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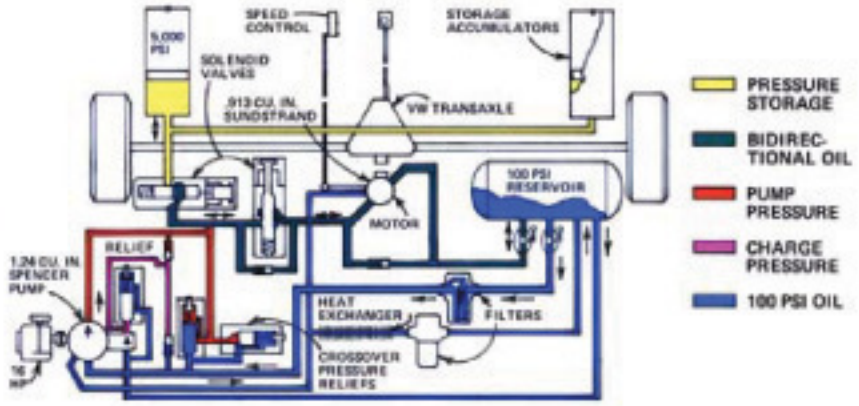
THIS CAR TRAVELS 75 MILES ON A SINGLE GALLON OF GASOLINE!

IT seems that Portland, Oregon's Vincent Carman (see "Can This Transmission Really Double Your Car's Mileage?" in MOTHER NO. 48) isn't alone. At least one other group of inspired experimenters has found a way to use hydraulics to vastly increase an automobile's gas mileage.

UPPER RIGHT: Instructor Parker whizzes on down the road in his advanced engineering class's 75-mpg automobile ... sans steamlined body. ABOVE: Two views of the stationary vehicle ... and the car with its clothes on. The guts of the hydraulic drive train and energy storage system ... Ernie adjusts the 16-hp engine ... and a 3/4 rear view of the street-ready auto. BELOW: Schematic of Basic HVTC drive system.



That group is a class of advanced students at Minneapolis, Minnesota's Hennepin Vocational Technical Center. And under

the guidance of instructor Ernie Parker (and without ever having heard of Vince or his Inertial Storage Transmission), the class recently designed and built what they call a "hydraulic storage transmission".

Does it work? It sure does! As the students have already demonstrated, when their special drive train is coupled to a 16-hp Tecumseh engine, installed in a Volkswagen chassis, and covered with a Bradley GT body ... the resulting one-of-a-kind automobile will travel (at speeds up to 70 mph) an incredible 75 miles on a single gallon of gas.

That's impressive, especially when you remember that the HVTC fuel-stretcher was entirely constructed from off-the-shelf components that are readily available to any home mechanic in any part of the country. The sleek little automobile contains absolutely no exotic technology or hardware at all.

IT ALL BEGAN IN 1920

The HVTC class project was originally launched because of a 1920 magazine article brought in by student Tom Steincamp. The piece described an automobile with a hydraulic drive train and labeled the vehicle "the car of the future". Some library research and a few group discussions soon convinced the class that the idea was a good one ... but that it would be even better if an energy saving accumulator was added to the hydraulic system.

Before long Parker's crew had roughed out a preliminary design of the new hydraulic drive. And the concept looked so good on paper that the group simply decided to go ahead and build one to see how it would work.

THE FIRST PROTOTYPE WAS A DUD

Parker's students quickly scrounged up a well-used VW chassis, a 60-hp VW engine, and enough hydraulic odds and ends to assemble a crude prototype of their design. It was a disappointment. The vehicle ran well enough, but it consumed only slightly less gasoline than a stock Volkswagen.

"This thing's got just too much horsepower," someone said. "Maybe a VW with a stock transmission needs 60 hp to get around ... but with the hydraulic drive train we've designed, I think a Volkswagen can get by with one heck of a lot less muscle."

Everyone agreed and the team of experimenters quickly rounded up a tow vehicle and began running a series of "drawbar tests" to determine the least amount of engine they needed to adequately power their 1,800-pound car. Result: The students concluded that a 16-hp Tecumseh overhead valve powerplant would do the job ... provided that their VW chassis was enclosed in a very aerodynamically clean envelope. (Say, something like the Bradley GT body that somebody just happened to want to donate to the project!)

HVTC CAR NUMBER TWO WORKS!

Just as Ernie Parker's engineering team was finishing its Second- generation "fluid powered" carriage, the opportunity arose to enter the machine in a Minnesota Society of Automotive Engineers economy run.

