Blue Bird Vision – PROPANE

Powered by:

ROUSH CLEANTECH | Ford

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Who We Are

ROUSH CLEANTECH

BUILT Ford TOUGH

PROPANE

GAS

CNG

Blue Bird Propane History

1) **Blue Bird launched our Generation 1 Propane system (vapor system) in 1992**
2) **We launched our Generation 2 Propane system (first liquid injection system) in 2007 with the GM8.1L / PTI / CleanFuel**
3) **We launched our Generation 3 Propane system in 2011 with the Ford / ROUSH CleanTech technology**
4) **We are currently in our Generation 4 Propane system, launched in 2014 with the Ford / ROUSH CleanTech technology**
   - **We have listened to the owners and technicians and made considerable improvements regarding maintenance accessibility, performance and emissions**

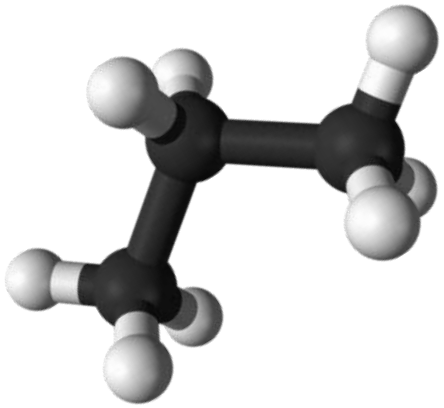
What is Propane Autogas?

- **Abundant Domestic Fuel:**
  - 90% of propane used in the U.S. comes from the U.S.
  - 7% of propane used in the U.S. comes from Canada
  - By-Product of natural gas processing and petroleum refining.

- **Growing Acceptance:**
  - Largest public refueling infrastructure of any alternative fuel
  - Powers over 23 million vehicles worldwide
  - Price gap continues to widen

- **Environmentally Friendly:**
  - 60% reduction in Nitrogen Oxide (NO_X) emissions
  - 80% reduction in Hydrocarbon emissions
  - 100% reduction in Particulate Matter (PM) emissions

- **Fuel Safety:**
  - Low operating pressure (150-250 psi)
  - Narrow flammability range (2.2%-9.6% Fuel to air ratio)



Propane Molecule
(C_3H_8)

