# ONYX Propane Engine Technology Portfolio Strengthens and Widens

NEWS PROVIDED BY
**ONYX Systems, LLC** →
May 14, 2024, 08:17 ET

HUNTERSVILLE, N.C., May 14, 2024 /PRNewswire/ -- Market analysts are projecting the small gasoline engines market size set to surpass $10B by the end of 2035, growing at a CAGR of 7.2% during the 2023 – 2035 forecast period, from an industry size of around $4B in 2022. The rising carbon emissions awareness amongst many individuals and companies consuming small gasoline engines is a factor forcing many Original Equipment Manufacturers (OEM's) to look for alternative low-emission engine solutions, delivering the same application power, if not more. ONYX has developed a suite of Propane Powered small engines from 452cc (13 HP) to 999cc (31hp), for both vertical shaft oriented and horizontal shaft oriented applications.

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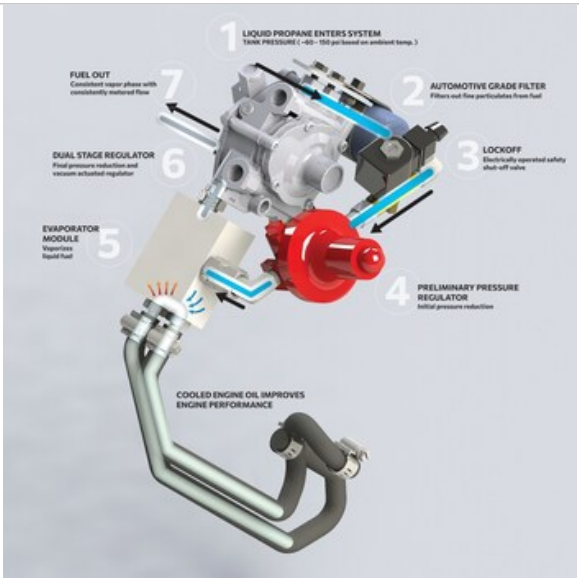
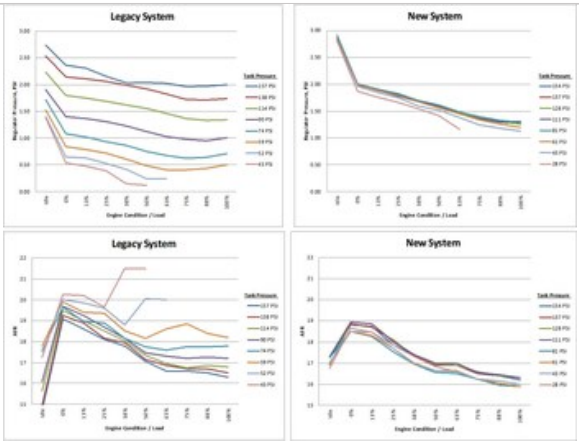
ONYX Small Off-Road Engine Line-up




ONYX 852cc (LX900) Propane Fuel System




852cc Engine Stability Improvement Charts

## Background – Propane Engine Technology

Over the years here in the US, widespread adoption of internal combustion engines using propane fuel systems has been slow. The main reasons being availability of propane fuel, affordable gasoline prices here in the US, and reliability performance issues with propane powered engines. More recently, with emission regulations closing in on gasoline and diesel-powered small engines paired with elevated gasoline and diesel prices, propane powered engine solutions are being viewed as a viable alternative. Propane is typically 30%-35% less expensive than gasoline and the supply of propane has become more widespread throughout the US over the last decade, e.g. most U-Haul locations nationwide have bulk propane filling stations and there are numerous propane distributors who will make regular propane tank deliveries or fillings for customers or at job sites. ONYX propane engines can run up to 100 times cleaner than their gasoline equivalent for exhaust emissions, with zero evaporative emissions from propane engines. This provides OEM's longevity to continue to use the superior power that internal combustion engines deliver in their products for the next couple of decades.

These factors together only leaves reliable performance concerns as the major remaining factor holding back the adoption of propane engine solutions for many industrial, agricultural, and lawn & garden applications. During the COVID era, ONYX embarked on an in-depth continuous improvement project to solve all of these endemic issues that have plagued propane fuel systems. ONYX has now incorporated these solutions into their latest engine families resulting in stable engine performance over a wide range of different operating conditions.

Traditional propane fuel systems do not precisely manage the fuel phase change within the fuel system, leading to fuel supply instability and unstable engine performance.

