

Achates Power Opposed-Piston Engine Sets New Benchmark for Fuel Efficiency

Published data from extensive testing shows Achates Power engine is 20 percent more fuel efficient than a recently introduced, state-of-the-art, four-stroke diesel engine

SAN DIEGO – Nov. 1, 2011—[Achates Power](#), a developer of radically improved internal combustion engines that increase fuel efficiency, reduce greenhouse gas emissions and are lower cost, today announced its highest engine efficiency test results. The results demonstrate a 20 percent improvement in fuel efficiency when compared to a recently introduced, award-winning, state-of-the-art, four-stroke diesel engine.

This milestone represents a seven percent gain since September 2010. Achates Power has demonstrated newly increased engine fuel efficiency results in every quarter of 2011, beginning with a 13 percent efficiency advantage presented at the [Symposium on International Automotive Technology \(SIAT\)](#) in January, a 15.5 percent efficiency advantage in June, and a 19 percent efficiency advantage presented at the [SAE Commercial Vehicle Engineering Congress \(ComVEC\)](#) in September. Brake thermal efficiency of 45.1 percent has also been demonstrated at the best engine operating point with an overall calibration that meets the stringent U.S. EPA 2010 emissions standard.

“Achates Power’s published technical results are demonstrated and validated from dynamometer tests of running engines, and have been validated by numerous third-party, independent sources,” said David Johnson, CEO, Achates Power. “No other independent engine developer has matched this level of reported data and results. As commercial and passenger vehicle manufacturers continue to seek improved fuel economy, our data speaks for itself and sets Achates Power apart in the market as a key player in the future of clean, efficient and cost-effective vehicle transportation.”

As confirmed by dynamometer testing, the Achates Power opposed-piston architecture with the two-stroke cycle has improved brake thermal efficiency resulting from a combination of the following four effects:

- Reduced heat transfer due to the more favorable combustion chamber area/volume ratio of the opposed-piston architecture;
- Increased ratio of specific heats due to the leaner operating conditions of the two-stroke cycle;
- Decreased combustion duration achievable within maximum pressure rise rate limits due to the more rapid expansion of the in-cylinder volume-per-crank degree angle; and
- Reduced pumping work as only a portion of the residual gases in the cylinder need to be scavenged at each cycle.

The thermodynamic rationale for these results is documented in the SAE International Paper [2011-01-2216](#), presented at SAE ComVEC on Sept. 14, 2011. The most recent 20 percent fuel efficiency improvement is from ongoing enhancements, including the latest hardware upgrades and calibration improvements and more than 2,500 hours of testing at the company’s San Diego facility.

When compared to the published performance data of one of the best medium-duty clean diesel engines in the world, the Achates Power engine demonstrates:

- 20 percent lower cycle average brake-specific fuel consumption
- Similar engine-out emissions levels
- Less than 0.1 percent fuel-specific oil consumption
- Reduced cost, weight and complexity

Dr. Paul Miles (Ph.D., Cornell), a Distinguished Member of the Technical Staff at Sandia National Laboratories and co-chair of SAE powertrain activities, applauds the methods Achates Power employs to determine engine performance, fuel

consumption and emissions characteristics. “Achates Power employs industry-standard instrumentation and methods to benchmark its engines at multiple engine load and speed points representative of regulatory test cycles,” he said. “The single-cylinder results are then carefully extrapolated to expected multi-cylinder results using a rigorous interface model. These are real-world numbers. The outstanding fuel economy and emissions it reports are a testimony to the effectiveness of the fundamental research and development work I have seen at its San Diego facility.”

“Through the application of rigorous science and engineering methods, Achates Power has overcome historical two-stroke engine challenges,” said Dr. David Foster (Ph.D., MIT), a professor of mechanical engineering at the University of Wisconsin-Madison, an Achates Power technical advisory board (TAB) member, and an expert in the field of internal combustion and fluid dynamics. “Achates Power uses sophisticated models and powerful computers to analytically solve the complex combustion processes of the opposed-piston, two-stroke cycle.”

Achates Power has built state-of-the-art laboratory facilities utilizing leading-edge testing, simulation and analysis tools; developed more than 1,000 patentable innovations; demonstrated the superior performance of its engines; and garnered the attention of top manufacturers around the world. The company has a highly-regarded TAB that includes National Academy of Engineering members and SAE Fellows with more than 200 years of combined experience. Achates Power is backed by Sequoia Capital Partners, RockPort Capital Partners, Madrone Capital Partners, InterWest Partners and Triangle Peak Partners. It was founded by Dr. James Lemke with investment from the late John Walton, son of Sam Walton, the founder of Wal-Mart.

For more information, [contact Achates Power](#) directly by emailing inquire@achatespower.com or calling 858.535.9920.

About Achates Power

Achates Power (www.achatespower.com) has developed radically improved internal combustion engines that increase fuel efficiency, reduce greenhouse gas emissions and are lower cost. Founded in 2004—by serial entrepreneur and influential physicist Dr. James Lemke who has more than 100 patents—with the mission to build fundamentally better engines, the San Diego-based company has more than 40 in-house engineers and scientists with proven technical know-how and expertise, coupled with the industry’s leading-edge testing, simulation and analysis tools. Achates Power has received widespread recognition from groups such as *Business Week*, AlwaysOn, The Guardian and Cleantech Group for its leadership in the Clean Tech sector. For more information, visit www.achatespower.com, www.twitter.com/achatespower and www.youtube.com/achatespowerinc.

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