

HPCR – High Pressure Common Rail



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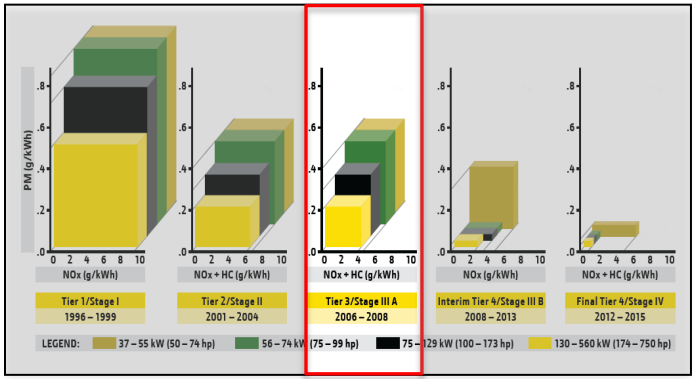
John Deere Technology Progression



Tier 3

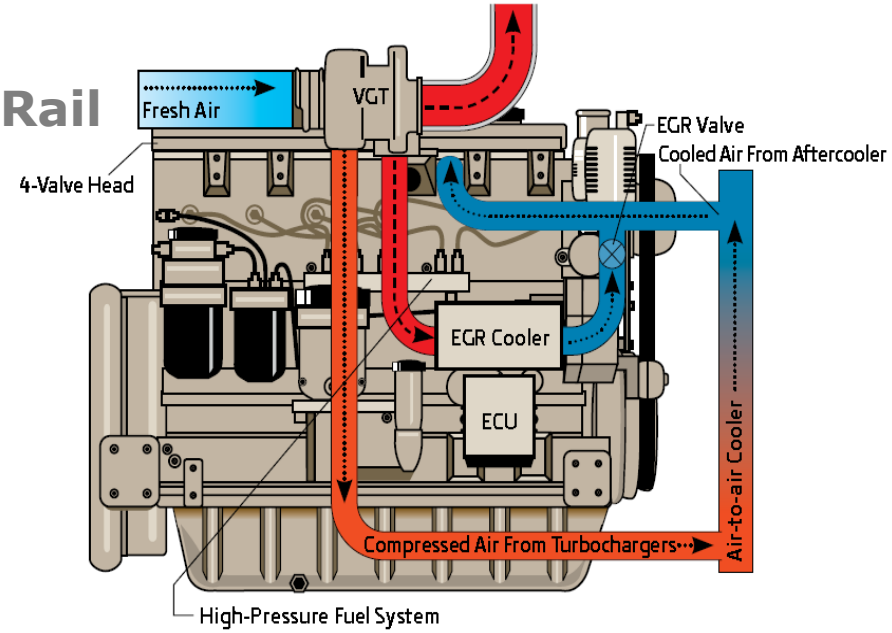
Technology

Calibration

HPCR – High Pressure Common Rail

VGT – Variable Geometry Turbocharger

CEGR – Cooled Exhaust Gas Recirculation



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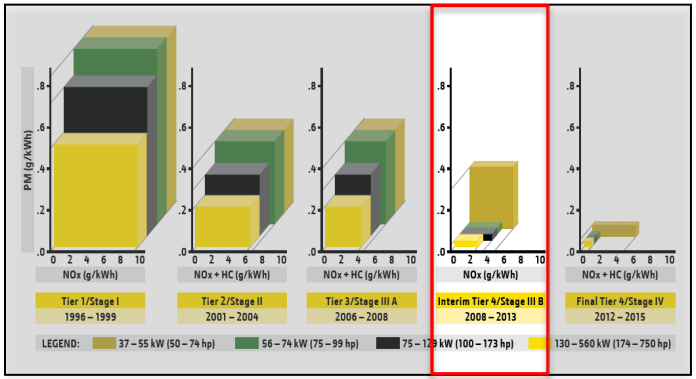
John Deere Technology Progression