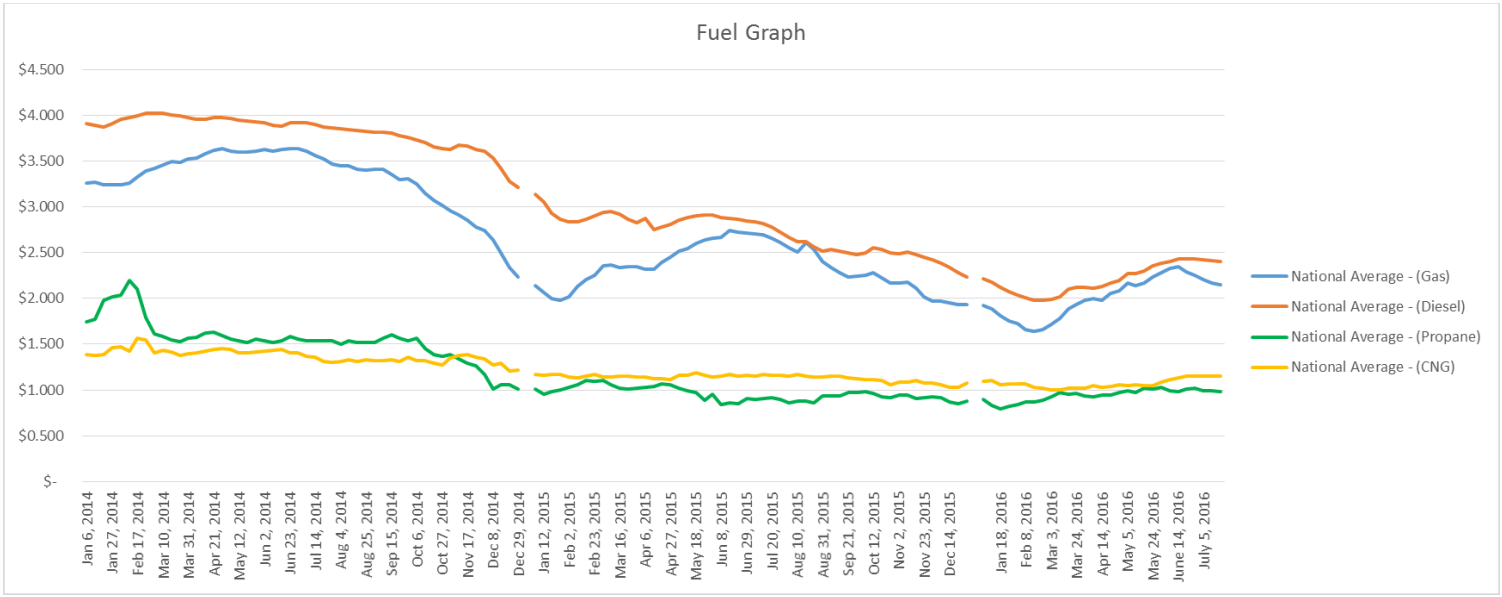
Fuel Information

- Propane has a higher octane rating than gasoline (**104** to **112**, compared with 87 to 92 for gasoline) and potentially more horsepower, but its lower British thermal unit (Btu) rating per gallon results in lower fuel economy. However, the price per gallon can quickly offset the lower fuel economy.

- **Energy content per gallon of fuel**
  - **Diesel – 128,488 BTUs**
  - **Propane – 84,250 BTUs**

- **What does this mean?**
  - **Propane only has approximately 65% the energy content per gallon as a gallon of diesel**
  - **You will get fewer miles per gallon than you currently get with diesel but propane is considerably cheaper.**

Fuel Price Information



- As much as gasoline and diesel has dropped in price, propane has followed suit
- On a national average, propane is 50% less expensive than diesel
- There is a Federal fuel rebate through the end of 2016
  - Propane - $0.36
  - Not yet passed for 2017

