



Propane Autogas is the Future

Blue Bird introduced the first OEM propane autogas school bus in 2007. However, propane autogas has fueled vehicles across the globe for more than a century. It is the leading — and fastest growing — alternative fuel in the United States and the third most commonly used vehicle fuel, following gasoline and diesel. Worldwide, more than 21 million vehicles operate on propane autogas. Adoption of propane autogas is expanding across the nation and will continue to grow due to the economical, clean-burning and domestic properties of this versatile fuel.

More than 90% of United States propane supplies are produced domestically, with an additional 7% from Canada. United States propane production has grown so much that 3 billion gallons were exported in 2012, despite concerns with national energy security. This trend, coupled with economic projections of the increasing costs for diesel and gasoline, makes propane autogas a domestic fuel option that cannot be overlooked. For example, in 2013 gasoline averaged \$3.70 per gallon, diesel cost \$4.05, and propane autogas was \$1.80 — and that's before any federal tax credits for alternative fuel usage.

What started more than 100 years ago is now here to stay, particularly in school transportation. Many school districts across North America have tried and tested the benefits of propane autogas and are coming back to Blue Bird for more!

For more information, contact:



Blue Bird
800.486.7122
blue-bird.com



ROUSH CleanTech
800.59.ROUSH
ROUSHcleantech.com



blue-bird.com

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Let's Talk Propane Autogas— Best Practices in the School Bus Industry



A heritage of looking ahead.



Propane autogas is the fastest growing segment in the school bus industry. School districts, contractors and private fleet owners interested in alternative fuel vehicles have a number of factors to consider when choosing the fuel and bus that's right for them.

Whether the decision to explore alternative fuels is based on a rapid return on investment, community impact, energy security, carbon footprint, safety, serviceability or a combination, fueling with propane autogas¹ is a practical and readily available solution.

The adoption of a domestically produced alternative fuel like propane autogas in a school bus fleet benefits schools and the community — saving taxpayer dollars and reducing harmful emissions in the air.

Industry leaders Blue Bird and ROUSH CleanTech have partnered to offer school buses fueled by propane autogas. These include the Type A Micro Bird and the Type C Vision. The goal of this guide is to deliver information that transportation directors need as they consider adding this fuel system to their bus fleet — before, during and after the purchase.

“With today’s tight school budgets, using a transportation fuel like propane autogas that saves taxpayers’ money, keeps the environment clean, and keeps jobs within our national borders is a win-win for everyone.”

*— William Schofield, Superintendent
Hall County Schools
Gainesville, Georgia*



¹Propane autogas, the commonly used term for vehicles operating on propane, is the same fuel used for home heating.

LET'S TALK:

TOTAL COST OF OWNERSHIP

One of the top concerns in fleet management is total cost of ownership — especially when it comes to investing taxpayer dollars. With propane autogas, the return on investment is usually experienced *within a 2- to 3-year period*, due to fuel and maintenance savings.

Arizona's Mesa Public Schools is saving \$6,500 per Type A school bus per year. *"I'm conservative when I run numbers, and the savings are amazing. We're saving 37.7¢ per mile with propane autogas. Our buses have been reliable and inexpensive to operate,"* says Ron Latko, Director of Transportation.

✓ Fuel Savings



On average, propane autogas costs about 40-50% less than gasoline and 50-60% less than diesel in most markets. Many school districts across the country are experiencing even better results on a per mile basis.

Hall County Schools in Georgia reports \$123,000 in fuel cost savings over a six-month period with their Blue Bird Propane Vision school buses. Missouri's Fort Zumwalt School District pays 60% less to fuel buses with propane autogas than with diesel. And Dallas Schools in Pennsylvania spends \$3 less per gallon for propane autogas compared to diesel. Long-term fueling contracts are common — and recommended. Should any unusual seasonal demand occur, a contract locks in fuel prices.

On top of an already affordable fuel, schools may also benefit from federal and state fuel tax credits. Learn more at the Energy Department's Alternative Fuels & Advanced Vehicles Data Center at afdc.energy.gov/laws.

✓ Savings Calculator



Blue Bird and ROUSH CleanTech provide online savings calculators to determine detailed savings for school bus fleets. By plugging in specific variables, such as average vehicle miles and years of operation, transportation directors can compute estimated fuel and maintenance savings. The interactive online savings calculator and iPad app also includes an emissions calculator and other valuable features.