Interim Tier 4

Technology

Calibration

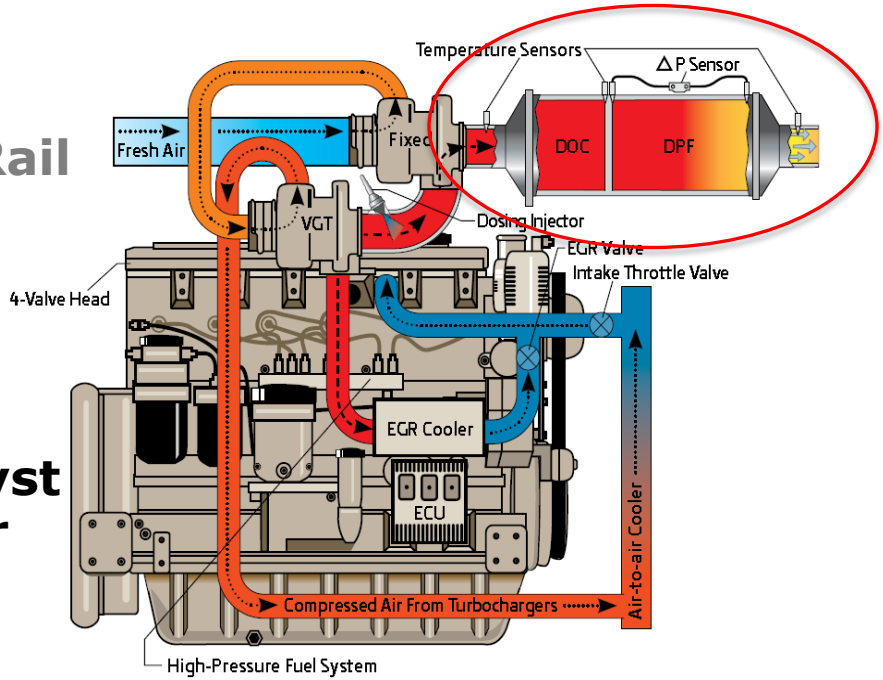
HPCR – High Pressure Common Rail

VGT – Variable Geometry Turbocharger

CEGR – Cooled Exhaust Gas Recirculation

Exhaust Filter

- **DOC – Diesel Oxidation Catalyst**
- **DPF – Diesel Particulate Filter**
- **ETM – Exhaust Temperature Management**



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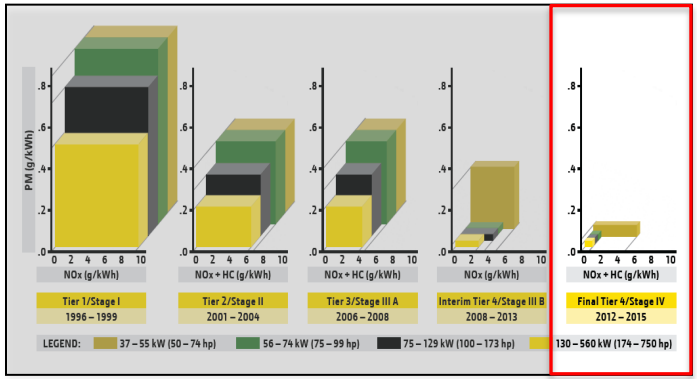
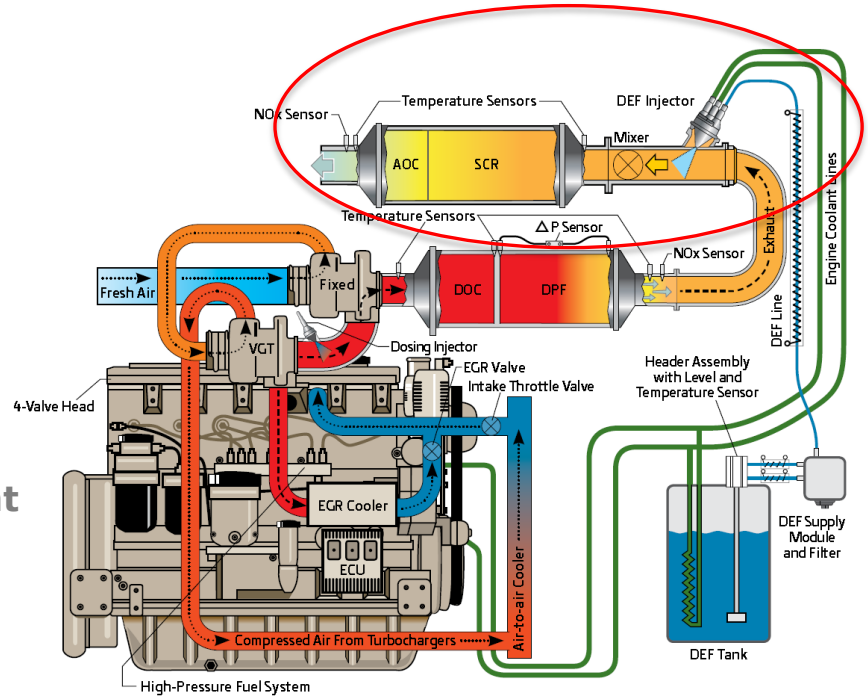
John Deere Technology Progression