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Cost per Mile

Current Deployments

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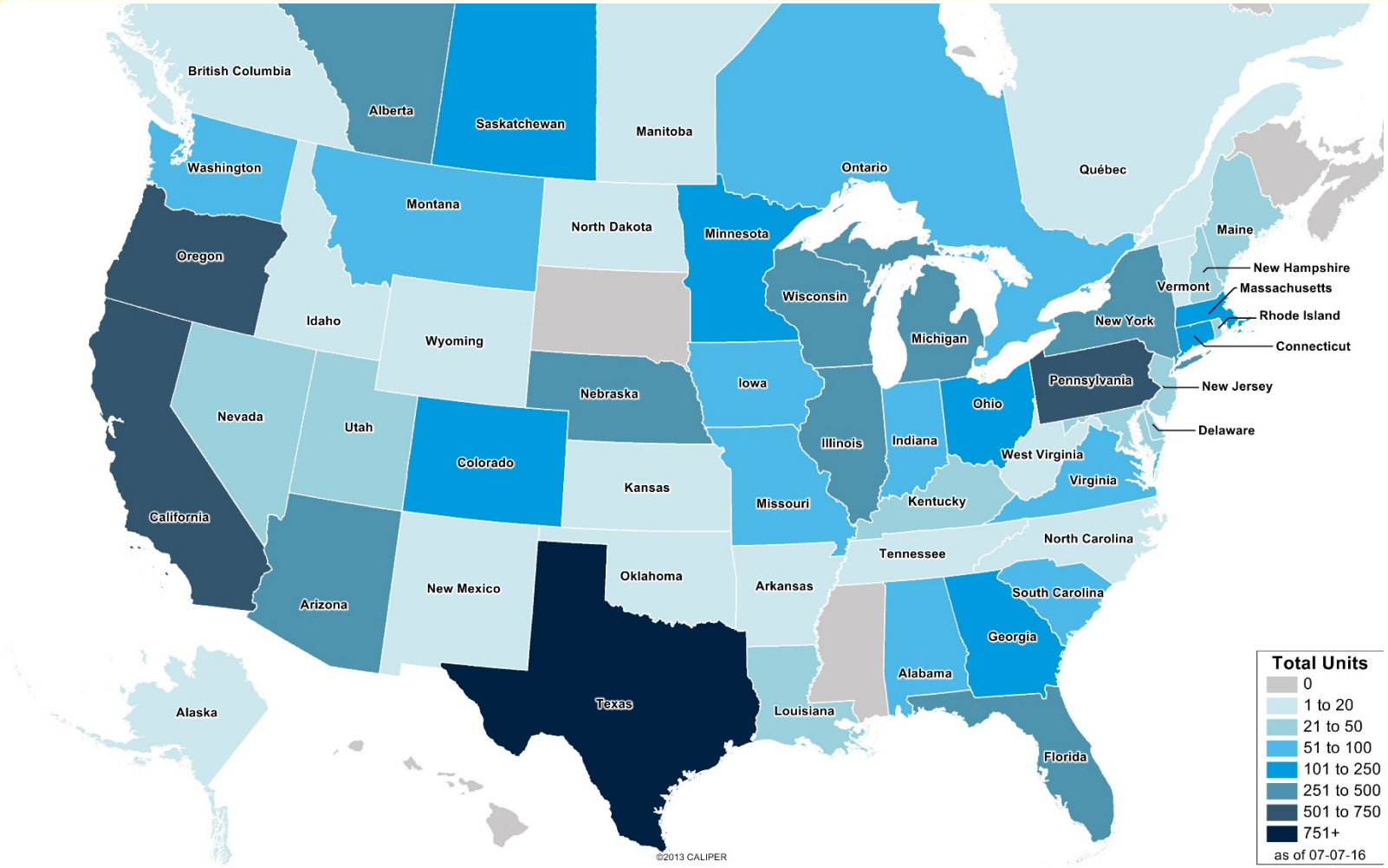
Blue Bird Vision N.A. Propane Deployments



TOUGH

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10,000 propane powered Blue Bird Visions sold since introduction

Maryland Customers

- 11 Contractors and 2 Municipal Customers by end of Summer
- 62 Total Propane Buses in Maryland
- Counties
  - Caroline County (Municipal)
  - Wicomico County (Municipal)
  - Anne Arundel County
  - Cecil County
  - Queen Anne County
  - Worchester County
- Contractors
  - Jubb's Bus Service
  - MBG Enterprises
  - Marshall Bus Company
  - R.E. Wilson & Sons Bus Company

