

UNDER THE HOOD

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UNDER THE HOOD OF THE 2007 SATURN VUE GREENLINE

Like most hybrids, the only way to externally identify that the Saturn Vue Greenline uses an internal combustion engine and electric propulsion is by observing the hybrid logo. However, the hybrid technology of this SUV is quite different from its competitors. Using a belt alternator system (BAS), the Vue's hybrid system costs less than \$2,000. The mild hybrid provides fuel economy and performance benefits for drivers.

HYBRID SYSTEM

Even though the motor-generator of the BAS mounts similar to the traditional alternator, there are a few design changes that range from

vides 12 V vehicle accessory power weighs less than 9 kg. Concealed under the cargo floor between the rear wheels, the 36 V NiMH battery can deliver and receive more than 10 kW of peak power.

To handle peak power requirements and ensure sufficient belt tension, the hybrid accessory drive has a hydraulic strut tensioner and a friction-damped rotary tensioner on a common pivot arm. A single high-strength aramid cord belt connects the damper, A/C compressor, dual tensioner, and the motor/generator.

Modifications to the electronically controlled transaxle include the addition of an auxiliary electric oil pump that maintains oil pressure when the engine is off. A solenoid controls the downshifting during regenerative braking. Other mechanical changes balance power and fuel economy and allow coast braking.

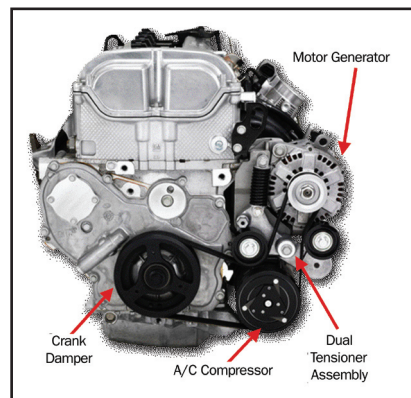
The vehicle's cooling system also cools the power electronics inverter and the dc-dc converter. To manage both the hybrid system and the 2.4-liter, 4-cylinder gasoline engine, the engine control module includes hybrid supervisory software that communicates via the high-speed CAN protocol.

HYBRID PERFORMANCE

With estimated fuel economy of 27 mpg city/32 mpg highway, the Vue Greenline provides a 20% fuel economy improvement over its non-hybrid counterpart. Testing conducted by independent test lab AMCI on 2006 SUVs from three other manufacturers and a standard 4-cylinder Vue show rather impres-

sive results. All vehicles were driven over a 500-mile route that had city and highway conditions and by each of six test drivers to provide the same driving pattern. The BAS Greenline achieved 4.7 mpg over the standard Vue and was within 2 mpg of the best performing full hybrid.

The improved fuel economy



The hybrid accessory drive uses a dual tensioner that combines a hydraulic strut tensioner and a friction-damped rotary tensioner on a common pivot arm.

strategy includes:

- Shutting off the engine when the vehicle is stopped.
- Restarting the engine when the brake pedal is released.
- Shutting off fuel during vehicle deceleration.
- Recovering vehicle kinetic energy during deceleration.
- Charging the battery under the most efficient conditions.
- Providing additional power from the electric motor/generator during launch and as required, such as during wide open throttle.

The motor/generator supplies additional power during launch and at wide open throttle for improved performance with a rating of 170 hp, instead of the 143 hp provided by the 2.2-liter engine in the conventional four-cylinder Vue. ■



The high-voltage NiMH battery in the Saturn Vue Greenline is nominally 36 V and buried under the vehicle's cargo floor.

obvious to subtle. On the obvious side are the motor/generator, the power electronics and the battery. Subtle design changes in the Vue hybrid include the hybrid accessory drive, modified transaxle and cooling for the power electronics.

The 16-pole motor-generator provides 60 Nm of torque and 4 kW of power and generates 5 kW. The power electronics that control the motor/generator, dc-dc converter, and other functions such as the transaxle auxiliary electric oil pump, and pro-