Final Tier 4

Technology

- Calibration
- HPCR – High Pressure Common Rail
- VGT – Variable Geometry Turbocharger
- CEGR – Cooled Exhaust Gas Recirculation
- Exhaust Filter
  - DOC – Diesel Oxidation Catalyst
  - DPF – Diesel Particulate Filter
  - ETM – Exhaust Temperature Management
- **Selective Catalytic Reduction Assembly**
  - **SCR - Selective Catalytic Reduction**
  - **AOC - Ammonia Oxidation Catalyst**



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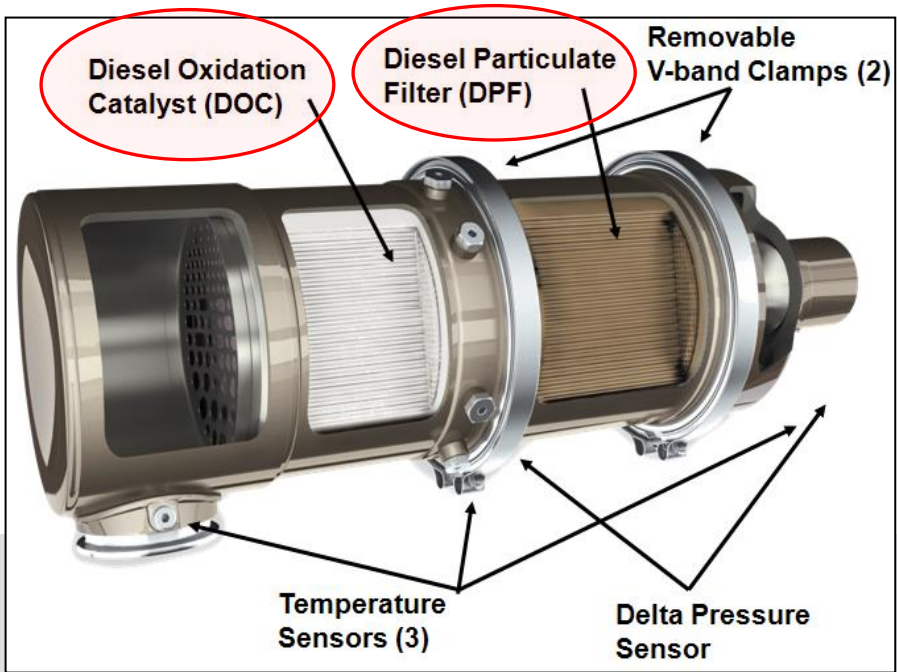
John Deere Interim Tier 4 Experience

John Deere IT4 Experience

1. **Highly Reliable**
2. **Seamless Regeneration**
   - < 175 HP ~ once every 80 – 100 hrs
   - ≥ 175 HP ~ once every 20 - 25 hrs
3. **Product Support**
   - Strong dealer network