Visit the iTunes App Store or go to ROUSHcleantech.com to download the free app.

✓ Maintenance Savings

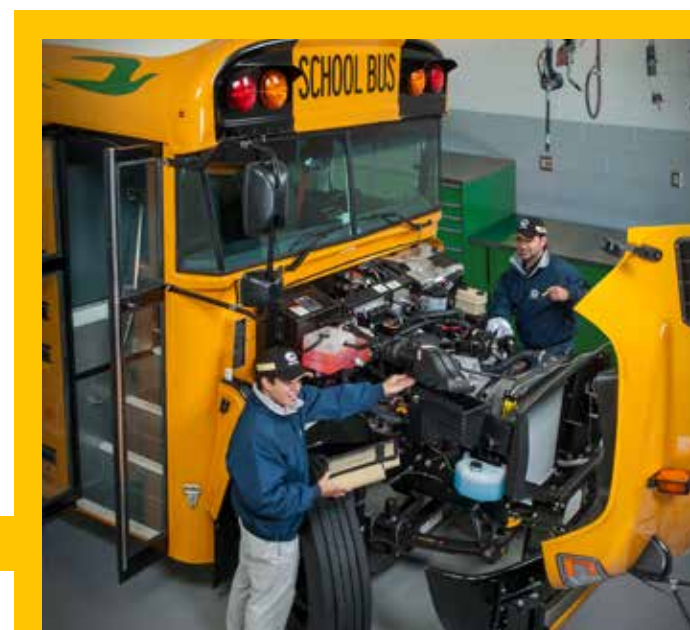
Due to its clean-burning properties, propane autogas can reduce maintenance costs and wear and tear on the engine and components. In fact, Ford builds the engines with hardened valves and valve seats, allowing the engine to withstand the higher operating temperatures and lower lubricity of gaseous fuels.

Propane autogas engines require less oil by volume than diesel and no additional diesel emission fluids. No extra valve adjustments are needed for maintenance. Service intervals for other fluids, coolants and filters can be 2 or more times longer for propane autogas, saving both time and money.

As an example, an oil change for a Blue Bird Propane Vision uses 7 quarts compared with over 17 quarts for a typical diesel engine.

"Tippecanoe is saving 5-fold on a per mile basis for tune-ups, engine life and other maintenance repair. Plus, we pay 70% less per gallon to fuel our propane autogas buses than our diesel buses. And the performance has been outstanding from the very first day."

— Kevin Neafie, Director of Transportation
Tippecanoe School Corporation
Lafayette, Indiana



LET'S TALK: SAFETY



20x

Propane autogas tanks are more puncture-resistant than typical diesel or gasoline tanks

Nontoxic, non-carcinogenic propane autogas is an approved alternative fuel under the Clean Air Act. The Environmental Protection Agency (EPA) classifies propane autogas as a non-contaminant of air, land and water resources. The natural properties of propane; the stringent safety codes and regulations developed by both the National Fire Protection Association (NFPA) and the propane industry; and the industry's extensive education, training and safety-awareness programs, all make propane autogas a safe and reliable transportation fuel.

By comparison, as little as 1 gallon of spilled gasoline or diesel can quickly contaminate groundwater above drinking water health advisory levels.

Fuel System Safety

Blue Bird strategically mounts the propane autogas fuel tanks between the robust frame rails for added safety. ROUSH CleanTech designs its propane autogas fuel systems to perform safely during both normal operations and in the event of an accident. The fuel systems are fitted with safety devices and shutoff valves that function automatically if a fuel line breaks. Unlike gasoline or diesel, propane autogas is a closed-loop system, meaning the fuel is never exposed to air and won't spill. But if a leak did occur, this gaseous fuel would dissipate in the air, not spill or pool on the ground. In addition, propane autogas has the narrowest flammability range of all alternative fuels.

Constructed of carbon steel and certified by ASME, propane autogas tanks are 20 times more puncture-resistant than diesel fuel tanks. They can also withstand 4 times the pressure. The tank mounting systems are designed at twice the requirement specified by the NFPA to ensure tanks remain securely attached even in a severe collision or rollover.

