Introduction to the new Hansen Supercharger™

Summary: Hansen Engine Corporation has developed a variable-displacement mechanically-driven supercharger to enable cost-effective engine downsizing with equal or better fuel economy than exhaust-driven turbocharging, and without ‘turbo lag’ or expensive auxiliary drives to reduce turbo-lag. This advancement is made possible by its variable-displacement feature which eliminates conventional supercharger inefficiency during the frequent ‘partial boost’ drive cycle conditions. Data from independent testing at Ricardo shows that it reduces drive power losses by 35-50% compared to a conventional supercharger during the US06 cycle. On-engine dynamometer testing at McLaren Performance Technologies provides further independent confirmation. The Hansen Supercharger™ system provides a practical and cost-effective single-device boost system for which the instant throttle response and improved drivability characteristics of superchargers are no longer handicapped by the fuel economy penalty of conventional superchargers relative to turbochargers.

The Hansen Supercharger™ Technology presents an innovative new supercharging technology invented and patented by Hansen Engine Corporation which has now been fabricated and laboratory tested. The primary distinguishing feature of this new supercharging system is “continuously variable displacement,” which contrasts with conventional fixed-displacement superchargers. Laboratory measurements have established that the new variable displacement system consumes only half the power of a conventional fixed-displacement supercharger to operate at the speeds and boost pressures that dominate the US EPA automotive driving cycles. These power savings directly reduce fuel consumption, and the Hansen Supercharger™ enables a greater degree of engine downsizing which allows for further fuel savings.

Conventional superchargers are of a FIXED-displacement design which cannot be varied. They are typically sized to yield a required peak power at the engine’s highest speed and power setting. Unfortunately, that sizing is only efficient at that highest speed and power level, and such sizing actually wastes fuel during the more common low speeds and power settings encountered during normal driving. At driving conditions of lesser speeds and power, a great deal of “excess air” is processed by the conventional fixed-size supercharger only to be discarded without benefit resulting in elevated parasitic power losses to drive the supercharger. The Hansen Supercharger™ efficiently processes only the necessary quantity of air without excess, and is therefore more fuel efficient.
“Variable displacement supercharging” complements the current industry trends in engine down-sizing and engine down-speeding. The new supercharger provides important improvements in throttle response, low-end torque, and fuel economy. Engine boost systems have historically targeted high-performance niches. In contrast, the Hansen technology is focused on fuel economy and drivability for the normal drive cycle.

The new supercharger has been successfully tested by two independent laboratories. First, “flow-bench” testing at Ricardo indicated that the Hansen Variable-Displacement Supercharger provides savings of 35-50% in shaft power to operate at speeds and manifold pressures typical of the US-06 drive cycle. This reduction is measured in comparison to a conventional “fixed-displacement” supercharger sized to meet the same low-speed “torque knee” boost requirement. Second, “engine-mounted” dynamometer testing was successfully completed at McLaren Performance Technologies, an independent Detroit testing laboratory. However, specific test results cannot be disclosed because they are subject to a current Non-Disclosure Agreement among the parties to this testing program. Hansen Superchargers™ can be made available to others for similar on-engine dynamometer testing.

In light of the supercharger shaft power savings measured during the Ricardo testing, the variable Hansen Supercharger™ driveshaft work is essentially equivalent to the turbocharged engine’s elevated exhaust pumping work. Because the supercharger is mechanically driven, it creates no back pressure in the exhaust system. As a result, the knock-limited compression ratio of a supercharged engine is beneficially higher than a turbocharged engine because the heat capacity of the high-density retained exhaust gas reduces the detonation-limited compression ratio of the turbocharged engine. Therefore vehicles and engines designed specifically for supercharging rather than turbocharging will benefit from such fuel-saving factors as increased compression ratios, optimized ignition timing, larger exhaust runner cross-sections, and improved axle ratios and transmission shift schedules.

A vehicle designed to take full advantage of the supercharged engine may meet or exceed a turbocharged vehicle’s fuel economy when operating at the variable speeds and manifold pressures typical of the US-06 drive cycle. This presents the opportunity for a significant shift in the boost system preferences of the auto industry. The Hansen Supercharger™ system provides a practical and cost-effective single-device boost system for which the instant throttle response and improved drivability characteristics of superchargers are no longer handicapped by the fuel economy penalty of conventional superchargers relative to turbochargers.
Hansen Continuously Variable Displacement Supercharger
US Patents issued: 7,726,285, 8,256,403, 8,302,401, 8,539,769, and 8,813,492
(Associated Chinese and Japanese patents have been allowed, and other foreign applications are pending)

Superchargers are available for inspection and demonstration once suitable Non-Disclosure Agreements are in place. A “concept demonstration” plastic replica could also be made available. The Company's corporate law firm is Briggs & Morgan which is responsible for NDA accommodations. Next steps may be initiated by contacting either of the corporate officers below:

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