Summary of common and prevalent issues with all *legacy* Propane Fuel Systems:

1. Widespread use of vapor draw tanks opposed to using liquid draw tanks due to common regulator freeze and associated with using liquid draw tanks.
2. Fuel flow issues when running vapor draw propane tanks causing premature run times and engine instability, especially with heavy load applications.
3. Vapor draw tanks susceptible to pressure variations due to ambient temperatures and dropping tank pressure during use leading to engine run instability.
4. Frequent vapor draw tank overfilling leading to liquid fuel ingestion causing regulator freeze and damage and unstable engine performance.
5. System instability, engine stall, and component damage when running on liquid draw tanks.
6. Fuel pressure and flow delivery not accurately metered precisely enough by traditional propane fuel systems. Regulating from variable tank pressures (as high as 180psi) to a very precise jet pressure of 2psi is difficult using traditional fuel metering methods.
7. Propane "heavy ends" impurities in the Propane fuel leading to system "gum-up" and component failure.
8. Electronic Fuel Injection (EFI) systems are not robust enough or suitable for many industrial applications due to excessive unit vibration, mechanical stresses, and environmental conditions; and EFI would not solve many of the problems cited above.

ONYX has developed new propane engine technology that eliminates ALL of the traditional issues associated with propane engine systems.

**The ONYX Solution**

ONYX reconfigured our engine systems to run on either liquid or vapor fuel.  Specific configuration improvements include:

1. Addition of appropriately specified automotive-grade LPG fuel filter and fuel lock-off orifices to eliminate fuel flow restrictions.
2. Addition of preliminary primary regulator to stabilize the fuel pressure being presented to the evaporator module.
3. Addition of proprietary evaporator module to manage the effective phase-change of the fuel from liquid to vapor under controlled conditions.
4. Engine oil is fed through the evaporator module to promote the fuel phase-change resulting in cooled engine oil, to improve engine performance.
5. Redesigned 2-stage regulator.
6. Carburetor optimizes flow of air and fuel for significant increase in power.

An illustration of the new fuel system is shown below.

**Test Results**

The charts below are result from testing where we measured the primary 1st stage regulator pressure (in 2-stage metering regulator) and overall engine AFR when subjected to various levels of supply pressure and across the entire spectrum of engine load.

All tests were conducted on dynamometer with same 852cc Kawasaki Engine, supplied by vapor draw fuel tank.

Results clearly shows that in the Legacy System the supply pressure has a significant impact on the regulated pressure and engine performance (AFR).

In contrast, in the new system the supply pressure has virtually no impact to regulated pressure, fuel supply and AFR.

**Conclusion**

In conclusion, the new system is far more capable of handling the expected changes to supply pressure during use of a vapor-draw cylinder caused by variation in ambient temperature and dropping cylinder pressure.

The table below lists key measured engine performance values, highlighting the amount of improvement from our legacy Kawasaki 852cc system (LX850 engine) to the new Kawasaki 852cc system (LX900 engine).

The engine performance improvement on the Kawasaki 852cc engine is quite staggering with a **27%** increase in maximum horsepower and **13%** improvement in peak torque generated by the engine (by the same engine with our new modified propane fuel system).

| Engine Power Performance Test Results | LX850 - 852cc Legacy System | LX900 - 852cc New System | Delta/ Improvement |
|---|---|---|---|
| Maximum Gross Power (hp) | 20.59 | 26.21 | 27 % |
| RPM @ Max Power | 2800 | 3400 | N/A |
| Gross Peak Torque (Ft.lb) | 40.48 | 45.60 | 13 % |
| Power @ 3600 RPM (hp) | 16.90 | 25.20 | 49 % |
| Power @ 3300 RPM (hp) | 19.00 | 26.02 | 37 % |
| Power @ 3000 RPM, (hp) | 20.33 | 25.12 | 24 % |

These results are an impressive conclusion to a lot of hard work by the ONYX engineering team. We are proud of our technology and with Propane emissions running two orders of magnitude below those of comparable gasoline engine emissions we firmly believe that our propane engine technology is a viable, economical, low-emission bridge technology for industrial applications for the next 15-20 years.

**Our engineering team offer engine integration services to ease the design process for your particular application(s).**

**We are also currently seeking Small Off-Road Engine distributors and dealers to work with. Interested distributors and dealers in this space please contact us to begin a conversation.**

**For more information on our technology contact sales@onyxsolutions.com or call ONYX at (800) 858-3533.**

**About ONYX Systems, LLC:**

Based in North Carolina, ONYX Systems, LLC is a leading provider of floor scrubbers and polishers for commercial and industrial use. Their high-quality products have been designed for efficiency, ease of maintenance, and serviceability, and are widely used by Business Service Contractors (BSCs) nationwide. ONYX is also a supplier of clean, eco-friendly propane engines, powering various industrial equipment and paving the way for a zero-emission future.

To learn more about ONYX Systems, LLC and our range of products and services, please visit our website. We are excited to continue setting new standards in the industry and look forward to serving our customers with the highest level of excellence.

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ONYX Propane Engine Technology Portfolio Strengthens and Widens. Seeking Small Off-Road Engine Distributors and Dealers. Contact us to start a conversation.

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