The tanks feature an overfill prevention device that automatically shuts off the filling process when the tank reaches 80% of its liquid capacity. This allows for changes in fuel volume caused by temperature variations without any release from the tank. The fuel system has 16 mounting points located inside the frame rails. And, because the system is fully integrated and designed in harmony with the gaseous fuels-prepped Ford 6.8-liter V-10 engine, there are no aftermarket parts.

"...the facts are, when you understand its properties and how to properly handle it, propane autogas is safe. For some reason, a lot of people have the perception that it's a volatile fuel when, in fact, it has a very narrow window for flammability."

— Mark Holloway, Senior Assistant Fire Chief
25-year veteran
West I-10 Fire Department
Houston, Texas



LET'S TALK: SAFETY

School Bus Safety Standards

Blue Bird school buses operating on propane autogas comply with the same safety standards as their conventionally fueled counterparts.

Blue Bird's propane autogas school buses pass rigorous crash testing, meeting and exceeding FMVSS and CMVSS safety standards. These tests include angled side and rear impact. In 30-minute testing, no leakage or pressure drop occurs. All Blue Bird school buses are engineered to meet the Colorado Rack test specifications in its standard configuration to ensure safety compliance. In addition to independent bus testing, Blue Bird's internal validation department evaluates all design, configurations and product integrity.



"Propane autogas fueled vehicles, if handled and maintained properly, are very safe and offer a lot of benefits to fleet users. Propane autogas tanks are more durable than gasoline or diesel tanks."

*— James Mays Jr., Vice President and Interior Firefighter
Licensed Emergency First Responder
Sheridan Fire Department
Lafayette, New York*



Environmental Responsibility

When compared to conventional diesel, school buses fueled by propane autogas emit less greenhouse gases, reduce total hydrocarbons emissions by more than 80% and virtually eliminate particulate matter. Fewer emissions leaving the tailpipe mean less exposure to potentially harmful particulates.

When Georgia's Hall County Schools switched to propane autogas, local area residents paid attention. Frank Lock, an area resident, says, *"I again found myself being passed by a school bus. I waited to inhale the poisonous odors, but I was very surprised and happy to find there was no odor at all. I knew right away that I was experiencing the less noxious exhaust from a new propane bus."* Hall County operates both special needs and passenger Blue Bird school buses fueled by propane autogas.

Another safety feature is the quieter operation. At idle, Blue Bird propane autogas buses are 11 decibels quieter than diesel. These reduced noise levels allow drivers and passengers to better control the environment inside the bus. During a driver safety competition featuring school buses fueled by propane autogas, drivers noticed the decreased engine sound. Some driver comments were: *"It's real quiet," "I couldn't even tell it was running," "I needed to make sure the bus was on,"* and *"You can hear your kids better in the bus."* William Schofield, Superintendent of Hall County Schools, agrees, *"Our drivers love how quiet the propane buses perform."*