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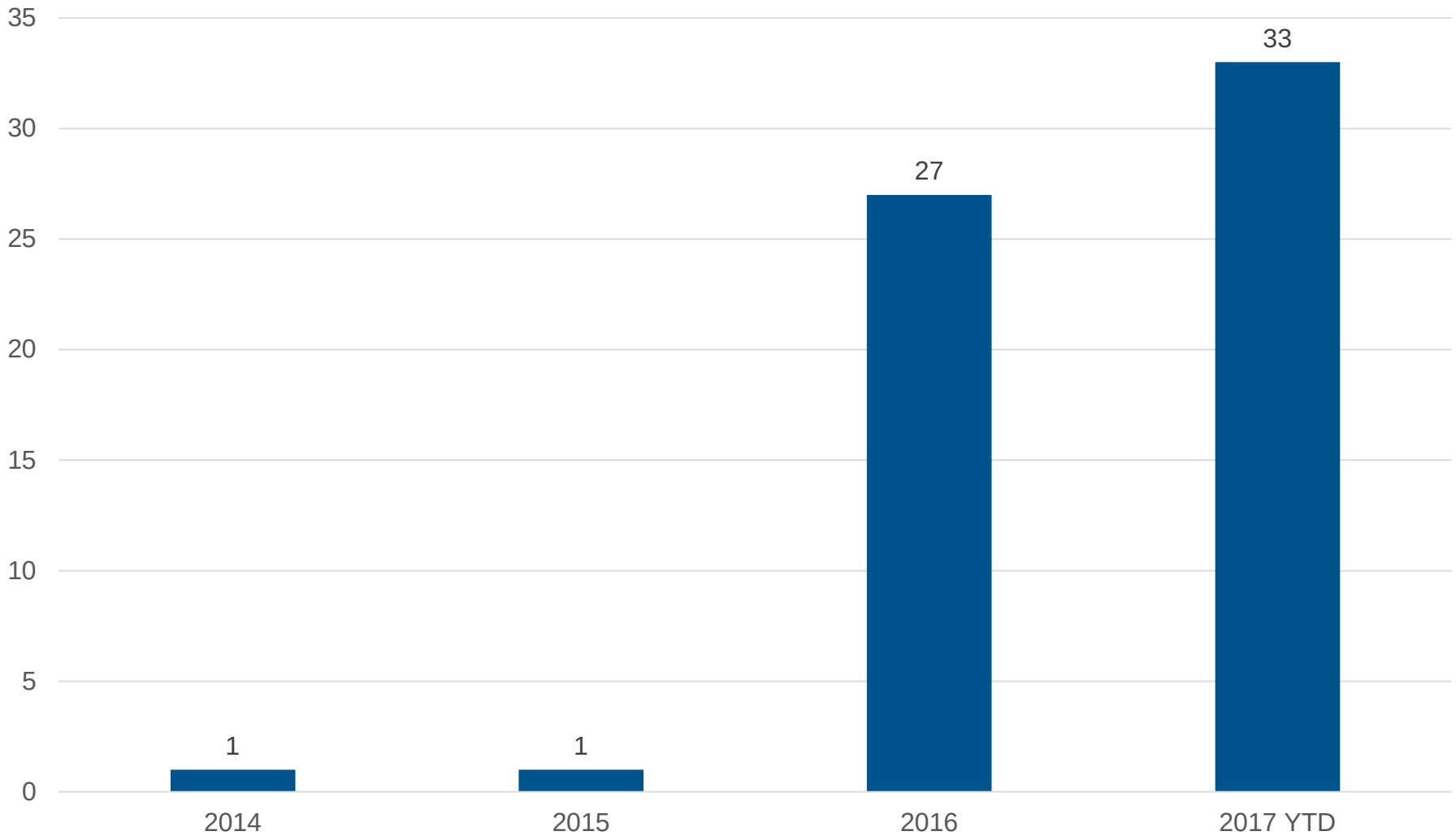
