

Higher Voltage for High-Tech Cars

By ANNE EISENBERG. Electrical systems in cars are about to hit their limits. If power brakes, power steering and air-conditioning have not drained them, additions like cell phones, Internet connections, heated mirrors and seats, rear air-conditioning blowers and electronic navigation will surely suck up any power that remains.

And that is only the beginning. Next-generation cars will have even more features, like electro magnetically controlled suspensions designed to let riders float over bumps and jolts, as well as electronic motor controls that will reduce both gasoline consumption and polluting emissions.

The current electrical systems just can't cope. So behind the scenes, auto makers and suppliers have spent the past few years planning a replacement: 42-volt systems. These mini-power plants will be on the scene as soon as 2004. While current systems provide up to 3 kilowatts, or 3,000 watts, of power, the new high-voltage systems will provide 8 kilowatts or more.

The change will be a major one because connectors, wiring, batteries, alternators, cables, switching and many other components will have to be re-engineered.

"Virtually every system on the car is affected," said Cary Wilson, director of electrical and electronic systems at Ford Motor Company. Despite the complexity of the job, Mr. Wilson said, it is clear that little additional power can be wrung from the present systems and that full-scale change is imminent. "It's not a matter of if," he said, "but a matter of when."

BMW may be the first to introduce the new high-voltage systems. "We plan to have a 42-volt system in place as early as 2004," said Peter Thoma, manager of electrical and electronic systems at the BMW Group in Munich. "The future car will still have a combustion engine, but other than that, it makes sense to go with pure electric power."

New 42-volt systems like BMW's will probably feature one powerful, integrated device that is both a starter and a generator.

"The starter as we know it today, that only rotates when you are trying to start the car, will be removed," said

Thomas Keim, co-director of a consortium, based at the Massachusetts Institute of Technology, on advanced electrical and electronic components and systems. "And so will the generator or alternator that sits outside the engine at the front of the car, driven by a rubber belt."

The replacement for these parts is a new machine that will function as a starter and then, when the engine is running, as an alternator. The integrated starter and alternator will probably be mounted on the crankshaft between the transmission and the engine, Dr. Keim said.

Ford is considering that kind of setup. "We are looking at one integrated starter and alternator combined in a machine that goes between the engine and the transmission," Mr. Wilson said. With such a device, a car's engine would shut down at a traffic light, and then, with a burst of power, start up again in an instant. (Actually, it would take about a fifth of a second.)

Mr. Cary predicted that auto makers would gradually convert to 42-volt systems, starting with dual, hybrid systems offering both the older voltage and the new 42-volt system. "Fuel economy, instant start-stop and maybe electrical power steering and brakes could take advantage of the 42 volt system," he said, while lighting, the stereo and other applications could be handled by the older system.

Dr. Thoma, of BMW, prefers the idea of switching directly to a full 42-volt system. "We are more interested in jumping directly into 42 volts," he said. "If you have two voltages, it means more cost and more weight."

A consortium sponsored by the Society of Automotive Engineers in Warrendale, Pa, is looking into standards for 42-volt systems, as are several other international groups.

"We are all very eager to sing off the same sheet of paper," said Dr. Keim, whose coalition at M.I.T. includes 44 auto makers and suppliers. The group meets regularly to hash out issues underlying standards for the new system. "There are so many issues that need to be worked out when you combine voltages," Dr. Keim said. "For instance, what is the stan-

dard for jump-starting a car?" he asked, pointing to the possibility of damage when different voltages collide.

Although many kinks must be worked out, Dr. Keim said that 42-volt systems would improve engine efficiency while reducing emissions. That will happen not only through the stopping and starting of the engine, but through enhancements like electronically driven engine valves, which will carefully control the input and exit of air and fuel.

Experts also expect electronic clutches, heated catalytic converters that will reduce emissions and steering and braking systems that will eliminate hydraulics.

The new 42-volt systems are likely to appear first in luxury cars.

"There are so many advantages," said Richard T. Johnson, engineering director for Bolder Technologies in Golden, Colo., a battery manufacturer. "All the accessories that are presently on the drive belts will be electrical so they won't have to run all the time." Accessories like air-conditioning consume power whether they are being used or not. "You are driving the belt whether the air-conditioning is on or off, turning energy into heat," he said. With the 42-volt system, accessories like air-conditioning compressors and power steering motors will be driven not by belts but by the electronic system.

Although automakers and suppliers are not certain when 42-volt systems will arrive, there is a consensus about one thing: the public is going to call it a 36-volt system, just as they describe the present system as 12-volt.

"It's actually a 14-volt system, the voltage of today's 12-volt cars when running," Dr. Keim said. "But people judge by the battery." The 12-volt battery so familiar to car owners, especially when it dies on a cold day, actually has an operating voltage of 14 volts once the engine is running.

"Consumers will probably think of the voltage as three times 12 or 36," he said, "even though it will be three times 14, or 42."

The New York Times
Thursday, April 6, 2000