John Deere Final Tier 4 Technology

Final Tier 4 Vehicle Testing

Corner Conditions

- High Altitude
- Arctic cold conditions
- Overnight idle
- High debris
- High ambient
- High humidity
- Snow plowing
- Ether usage
- 48 hr shutdown extreme cold
- Poor fuel quality
- Off-level operation
- Light load / low rpm
- Light load cyclical operation

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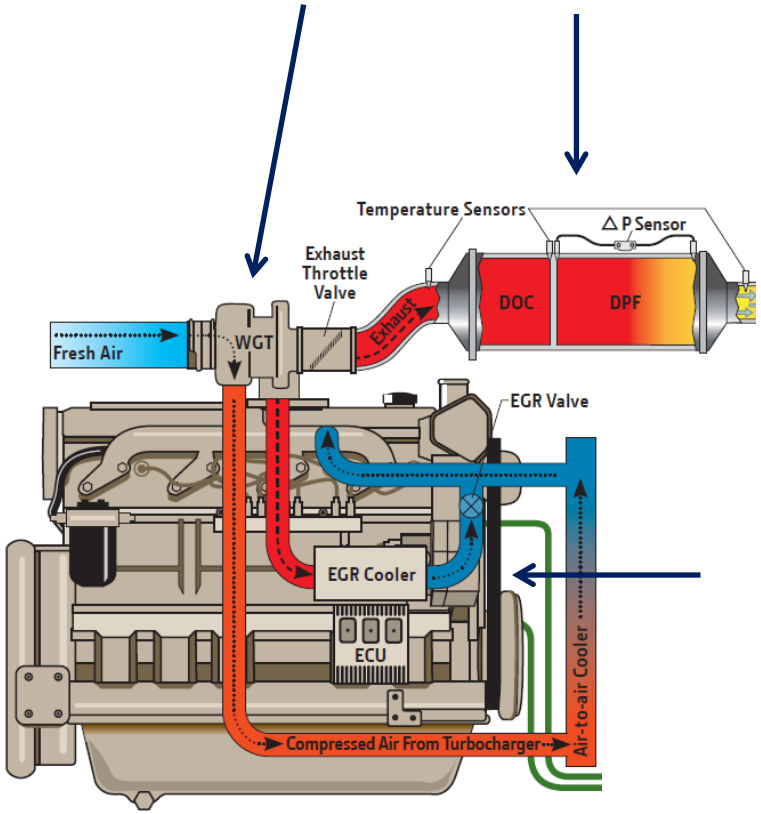
FT4 Technology



Includes IT4 technology

- Exhaust filter (DOC + DPF)
- Cooled **EGR**
- **Variable Geometry** Turbocharger

