The 6L80: These Are the Good Old Days!

When you get into a discussion with someone about how expensive it is to live these days, invariably someone is sure to begin to reminisce about the “good old days.” Cheap gas and utilities, low taxes and low tech cars are always a favorite. People tend to look at the past through rose-colored glasses, and it always appears that what we had before is better than what we have today.

The same is true when it comes to the transmission industry. How many times have you heard the elder statesmen refer to the “good old days,” when the 350 and C-6 were kings? What they fail to mention is, when the 350 came out, it was a disaster, and many in the industry cursed the 350 for its complexity and lack of serviceability. The same is true today: With the advent of electronics in the transmissions we service, our jobs have gotten tougher but in many ways they’ve also gotten easier.

So what drives this technology? Do the OEMs just hate the aftermarket so much they want to see it eliminated, and technology is their way of accomplishing that? Well the truth is there are three things driving the technology changes:

1. Competition among the OEMs to make a bigger/smaller, faster, more reliable and efficient car
2. Ever-tightening emissions standards
3. The cost of fuel and the need to improve fuel economy dramatically

A major transition in the transportation industry occurred in the late 1970s and early 1980s. Back then, fuel economy and emissions were major issues. The advent of closed loop fuel control systems, fuel injection, and torque converter clutch systems seemed overwhelming. Many technicians moved away from repairing transmissions and doing tune-ups and driveability diagnosis in an attempt to avoid that dreaded word: “electricity.” What they found was those evil electrons followed them into the braking and suspension systems, and every other system on the vehicles of today.

This industry is about to undergo another monumental change: In fact, the changes that’ll occur over the next five years will make the changes we’ve seen in the last 20 years seem like child’s play. The technology demon is about to be let out of the bottle, and many in our industry will try to run and hide again. But, just as in the past, the technology will follow them into every system in the vehicle. So what’s driving this change? It’s the same things that drove the changes years ago: competition, fuel economy, and tightening emission standards. So what types of things are coming down the pipe? They include:

- Ion monitoring of the ignition system
- Active fuel management (Displacement on Demand)
- Integrated starters and generators
- Gasoline direct injection systems
- Homogeneous Charge Compression Ignition (HCCI)
- Particulate filtering for diesel engines
- Full hybrid drivetrains (both engine and transmissions)
- Fuel cell drive trains
- Two mode transmissions (ECVT) (Electrically Controlled Variable Transmission)
- 6-, 7- and 8-speed transmissions

This just deals with the drivetrain; the changes will be just as pronounced with other vehicle systems.

So what is a two mode transmission? Starting in 2003, GM started equipping city busses in Seattle and other major cities with a new design “Variable Hybrid Drive Train,” known as a two mode or dual mode transmission (figure 1). The result has been impressive to say the least, with documented fuel savings of 60%. Light duty

Figure 1

by Steve Garrett

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applications with this transmission technology improve fuel economy as much as 25%. Several manufacturers in addition to GM have agreed to use the technology in their vehicles, including Mercedes, Chrysler, and BMW for the 2007/2008 model years.

A combination of a conventional automatic transmission and electric transmission, the two-mode design uses clutches and planetaries as well as electric drive motors (figure 2). This system uses a lot of sophisticated electronics, a major battery pack (300-600 volt), and several subsystem interfaces.

The two-mode powertrain will be available in both rear and front drive designs and will provide four fixed gear ratios and two variable gear ratios. The system will also provide a regenerative braking feature as used with some electric vehicle applications.

The other change to the transmission industry is the introduction of 6-, 7- and 8-speed transmissions.

Those of you who attended this year’s ATRA Technical Seminar heard us talk about the GM 6L80: the first of 10 new 6-speed automatics to be introduced by GM Powertrain (figure 3). The 6L80 is different than anything you’ve worked on in the past. The 6L80 (RPO MYC) is currently available in the Chevrolet Corvette, Cadillac XLR-V and the Cadillac STS-V. The 6L80 will be introduced into several “up level” SUV applications for the 2007 model year. The 6L80 cuts 0-60 MPH times by as much as 7% while improving fuel economy on average 4%. The 6L80 has the following features:

- Input torque capacity 430 lb-ft (583 Nm)
- Output torque capacity 664 lb-ft (900 Nm)

- Ratios
  1st – 4.02:1
  2nd – 2.36:1
  3rd – 1.53:1
  4th – 1.15:1
  5th – 0.85:1
  6th – 0.67:1

- Maximum shift speed 6500 RPM
- Maximum GVW 8600 lb
- Maximum GCVW 14000 lb
- PRNDL positions P, R, N, D, (S or M)
- 2 shift solenoids used (On/Off)

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Design): SS1, SS2

- 6 PWM controlled pressure control solenoids (PCS): PCS1, PCS2, PCS3, PCS4, PCS5, TCC
- 32-bit TCM mounted inside the transmission on the valve body (referred to as the “control solenoid valve assembly”). TCM incorporates solenoids, pressure switches, TFT and is bolted to the valve body using 6 bolts.
- EC3 Converter 300mm (Corvette) 258mm twin plate (XLR-V and STS-V)
- Fluid required: Dexron VI
- Fluid capacity:
  - 6CDA — 9.5L (10 qts.)
  - 6CZA — 9.7L (10.2 qts.)
  - CYA — 11.9L (12.6 qts.)
- Clutch-to-clutch shifts: 5 clutches, 1 sprag
- Planetary assemblies: Input (Simpson) Output (Dual pinion design)
- Vane-style oil pump
- Internally-mounted TISS and TOSS Hall Effect speed sensors

- Internal Mode Switch (IMS) equipped
- Performance Algorithm Shifting (PAS) programming
- Performance Algorithm Lift foot (PAL) programming
- Sport mode and TAP shift equipped
- Adaptive strategies with fast learn capabilities
- 75 transmission-only DTCs; Lean diagnostic process used

This year at the ATRA Powertrain Expo in Orlando, I’ll be conducting an in-depth class on the 6L80.

As you can see, this is only the tip of the iceberg when it comes to the technology that is about to be released into the market. Hang on, and keep your eyes and ears open: It won’t be long before these will be the good old days!