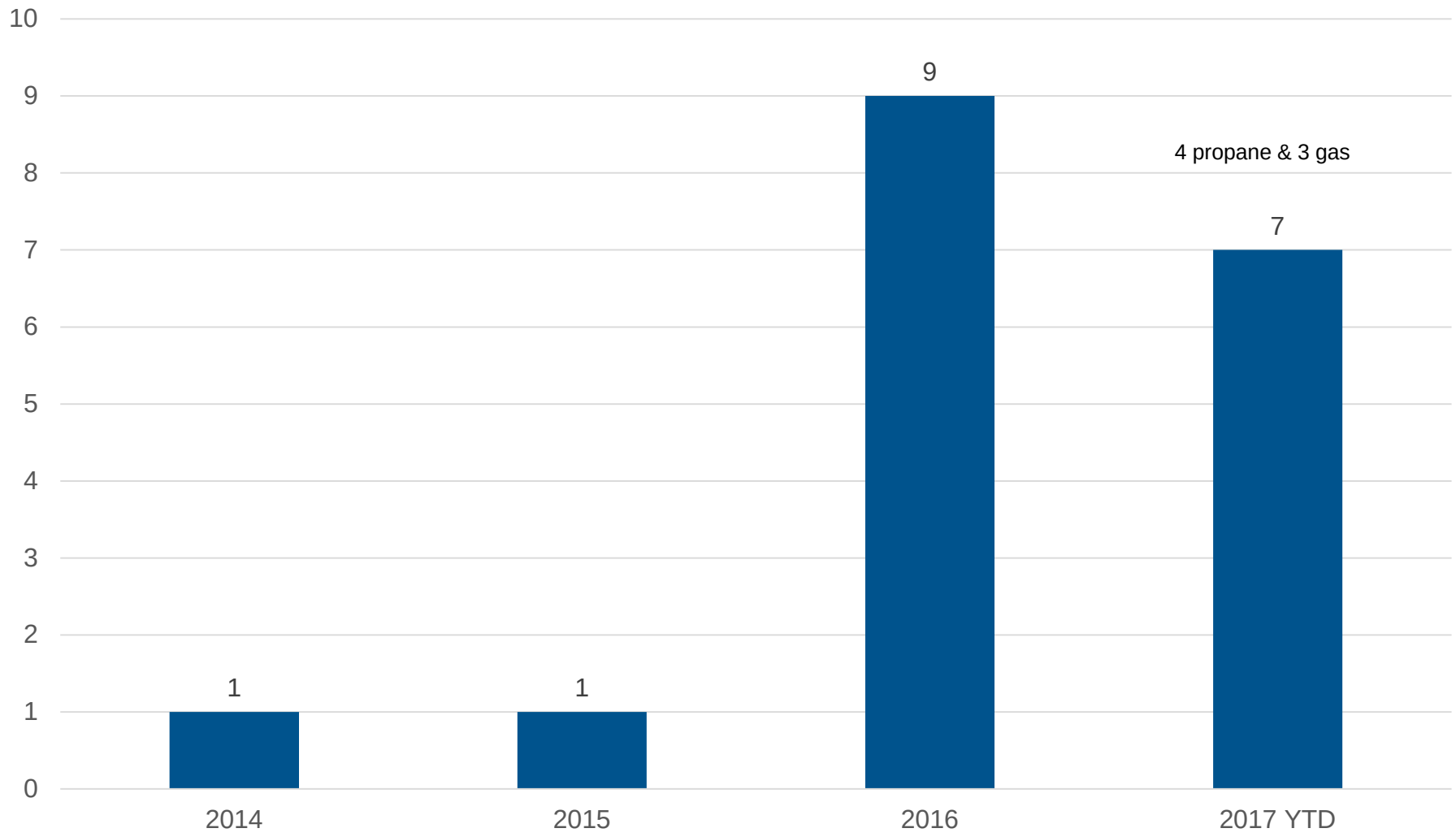
Blue Bird Propane Sales - Maryland