PLUS ... Increased injection pressure

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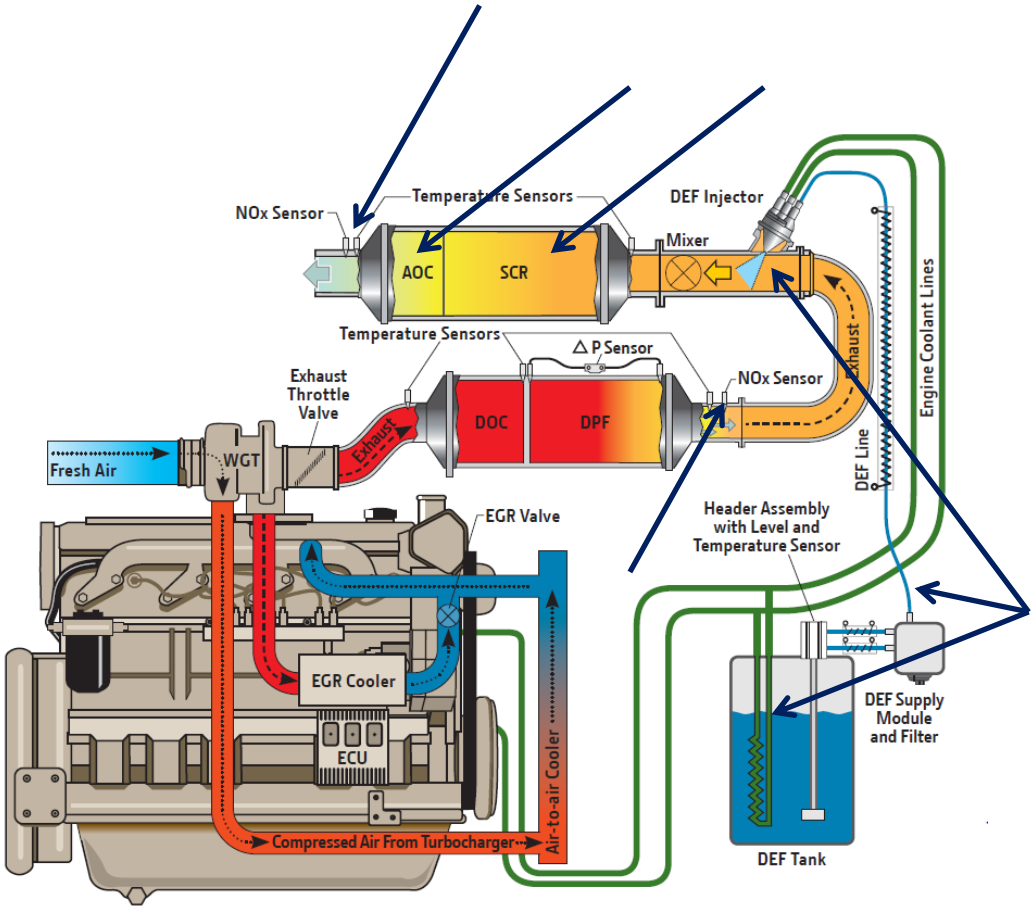
FT4 Technology



Uses a 'Secondary' Fluid

- Diesel Exhaust Fluid (DEF) = 32.5% urea + 67.5% demineralized water

DEF quality is important

- Engine will derate with poor DEF quality

Engine will derate without DEF

- **50% torque at low idle**

DEF Tank Filling

- **Check daily, refill as required**

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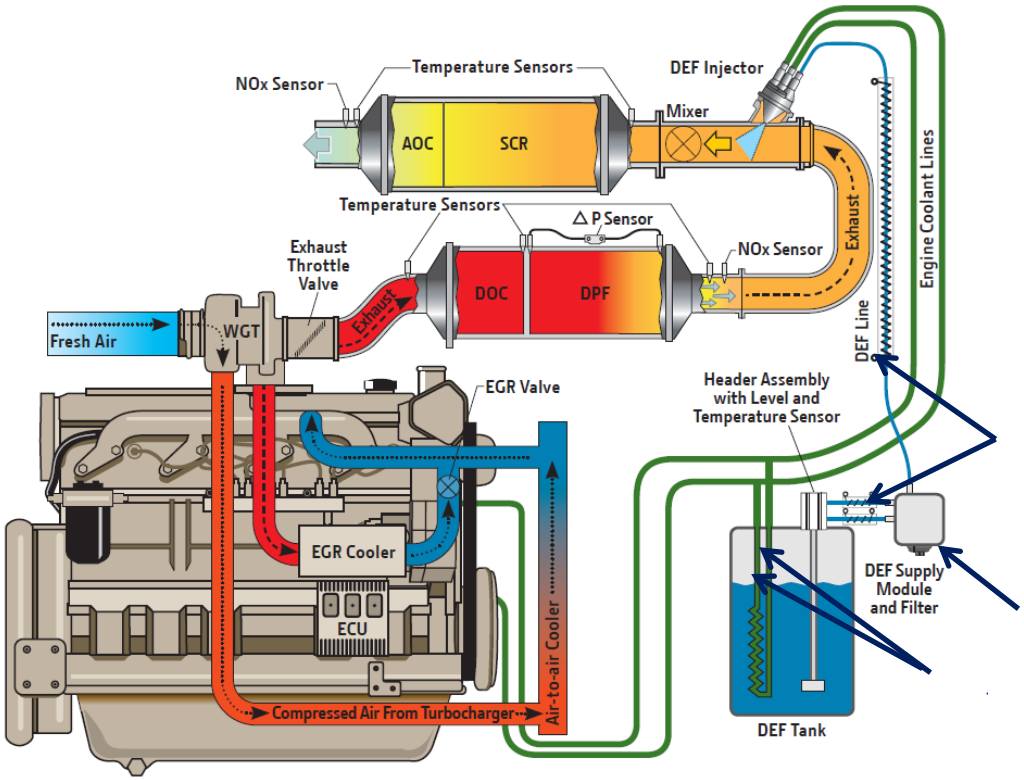
FT4 Technology