Propane autogas reduces
total hydrocarbon
emissions by **80%**

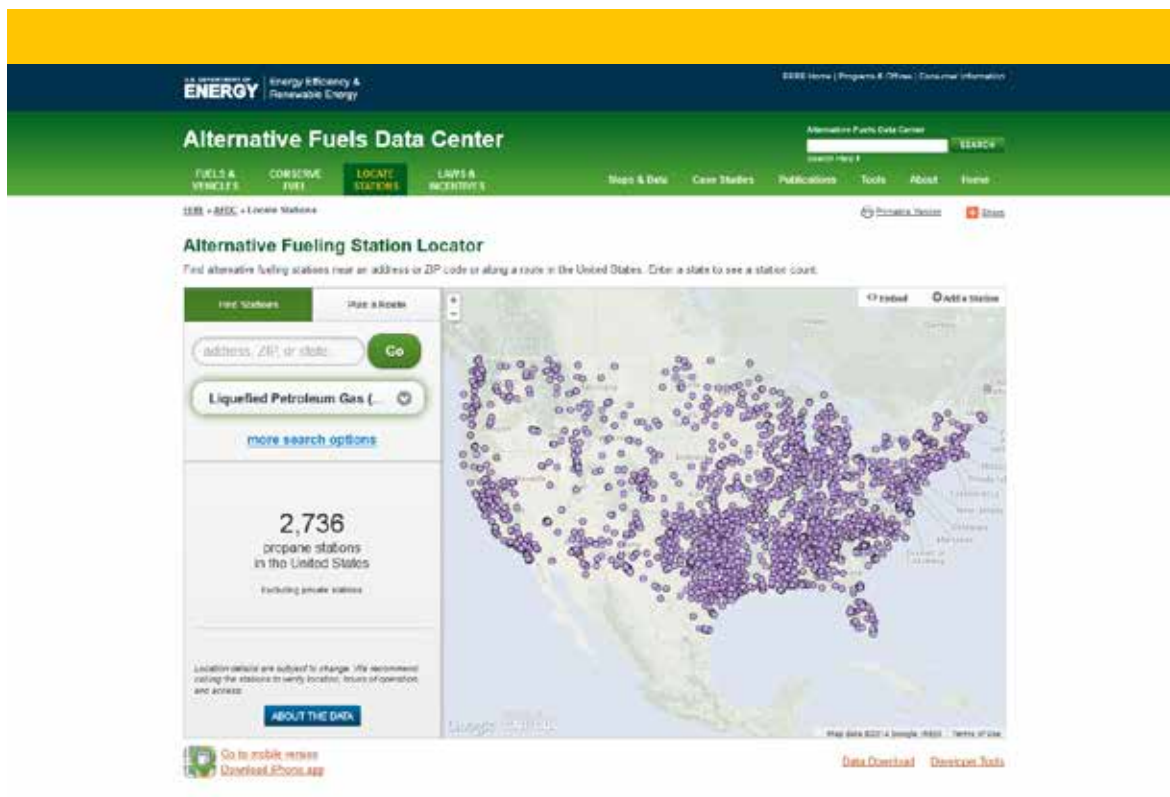
LET'S TALK: REFUELING OPTIONS

As the third most widely used engine fuel behind gasoline and diesel, propane autogas has a national infrastructure in place. Thousands of refueling stations, 56,000 miles of pipeline, an established distribution process and more than 6,000 retail locations makes propane readily available throughout the nation.

Two types of refueling stations are available for school districts: public and private. The choice of how to refuel a school bus depends on each school district's needs.

✓ **Public Fueling Stations**

Public stations are an effective option for transportation directors when they are located near bus terminals or along school routes. Propane autogas is the only alternative fuel with public stations in every state. To find the locations of existing stations, visit the Energy Department's Alternative Fuels & Advanced Vehicles Data Center at afdc.energy.gov/locator/stations.



“Propane infrastructure has a low cost, resulting in a quick and easy return on investment to school districts. Our approach to providing infrastructure support to our autogas customers is two-pronged: installing dispensers at customer locations and installing filling stations to serve customers who need 24/7 refueling capabilities outside their own business locations.”

— Warren Patterson, Vice President of Sales
AmeriGas

“At a time when school districts are challenged to cut their budgets, we’re able to not only offer a fuel that costs significantly less, but in most cases will eliminate fuel cost volatility through a number of different pricing options.”

— Nathan Ediger, Director of Autogas
Ferrellgas



✓ **Private On-Site Fueling Stations**

Most transportation directors choose to install on-site refueling infrastructure. Installing a propane autogas station costs less than any other fueling station, including gasoline and diesel. Many times, your local propane provider will install a fueling station onsite at no charge with a long-term propane contract. Because of its EPA classification as a non-contaminant, propane autogas infrastructure has fewer compliance requirements than conventional fuels — so no costly EPA monitoring is involved.

The most popular on-site refueling option is a skid-mounted station. This easily installed aboveground infrastructure takes up little space and can be relocated or removed if needed. It includes an aboveground propane tank, dispenser, pump, piping and control panel mounted on a concrete or steel frame to create a portable unit. Depending on the type and size of the refueling station, installation can be completed in a short timeframe and with minimal changes to the site.

Permanent underground storage tanks provide another option. These stations feature spill-proof pumps that ensure the safe transfer of the fuel.

The cost to upgrade an established refueling facility is minimal. Fuel providers will usually assist with hardware costs, permitting and installation. They can help determine necessary permitting and compliance with local regulations, too.

