Benefits of Propane for Rural Alaska

Propane for Rural Alaska

In 2008, the City of Tanana investigated using propane (liquid petroleum gas or LPG) as an alternative to diesel fuel. The City determined propane is:

- clean burning with significantly less pollutants than gasoline and diesel,
- next-generation technology, low-maintenance, efficient and reliable,
- safe and governed by stringent safety regulations.

Our nation uses more propane than any other country in the world. Propane is a natural gas liquid. LPG is extracted during natural gas processing and petroleum (oil) refining. Natural gas based propane provides around 55 percent of the propane used in the U.S., while the remaining 45 percent is extracted from petroleum. Petrochemical production of plastic, rubber, fertilizers, dyes and textiles uses 45 percent of the propane consumed in the U.S. Residential and commercial use accounts for 42 percent of propane used in the nation.

Propane Facts

Propane is an energy rich gas. One gallon of liquid propane weighs 4.24 lbs. compared to water that weighs 8.33 lbs. Propane does not dissolve in water. Liquid propane turns to gas at temperatures above at -44°F. Propane produces 91,600 BTUs per gallon while diesel/heating oil produces 134,000 to 138,700 BTUs. LPG has infinite "shelf life" and does not deteriorate over time like gas and diesel. Propane is odorless and an odorant (mercaptan) is added and smells like rotten eggs to serve as a warning agent for escaping gas. There are around 70,000 miles of interstate propane pipelines in the nation. There are more than 25,000 propane retailers.

Propane Safety

People may think that propane vapor might ignite easily, but ignition requires the right mix of air and LPG vapor. A propane/air mix must contain from 2.2 to 9.6 percent propane vapor to ignite. If a LPG mixture contains less than 2.2 percent gas, it’s too lean to burn. If it contains more than 9.6 percent, it’s too rich to burn. Propane won't ignite when combined with air unless the source of ignition reaches at least 940°F. LPG has a narrow range of flammability when compared with other petroleum products. In contrast, gasoline will ignite when the source of ignition reaches 430°F to 500°F.

The possibility of a propane tank explosion is extremely remote. Propane tanks do not explode, implode or rupture on their own. LPG has a remarkable safety record due to stringent regulations. LPG is a safe fuel and is used in millions of homes without incident. Propane fires accounted for 0.0034 percent of home fires. Village residents have expressed concerns about fire hazards, but as rural communities become more familiar with LPG, apprehension about propane will decrease.
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Propane Distribution
There are 70,000 miles of interstate propane pipelines in U.S.:
- 25,000 propane retailers
- 90 barges and tankers
- 35,000 fuel delivery trucks
- 22,000 railroad tanker cars
- 12,500 storage facilities
- 56,000 employees

Propane Cylinders
Propane weighs 4.24 lbs per gallon. A 100 lb tank holds 23.6 gallons of propane. Cylinders are filled to around 85 percent capacity (85% liquid and 15% gas) for expansion purposes. LPG expands with heat.

LPG Cylinder Certification
LPG cylinders must be recertified for safety 12 years from their date of manufacture and every five years thereafter.

Propane-Air
In the future, village homes and businesses may be heated by propane-air, a combination of vaporized propane and air, also known as synthetic natural gas (SNG). Natural gas utilities add SNG to natural gas during peak use periods.

Propane School Buses
The Clean School Bus USA Act of 2003 funds the nationwide upgrade of school bus fleets to low-emission vehicles. Texas secured $805,000 to develop and certify low-emission propane school buses. Alaska has no propane school buses.

Propane Delivery Along Alaska's Rivers
Propane is currently shipped to Yukon River villages in 100 pound (23.6 gallons) cylinders that require a lot of expensive handling. Large volumes of LPG need to be barged to villages using medium (1,000 gallon) and large (6,500 gallon) sized tanks for propane to be cost-effective. Very few villages have facilities that can handle $6,500 gallon propane tanks. Barge loading and unloading facilities in many villages are primitive or entirely absent. Inadequate docking services along Interior rivers increases transportation costs. A 2009 barge landing study looked at barge mooring and fuel/freight transfer needs of coastal and riverside communities and found villages need more cost-effective docks.

Clean Burning
Propane is clean burning. LPG exhaust creates 60-70 percent less smog-producing emissions than gasoline. Compared to gasoline, LPG yields 12 percent less carbon dioxide, about 20 percent less nitrous oxide and a 60 percent reduction in carbon monoxide. Discharge of toxins and carcinogens such as benzene are reduced by as much as 96 percent when propane is used in place of gas.

LPG combustion meets or surpasses nationwide clean air emission standards and produces low amounts of greenhouse gases. Propane is considered an alternative fuel by the federal government because it burns cleaner than gasoline, heating oil and diesel. Engines using propane remain clean, carbon-free and have minimal maintenance costs. LPG engine ignition does not leave lead, varnish or carbon deposits that cause premature wearing of pistons, valves and spark plugs. Many states offer fuel tax incentives to encourage the use of clean fuels. Texas has a federal tax credit of $0.50 per gallon for propane used in motor vehicles.