DEF will freeze … it's ok! EPA allows time for it to thaw

- Starts to freeze at 12^0F

DEF in tank thawed with engine coolant heater

DEF Lines electrically heated

DEF will purge at key-off

- Prevent lines from freezing (<2 minutes)

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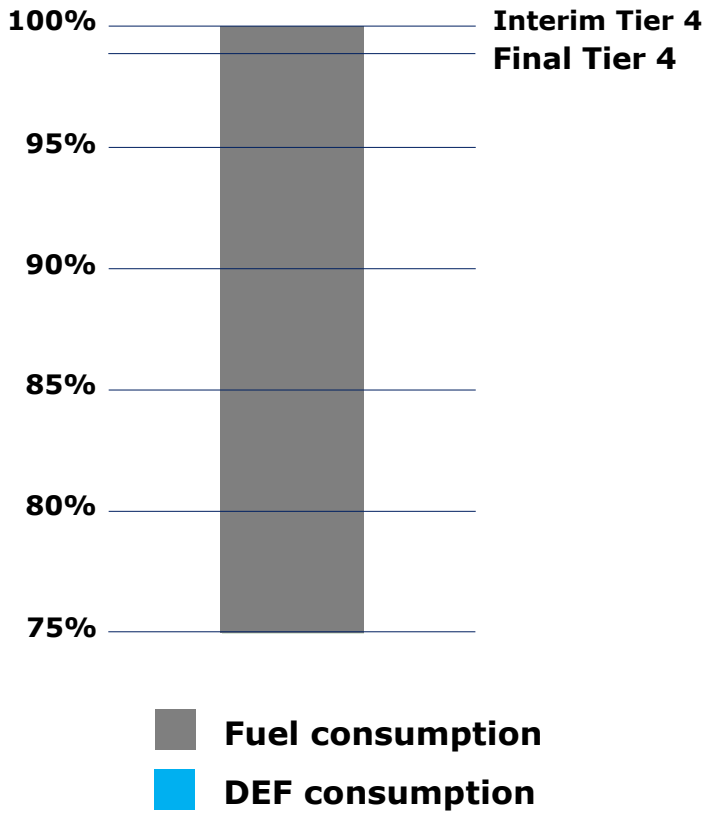
Final Tier 4 Operating Costs

FT4 Fluid Consumption



Final Tier 4 Expectations

- Diesel fuel economy improvement: 1-4 %
- Low DEF consumption: 1-3 %
- Improved diesel fuel consumption + low DEF consumption

= "Best Total Fluid Economy"

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Particulate Filter Soot Cleaning and Service

Soot Cleaning (Automatically done by machine)

<175hp ~ once per month

>175hp ~ once per week

Final Tier 4 Intervals expected to be same or better

Final Tier 4 Value Proposition

A change in emissions standards does not change the expectations of customers for durability, performance and service that help make them successful.

An Optimized Solution.

A Fluid Efficient Solution.

A Field Proven Solution.

An Integrated Vehicle Solution.

So how are we going to improve our environment in terms of emissions?

Run More Tractors!!!

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