2014 - 2017

New propane/gas customers 2014 – present - Maryland



Feedback in Maryland

- Mechanics like the simplicity of maintenance over diesel
- Drivers enjoy the quiet engine
- Cold start issues eliminated
- Most end-users in Maryland are return customers
- Keys to growth
  - Propane Education
  - Sharing experiences with neighboring counties
  - Take advantage funding opportunities.
  - Partner with a knowledgeable fuel provider.

Why Propane

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Why Propane

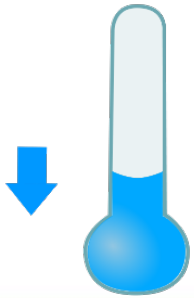
Why are Districts converting to PROPANE buses?

- ❖ Cost savings
  - Maintenance
  - Fuel Costs

- ❖ Lowest Emissions in a School Bus

- ❖ Noise Characteristics

- ❖ Cold Weather Performance

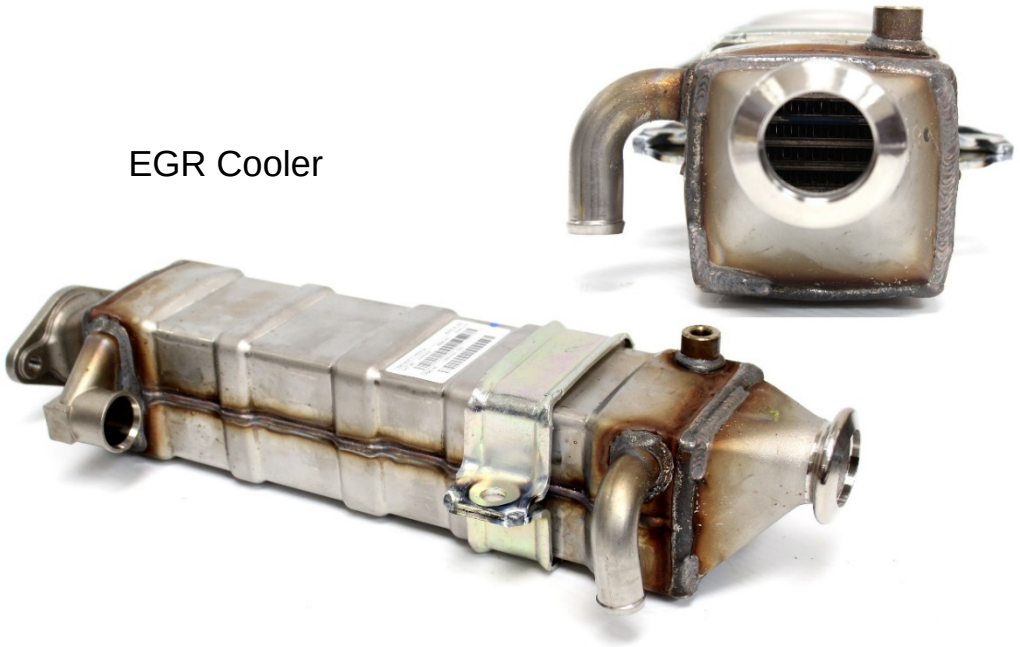


Maintenance Components to Eliminated

Charged Air Cooler

Maintenance Components to Eliminated

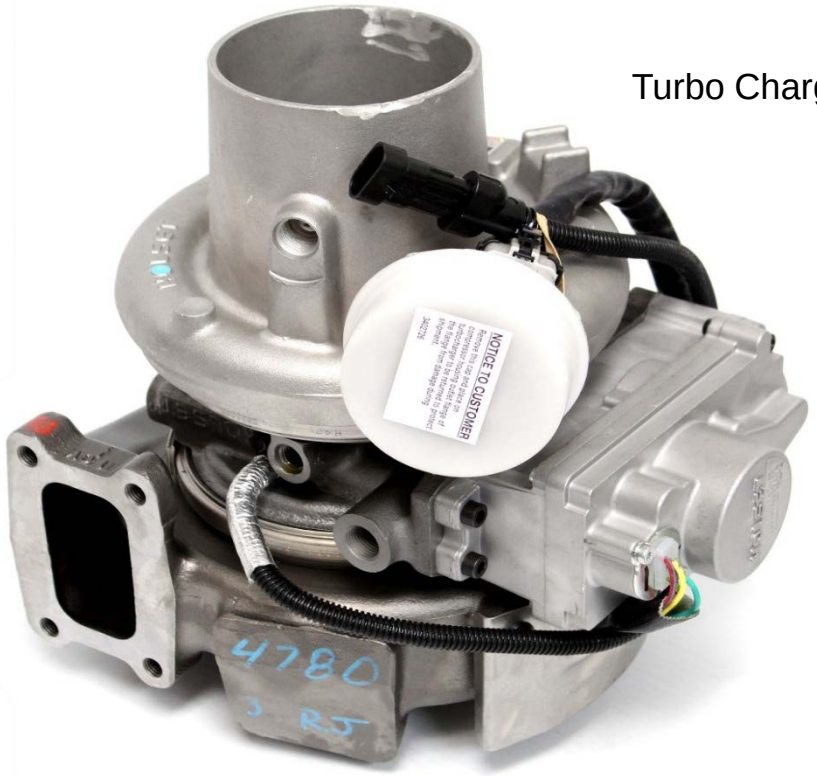
EGR Cooler



Maintenance Components to Eliminated

EGR Valve

Maintenance Components to Eliminated



Turbo Charger

Maintenance Components to Eliminated

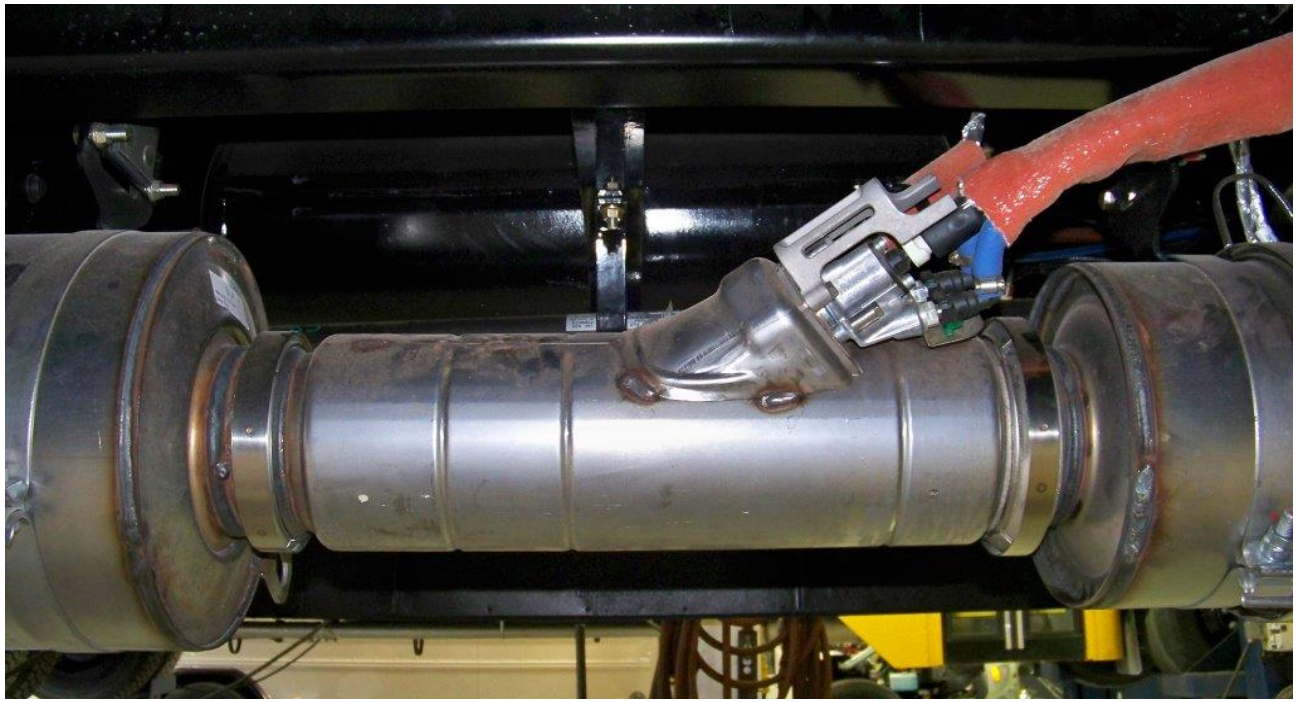
Dosing unit

Maintenance Components to Eliminated

Pre-Oxidation Catalyst

Maintenance Components to Eliminated

Dosing Module



Maintenance Components to Eliminated

Heated Supply Line

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Maintenance Components to Eliminated