“The new propane autogas technology cuts our fueling time in half compared to the previous generation of this fuel,” says Juan Mejias, Fleet Manager of Alvin Independent School District in Texas. *“Plus, our recent facility upgrade was fast and cost-effective.”*

✓ **Speed of Fueling**

Drivers will find the speed and ease of fueling Blue Bird propane autogas buses comparable to that of gasoline or diesel. On average, a school bus fuels at 8 gallons per minute.

LET'S TALK:

MAXIMIZING EFFICIENCY

The miles per gallon of a propane autogas bus are generally less than a diesel bus. However, mileage can vary depending on driver operation. With its increased torque and horsepower, a Blue Bird propane autogas bus can obtain higher miles per gallon with conservative driving. Below are behavioral modifications to reduce fuel consumption when operating a propane autogas school bus:

Minimize Warm-Up Time

Unlike diesel engines, the propane autogas engine and Ford transmission are ready for immediate use after start-up. The best and most efficient way to warm up the powertrain is by driving, not idling. If needed, a short warm-up for the heating or air conditioning system is fine.

Limit Use of High Idle

The stationary elevated idle control (SEIC) is intended for use with high-power accessories, such as a wheelchair ramp, or for short periods when additional air conditioning is required. Continuously using the SEIC will waste fuel.

Reduce Use of Full-Throttle

The propane autogas engine is not turbocharged, so there is no turbo lag. The practice of pushing the pedal fully for all accelerations and then lifting the pedal as the vehicle speeds up, is unnecessary, as it wastes fuel. The school bus is most efficient and smooth when driven like a car, where the throttle is increased until a desired acceleration is achieved, then held constant at a preferred speed. Use full throttle only when requiring maximum acceleration, such as highway merging.

"These propane autogas buses have surpassed our expectations, and we plan to keep coming back for more until we are 100-percent propane powered."

*— Ron Latko, Director of Transportation
Mesa Public Schools
Mesa, Arizona*



Mesa Public Schools has
logged savings of

37¢
per mile
with propane autogas



LET'S TALK:

CLIMATE PERFORMANCE



Blue Bird Propane Buses
start up in temperatures
as low as

-40°F

"During zero-degree days, our Blue Bird Propane-Powered Visions started and performed to their peak."

*– David Anderson, Director of Transportation and Fleet Service
Adams 12 Five Star Schools
Thornton, Colorado*



Cold weather is not an operational barrier to the use of propane autogas. With the ROUSH CleanTech fuel system, the propane remains in a liquid state until it gets to the cylinder, which has alleviated cold start issues associated with vapor technology propane systems of the past. In fact, the fuel system provides for unaided cold weather starts to -40° F.

Testimonials from the field demonstrate that in cold weather, buses fueled by propane autogas start and operate even better than their diesel-fueled counterparts, where the fuel may gel at extremely cold temperatures.

Tom Ganley, Regional Director of Maintenance for Student Transportation of America (STA), says the company has experienced great success operating a fleet of Blue Bird propane autogas buses in Chaska, Minnesota. *"I don't need to tell you that it gets cold here,"* Ganley says. *"It was STA's original cold-weather testbed for our propane autogas fleet, and provided us with a great source of confidence and credibility for our green fleet initiatives."*

STA parks the buses outside during the winter months without plugging in the engines. The buses have started and performed well even in record cold temperatures. According to Ganley, even the heaters in these buses respond quickly and produce warm air faster than their conventionally fueled buses.



LET'S TALK: THE PURCHASE

Blue Bird buses offer proven original equipment manufacturer performance to school districts across the country.

Manufactured on a purpose-built Blue Bird chassis, the Propane Vision school bus runs on the Ford 6.8-liter V10 engine. The Ford 6R140 automatic transmission delivers 362 horsepower and 457-lb-ft of torque.

This bus offers a seating capacity of up to 78. Available in two fuel tank sizes, the standard fuel tank holds 70 gallons, and the 100-gallon extended range tank boasts the industry's largest propane autogas fuel tank.

The Blue Bird Propane-Powered Vision features a ROUSH CleanTech liquid propane autogas fuel system, which consists of the fuel tank, fuel rail and lines, evaporative canister and calibration of the powertrain control system. The fuel system and powertrain offers best-in-class serviceability and broader optional equipment choices than previous generations of the 2 school buses.