Canadian Propane
Much of Alaska’s propane is delivered by hydro-rail from Canada. LPG rail tankers are loaded into ocean-going barges in Prince Rupert, BC. A tug tows the barges to Whittier for transfer to the Alaska Railroad for shipment to Anchorage and Fairbanks. LPG is trucked to small communities. All this transportation adds considerable cost to propane delivered to Alaska.

The Tesoro Refinery in Kenai produces about the same amount of propane that is purchased from Canada. The refinery receives crude oil from Cook Inlet and the North Slope. Tesoro charges a few cents less per gallon than propane shipped from Canada.

The future large-gauge natural gas pipeline will allow Alaskans to process large quantities of LPG for in-state use. A gas plant can be constructed near the Yukon River Bridge. North Slope natural gas is considered a “wet” product with high concentrations of petroleum liquids such as propane. The facility would extract propane from natural gas for shipment to villages. Localized processing will reduce transportation costs and provide an abundant source of inexpensive LPG for much of rural Alaska.

Propane Employee Certification
Tanana received funding in 2009 to provide propane Certified Employee Training Program instruction for 15 individuals from villages such as Fort Yukon, St. Mary’s, Nenana, Kipnuk & Emmonak.
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Alaska Propane Use
A 2005 study determined Alaska uses 15 million gallons of LPG per year or 1,000 barrels per day. It is difficult to estimate the total amount of LPG used in Alaska since the Energy Information Administration does not show consumption figures for propane use in Alaska because LPG data is “withheld to avoid disclosure of individual company data.”

Propane Education Council
The Propane Education and Research Council receives a ½ cent per gallon assessment on each gallon of odorized propane. PERC collected $48 million in 2007 to improve consumer and employee safety, fund research and development LPG technology.

Denali Energy Projects
The Denali Commission’s 2007 annual report shows that $383 million has been spent in support of energy projects - 158 energy facilities have been completed, 78 projects are in progress and 56 are in the planning state. No funding has been allocated for propane facilities.

Propane GasCheck Program
Propane distributors operate the GASCheck program where technicians inspect residential propane systems and appliances to ensure they are running safely and efficiently.

CHP Technology
CHP systems are used extensively in Europe and Japan, but are fairly new in the U.S. CHP systems can have maintenance intervals of 10,000 hours. Propane is used by more than 60 million people in U.S. homes.

The YKPPD report is downloadable at: http://www.englishoe.com/ykpdpreportreducedfilesize2810reducedagain.pdf

Docking improvements along Alaska rivers receive very limited federal support. Federal transportation construction programs do not support barge landings and dock improvements because the government believes there is a lack of economic viability. The Alaska legislature has also not been funding barge landing and dock improvements along the Kuskokwim and Yukon rivers. Alaska needs to upgrade river loading and unloading facilities for propane to be economical in rural Alaska.

Interior Rivers Port Authority
Concrete actions need to be taken to improve loading and unloading facilities to handle propane expansion in villages. Propane distributors, trucking firms, barge lines and villages will need to work together to develop a river-based propane distribution system. A port authority is the best avenue to develop and manage docks and barge landings to accommodate large propane tanks. An authority could develop a regional port plan to address transportation and docking issues along Interior rivers. A port authority could enter into contract agreements, receive funding, issue bonds for construction projects, directly administer state land and acquire rights-of-way. The authority could potentially purchase bulk propane for shipment to villages.

Coastal Village Port Authority
A coastal port authority could be established to management port improvements for ocean-going propane barges. Small million gallon propane barges could provide coastal villages with low cost propane. The potential for ocean-going propane barges delivering LPG from the North Slope to coastal villages is real. The Beaufort and Chukchi Seas are becoming ice-free during summer months and the prospect of propane being shipped through the Arctic Ocean is valid. When villages along Alaska's rivers and coast have large LPG tank and transfer facilities communities can use vaporized propane to heat homes.

Propane-Air
Small communities in Canada use vaporized propane. In Whistler, Canada, the city vaporizes over 7 million gallons of LPG in aboveground facilities and distributes the propane-air through underground lines to homes and businesses. The vaporized LPG is metered and consumers were billed monthly. Whistler converted the propane-air delivery system to natural gas when the city was connected to a regional natural gas line.

Villages in the future with large LPG storage facilities can operate propane-air delivery systems. Propane-air can be piped to schools, government buildings, power plants, laundromats, businesses and homes. Homeowners can use vaporized propane for heating, cooking and clothes drying, just like families in Anchorage that are connected to natural gas. An underground delivery network would fundamentally be the same type used in Anchorage to delivery natural gas. There are millions of barrels of propane on the North Slope that can be used to heat rural Alaska.