



REDUCING MAINTENANCE TIME, REPAIRS, AND REPLACEMENT COSTS WITH PROPANE SCHOOL BUSES

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It is well documented that propane school buses provide a variety of benefits for transportation budgets, the students they serve, and the community at large. School buses operating on propane reduce transportation costs, provide safe transportation for students traveling to and from school, and reduce emissions.

Transitioning a school bus fleet to propane does require some planning and preparation but, in the end, maintenance directors, technicians, drivers, students, and administrators will gladly support the decision. Propane school buses are easier to maintain and are void of many of the costly repairs that are constant headaches for a maintenance staff that is burdened with keeping a diesel fleet operational on a fixed budget. Lower maintenance requirements and more uptime on the route are two of the primary reasons propane school buses provide the lowest total cost-of-ownership throughout the 10- to 12-year lifespan of the bus.



AVOIDING TIME-CONSUMING REPAIRS AND COSTLY REPLACEMENT PARTS

Unlike diesel technology, propane does not require a complex emissions system, additional filters, or fluids to comply with EPA clean air standards. Fleets can avoid vehicle downtime (and the associated labor costs) caused by the continual maintenance and removal from service necessary for diesel buses to clean diesel particulate filters. Since 2007, diesel engine design has dramatically changed and idling for longer than five minutes has proven to cause premature failures of injectors, turbochargers, EGR valves and coolers, irregular-closed crankcase filters, and other non-warrantable repairs that can damage entire engine systems and put diesel buses out of service.

Propane school buses are simple and easy to maintain. In contrast to the diesel engine technology, propane engines require a simple three-gas catalyst, similar to those in personal vehicles, and do not have limitations on idling. Portland Public Schools in Oregon says it's much easier and requires less time for a technician to maintain the district's propane buses than the more complex diesel buses.



Propane produces fewer emissions which has proven to reduce wear and tear on an engine and its fuel system technology. Schools are quick to point out that if not for factory warranties, maintenance intervals on propane buses could be extended which provides immediate savings on oil and filter changes. Alvin Independent School District, in Texas, says it has experienced extended oil changes for its propane buses, changing every 10,000 miles.



FLUIDS AND FILTERS

Fleets are quickly becoming advocates of the "3 F" — fluids, filters, and fuel — analysis and recognizing the significant impact they have on a fleet's operations, maintenance, and repair budgets. Two of the three F's, fluids and filters, are directly related to the hidden costs of diesel that can be avoided when districts switch to propane. The third F is fuel — historically propane costs less per gallon than both gasoline and diesel and costs can be reduced even further with available state and Federal incentives, grants, loans, and rebates.

When it comes to fluids, propane school buses require fewer quarts of oil for operation. Oil changes are a perpetual maintenance cost that adds up quickly for a school district and even more so for a large bus fleet. For example, the Tippecanoe School Corporation [TSC] in Lafayette, Indiana, reported that its diesel buses require 32 quarts of oil per oil change and the district's propane buses required only seven quarts. TSC's technician said the district could easily change the oil in a propane bus almost five times for what it costs to change oil once in a diesel bus. Another important item to note, diesel engines equipped with the selective catalytic reduction [SCR] emissions technology will not operate without diesel emissions fluid [DEF]. This is an added operation and maintenance expense that is not required for propane engines.

Costs on filters are significant over the lifespan of the vehicle. Diesel filters are more expensive and require more frequent replacements than propane filters. The diesel buses owned and operated by TSC require two fuel filters that cost \$40 each, while propane buses use a single filter that costs substantially less. The largest and most expensive filter to maintain, the diesel particulate filter [DPF], requires periodic cleanings for the vehicle to operate properly. Clogged diesel particulate filters will de-rate an engine's RPMs and render the bus inoperable.

FOCUS BEYOND WINTER

For school districts located in cold climates, a sizable percentage of their maintenance budget is devoted to preparing and responding to winter conditions. When the temperature drops during winter months, diesel fuel will freeze, which leads to clogged fuel lines and fuel filters and an out of service bus. Preventative measures to ensure a diesel bus starts when it's cold outside can increase costs. Propane, on the other hand, requires no fuel additives and provides reliable starting in any temperature or climate.

To combat diesel gelling, districts have a couple of options to consider, both of which increase maintenance costs. Some districts choose to blend kerosene with diesel. While the gelling problem is contained, kerosene is known to "dry out" the fuel, decreasing engine lubricity, and causing premature wear and tear on the engine. The second and most common option is to add an OEM recommended anti-gelling agent. TSC has spent up to \$25,000 annually on winter fuel additives alone. In contrast, the district's five propane buses start reliably in cold weather, take significantly less time to warm up [a benefit not lost on bus drivers], and require no fuel additives for proper operation in cold weather.

Metropolitan School District of Warren Township in Indianapolis, Indiana would spend almost \$41,000 on cold start-ups during the winter months. Like all districts operating diesel engines, a significant portion of the district's operating budget was focused on starting and warming up the diesel buses when temperatures fell near or below 32 degrees Fahrenheit.

In addition to fuel additives, many districts are using engine block heaters in the hopes of maintaining adequate warmth in the engine's core, coolant, and oil to aid starting on cold mornings. Unfortunately, block heaters are proving to be less reliable with the new diesel engines. In addition, electric engine block heaters require an electrical supply to operate efficiently which may require modifications to existing facilities. Independent School District 15 in St. Francis, Minnesota, reduced its utility bill by \$10,000 simply by switching to propane buses and eliminating the need for engine block heaters and the electricity required to power them.

GARAGING

Let's clear up the misconception surrounding garaging and maintenance facilities. Propane is the easiest alternative fuel to add to a fleet because the requirements to store, maintain, operate, and repair propane buses are very similar to buses powered by traditional fuels like gasoline and diesel. Facilities that are code compliant for conventional fuels are compliant for propane and typically do not require modifications to existing structures to accommodate propane buses. Ventilation, electrical, and sources of ignition requirements are the same as those for gasoline and diesel and there are no additional requirements for gas detection. Also, segregation of major and minor repairs is not required for a code compliant facility.

All facilities are required to comply with the National Fire Protection Association's Liquefied Petroleum Gas Code [NFPA 58] and Code for Motor Fuel Dispensing Facilities and Repair Garages [NFPA 30A]. More information on specific codes is available at nfpa.org and at propane.com/on-road-fleets. **Please consult with Authorities Having Jurisdiction [AHJ] prior to switching to any alternative fuel.**



By switching to propane buses, school districts will benefit from savings provided at the pump and beyond. All of these benefits leave more room to finance what matters most — educating students with more teachers, better resources, and maybe more field trips on those propane-powered buses.