The Micro Bird G5 bus uses Ford's E-450 cutaway with a 6.8-liter V10 engine. The bus comes with a 48-gallon tank and seating capacity for up to 30 passengers. This bus is also equipped with the ROUSH CleanTech liquid propane autogas fuel system.



Both the EPA and the California Air Resources Board have certified all Blue Bird propane autogas school buses.



"We knew that the Vision is the best bus out there. And with the expertise and support from Blue Bird and ROUSH CleanTech, it was easy to make the decision to fuel with propane autogas for our customers."

*— Leslie Sheldon, Operations Manager
All-Star Transportation
Waterbury, Connecticut*



Sales Support

With each purchase, customers receive comprehensive support from technology experts at Blue Bird, ROUSH CleanTech and their local Blue Bird dealer. Blue Bird's extensive network includes 47 dealers, with over 200 service locations throughout North America.

Blue Bird's dealers and ROUSH CleanTech's regional propane autogas experts work together with transportation directors to help evaluate costs and options. For instance, analyzing bus routes based on distances can determine necessary fuel tank sizes and range requirements. Researching available state and federal tax incentives can uncover possible funding opportunities.

Connecticut's All-Star Transportation has continuously followed alternative fuels and closely monitored changes in the industry for the past 35 years. When they considered propane autogas, *"the Blue Bird and ROUSH CleanTech teams were a wealth of information, and addressed all our concerns quickly,"* says Leslie Sheldon, All-Star's Operations Manager.

Blue Bird dealers offer school districts the use of demo propane autogas buses in order to experience the benefits first-hand.



To attend a Propane Ride and Drive event in your area, or to request a test-drive, visit bluebirdpropaneroadtour.com today.



LET'S TALK:

SERVICE AND WARRANTY

Owning and operating alternatively fueled buses shouldn't mean compromising factory warranty coverage or serviceability.

Educational Preparation

Educational preparation is also available for a contractor's or school district's entire transportation team. Blue Bird and ROUSH CleanTech provide in-person and web-based training on dozens of topics including components of the fuel system, refueling, operation, maximizing efficiency while driving and more.

Coverage

Each propane autogas school bus comes with a 5-year / 100,000-mile Ford powertrain and ROUSH CleanTech fuel system coverage. Blue Bird and ROUSH CleanTech's support program includes issue resolution processes, technical assistance and claims processing to ensure claims are handled efficiently.

Blue Bird's service engineers work directly with school districts' technical experts to provide quick solutions and expert advice. Blue Bird's field service representatives average 25 years of serving customers.

Nationwide Service Network

With an extensive nationwide service network and comprehensive service-training programs, operational support is available online, in person and by phone. Blue Bird and ROUSH CleanTech's field service and operations team provides training and education for all customers, service technicians and drivers.

The team reviews maintenance practices and service requirements with each school district's service provider. The ROUSH CleanTech technical service hotline connects directly with a field service engineer who can discuss each step toward a diagnosis and work to get the bus back on the road. Interactive web-based training is also available, along with online resources including the service and diagnostic manual, technical information videos and coverage information. Blue Bird and ROUSH CleanTech also archive webinars online to allow districts to view and share information about propane autogas.

Blue Bird's dealers and ROUSH CleanTech's sales and engineering teams are accessible before, during — and most importantly — after the sale.

"The transition has been easy and transparent. Our fuel team was trained on the characteristics of propane autogas and how to safely refuel."

*— Jeff Schwepker, Director of Transportation
Fort Zumwalt School District
O'Fallon, Missouri*



Bus Maintenance

With 3 parts carbon and 8 parts hydrogen, propane is a clean-burning, low carbon fuel. And less carbon means less engine buildup and less wear and tear. According to Equipment World magazine (September 1, 2013), "Soot is carbon and there's much less carbon in propane fuels. Your oil will stay much cleaner much longer burning propane."

Maintenance on buses fueled by propane autogas is similar to conventionally fueled engines, with no additional requirements except for an inexpensive fuel fill filter replacement every 50,000 miles.

All Blue Bird propane autogas school buses can be serviced using standard Blue Bird and Ford diagnostics equipment.



Find a Blue Bird dealer or service center in your area with our interactive map.

Visit blue-bird.com/find-a-dealer today.