Dosing Control Unit

Maintenance Components to Eliminated

Assembly for DEF Tank

Private & Confidential

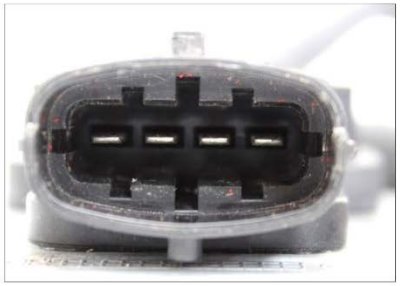
Maintenance Components to Eliminated

DEF Tank

Maintenance Components to Eliminated

SCR Catalyst

Maintenance Components to Eliminated



NOx Sensors

Private & Confidential

Maintenance Components to Eliminated

Additional Sensors
&
Assemblies

Oil Change compared to Diesel

Ford V10

Gas and Propane

7

Quarts

Diesel Engine

17-30 Quarts

Real World Savings with Propane

- **Our customers report**
  - **$0.77 per mile on diesel buses**
  - **$0.43 per mile on propane buses**

- **That's a savings of $0.34 per mile, which means…..**

- **If you drive 12,000 miles per year and operate for 15 years…**

  - **1 bus saves $4,080 in 1 year**

  - **1 bus saves $61,200 in its lifetime**

- **Total Cost of Ownership (TCO) Calculator available for YOUR fleet.**

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TCO: Fuel & Maintenance Costs

Total Cost of Ownership for YOUR fleet:

Fuel Costs		PROPANE Pre-Rebate	PROPANE Post-Rebate		DIESEL	
Fuel cost		$0.91	$0.41	/ gallon	$2.00	/ gallon
Propane rebate / gallon	$0.50					
Miles / gallon		3.6			7.0	
Fuel cost / mile		$0.25	$0.11		$0.29	
Fuel Savings / mile (positive is savings)		$0.03	$0.17			
Fuel Savings / bus / year (savings are positive)		$388.24	$2,152.94			

Annual Maintenance Costs (Engine)		PROPANE				DIESEL			
Oil changes - mat'l cost (oil & filter)		$18.34		7qts + filter		$47.10		17qts + filter
Oil changes - frequency (based on manufacturer recommendations)		2.52	5,000	miles / 6 mos		4.20	3,000	miles / 6 mos
Oil changes - labor - [mins / change]	60	$40.00			60	$40.00		
Oil change cost / year		($147.02)				($365.82)		
DPF service- mat'l cost (post warranty cost / total years of service)						$142.00		
DPF service - frequency						1.00		
DPF service - labor - [mins / year]					120	$80.00		
DPF service cost / year						($223.00)		
*EGR Cooler / Valve - mat'l cost (post warranty cost / total years of service)						$70.00		
EGR Cooler / Valve - labor - [mins / year]					360	$240.00		
EGR Cooler / Valve cost / year						($310.00)		
DEF - mat'l cost / year (assumes 2% dosing rate)						$80.46		
DEF - frequency (refills / year based on mileage) - [bus DEF tank size - gallons]					15	2.40		
DEF - labor (handling, filling, recording) - [mins / service]					5	$3.33		
DEF cost / year						($88.46)		
Turbo - mat'l cost (post warranty cost / total years of service)						$995.00		
Turbo - labor - [mins / year]					180	$120.00		
Turbo cost / year						($1,115.00)		
Total annual maintenance costs		($663.51)	($663.51)			($5,720.62)		

Safety

Crash Testing

- Blue Bird is certified to CMVSS 301.1 testing protocol
- 4,000 lbs @ 30 MPH
- Angled side and rear impact
- 220 PSI tank pressure
- 30 minute test

Other Features

- When Propane Autogas is released from the tank it is a vapor, therefore cannot be ingested like gasoline or diesel.
- **Fuel is retracted back into the tank once the bus is shut off.**
- The ROUSH CleanTech fuel system is fitted with safety devices and shut-off valves that function automatically if the fuel line ruptures
- **Fuel Tanks are 20x more puncture resistant than a diesel tank.**

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Training & Support

i.g. Burton

ROUSH Trainings

- **Online courses (primary method)**
- **Onsite Training at schools location**
- **Training in Livonia, MI at Roush**
- **6 Regional Training locations**

- Product Support
- Installation Support
- Field Support
- Warranty Support
- Field Data Analysis
- Technical Hotline

Thank you!

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