The test course was a 100-mile "average" trip (one-third city, one-third suburban, and one-third country driving) and the HVTC vehicle had less than one mile on it when the rally began. As far as this particular car was concerned, then, the run was far less a competition than a shakedown cruise to flush out the bugs which always hide in every new engineering concept.

Sure enough, the HVTC automobile had its share of gremlins ... one of which was so serious that the car rolled up "only" a "disappointing" 50 mpg. As instructor Parker explains it:

"A valve we had changed the evening before vibrated closed, thus starving the vehicle's hydraulic pump of oil. If we'd mounted the valve's lever just 90 degrees to the left or to the right, this wouldn't have happened. The mistake really murdered us in the competition, though, because-with that valve closed-our car's engine had to pump twice as much oil as necessary to push the machine down the road."

Were the HVTC students licked by this less-than-ideal first public showing of their hydraulically driven automobile? Of course not! They just pitched in, exorcised the imps and goblins from the car, and put the machine back on the road. Further tests soon showed that the vehicle's combination of [1] aerodynamic body, [2] 16-hp engine, and [31 "infinite

gear ratio" hydraulic drive and energy storage system is a real winner.

The little car will accelerate from 0 to 60 miles per hour in a very satisfying eight seconds. Furthermore, under "no wind" conditions, the automobile can cruise down the highway at a steady 70 mph ... while carrying a reserve in its accumulators that will push it on up to higher speeds for a short distance. And it does all this on a maximum fuel consumption of .9 gallons per hour ... which works out to a shade better than 75 miles per gallon. (Are you paying attention, Detroit?)

Still, Ernie's class is quick to point out that its car can be improved a great deal more. One of the most obvious refinements, the students say, will be the elimination of the vehicle's VW transaxle. "We left the transaxle in so we wouldn't have to redesign the VW chassis's suspension," they point out, "which means -since nothing is 100% efficient- that we've combined the inefficiencies of our hydraulic drive with the well-known inefficiencies of the old mechanical drive. If and when we couple our hydraulic motor directly to the car's wheels, we should realize a marked improvement in our car's efficiency."

THE SAME, YET DIFFERENT

The Hennepin Tech students' energy storage transmission is, in some ways, quite similar to Vince Carman's Inertial Storage Transmission featured in MOTHER NO. 48. Both use off-the-shelf hardware and well-proven technology. Both dramatically extend an automobile's gasoline mileage by capturing, storing in an accumulator, and later using the energy that ordinary automobiles normally waste during braking and when they are idled in city traffic with their engines running.

But the two transmissions are quite different too. Carman, for instance, uses "fixed displacement" pumps and motors in his hydraulic drive train because he feels that they're the most efficient ... while the HVTC student team chose "variable displacement" hardware because such pumps and motors are easier to control.

Another major difference: The Portland car's engine is run at a constant rpm and is turned off as soon as it has pumped a predetermined pressure into the accumulator in its hydraulic drive line. In the Minneapolis vehicle, on the other hand, the engine's rpm is allowed to vary according to the amount of pressure that is in the drive line's accumulator and how fast that pressure is being drawn off ... and the powerplant is almost never shut completely down while the car is moving.

The two vehicles' speed control systems work differently too. Any time the operator's foot is removed from the accelerator in Vince's car, the automobile is automatically put into a "braking mode". (The car is rapidly slowed down as the turning of the rear wheels runs a pump which pushes hydraulic fluid into the drive line's accumulator.) The accelerator pedal on the HVTC machine, however, is pivoted in the middle. When the driver pushes with his or her toe, the car speeds up. Heel pressure throws the system into braking mode and rapidly slows the vehicle down. And when the operator removes his or her foot from the pedal altogether, the car's drive system switches into a freewheeling neutral, and the machine coasts.

IS THE HVTC CAR IN YOUR FUTURE?

Even though Ernie Parker's class fabricated its "car of the future" from standard hardware that's available to any family mechanic (or Detroit engineer) today, it's doubtful that GM, Ford, or Chrysler will start cranking out carbon copies of the HVTC automobile any time soon. If you want one of the 75-mpg vehicles for your own use ... well, you'll probably have to put it together yourself.

And maybe MOTHER will be able to help make that possible. Naturally, a great deal of testing remains to be done on the HVTC concept, the design will undoubtedly be refined as time goes on, etc. But this magazine's editors intend to monitor the work of Ernie Parker's group closely, do what we can to help the engineering team hone and develop its ideas ... and keep you informed of the progress that is made. Perhaps, before too long, we'll even be able to offer you plans that you can use in the construction of your own 75-mpg "car of the future".
