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AN AMAZING 75 - MPG HYBRID ELECTRIC CAR

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With the price of gasoline already out of sight, just about everyone is scrambling for a way to squeeze the last possible drop of energy from each precious gallon. However, David Arthurs-of Springdale, Arkan sas-probably couldn't care less ... because he has designed and built a car that can travel 75 miles or more on just four quarts of the expensive liquid!

What's his secret? Well, Dave's Opel CT is a hybrid electric vehicle. That is, the car is driven by an electric motor . . . but that powerplant's "juice" is generated with the help of an ordinary, fuel-stingy lawn-mower engine! Now the fact that the system works isn't really surprising. What's amazing is that the crossbreed hookup performs so well! According to David, the Opel has not only a virtually unlimited range (when driven prudently), but also a top speed of 90 miles per hour . . . and emits a minimum of pollutants as it tools along the highway. Better yet, the car can-if need be-run on its batteries alone for short in-town hops . . . and will never be "stranded" as long as there's fuel in the "on board" generator!

WORLD WAR II TECHNOLOGY

Mr. Arthurs is the first to admit that there's nothing "new" to the system he's developed . . . in fact, all the technology incorporated into his design has been available for about 35 years, just waiting for someone to put two and two together and make the whole thing work. "I began researching the idea for a hybrid electric auto about a year ago. There wasn't much information to be found on the subject, so I designed a system from scratch. In about a month's evening-and-weekend time, I had the car finished and running."

Surprisingly enough, the project didn't cost a fortune, either. Because the vehicle's components are either standard "off the shelf" hardware or available as reasonably priced military surplus, the conversion to "hybrid drive" only set Dave back about $1,500. By the same token, any necessary replacement parts are easily obtainable . . . and a good deal of the equipment can be "scrounged" rather than purchased new.

HOW IT WORKS

In essence, David has utilized a small gas lawn-mower engine to drive a generator, which-in turn-supplies the vehicle's drive motor with electricity. To do so, he first removed the Opel's original power-plant and installed a 400-amp DC motor/ generator (actually a jet engine's starting motor) in its place. (Since there's no need for a clutch in Dave's setup, the stock unit was pulled out and the main shaft of the drive motor was fastened directly to the input shaft of the car's transmission.) Then, to provide a consistent source of power for this motor (and to supply an energy storage bank), the engineer installed four 12-volt, heavy-duty automobile batteries-in series-which are "fed" by a 100-amp generator that's run off a 5-horsepower lawn-mower engine.

Of course, other components (such as relays, charging diodes, rectifiers, and an additional motor speed regulation circuit) are necessary to keep input and output power within optimum limits-and to allow full control of the vehicle at all speeds-but these are standard electrical parts which have been available for years.

The engine-driven generator can handle the demand from the main motor up to speeds of about 50 miles per hour. The "stored" energy in the batteries comes into play at higher velocities, giving extra kick for passing and climbing hills. To guarantee that the charging system isn't overworked . . . Dave has rigged up a regenerative braking circuit which- in effect-turns the drive motor into a generator, to feed the batteries when the vehicle is decelerating. (This not only takes advantage of normally wasted energy, but also saves wear and tear on the car's conventional braking system.) Since the Opel's "stock" cooling apparatus has been removed, two small thermostatically controlled electric fans provide ventilation to the motor and generator as required ... while the gasoline engine is, of course, air-cooled by design.

GROWING PAINS

Any project fresh off the drawing board has its share of problems, and the Opel hybrid was no exception. When David pressed the accelerator for the first time, he got a 300-amp surge which melted his relays. So he searched his graduate texts for the answer ... and finally found it in-of all places-an old high school physics book: A pulser was necessary to "chop" the current flow and prevent a heavy initial draw to the drive motor.

As Dave explains it, "The motor will always have full voltage and full current, but the pulser makes it 'think' the voltage and amperage are cut down to about 1/4 of what's actually available. With this gadget-which is simply a combination of a reworked car generator and an old fan motor-I can keep the draw within limits and effectively control the car's acceleration . . . without sacrificing the maximum current or voltage that's necessary for high-speed driving. I could have achieved the same results with a commercially available FCR control ... but one of those units would have cut my power slightly, and cost in the neighborhood of $800! I can build my own device for about $25, and I can fix it myself if it breaks!"

AND IT'S REALLY PRACTICAL!

Actually "piloting" the hybrid electric isn't much different from motoring in any conventional automobile. There's a slight hum from the electric motor, but the sound is certainly no more obvious than that of an internal combustion engine at speed. And-unlike many electric vehicles-the little Opel' really has some get-up-and-go . . . due to the fact that the converted car is only about 50 pounds heavier than its original 2,100-pound weight.

Of course, some folks will question the idea of shifting without a clutch . . . but with the fully synchronized gearbox-this doesn't prove to be a problem at all (and the motor could be run through a conventional clutch with few complications).

As far as the driving range is concerned, Dave points out that-if driven carefully the car can travel unlimited distances (as long as the generator engine continues to function) . . . because of the fact that the motor has a low draw at cruising speeds: only .23 amps at 1,800 RPM. Since the Briggs & Stratton engine turns at a fixed rate and can generate 100 amps at about 28-1/2 volts, normal driving presents no problem. Hot or traveling in a very mountainous area-could, however, tax the car's charging system . . . but even these demands don't pose much of a problem, because the batteries can be brought from a 1/4 charge (the effective "dead" state, with a built-in safety factor) to a full charge in only 15 minutes.

David Arthurs' electric Opel sounds almost too good to believe . . . and best of all, its circuitry can probably be adapted to just about any vehicle on the road today! It is true that small, lightweight cars are more easily "hybridized", but this same system will also work in a heavier auto . . . it could even be upscaled to suit one of the large American models.

In short, Dave has succeeded in doing-for a lot less money-what countless government-funded researchers have failed to accomplish: building a passenger car that uses a minimum of energy. Now all he has to do is burn "homegrown" alcohol fuel in his generator engine . . . and Mr. Arthurs will have the most economical set of wheels in town!

Hybrid Car Plan

Plans for the Hybrid car, item number 1764 are available for $25 at www.MotherEarthShopping.com or by calling 800-234-3368.