

Modifications: Do They Really Work?

By Bill Kleckner

In some instances, the transmission industry is in continual pursuit of improvements based on the premise that engineers make mistakes. We want transmissions to shift and feel the way our preconceived seat-of-the-pants driving tells us it should feel. My question to you is, are we improving the transmission or just making it feel right? Do we make it last more or fewer miles after overhaul?

In other words, will the transmission last as long as it did from the factory when it was new? The first response that may come to mind is that the transmission no longer is new and we cannot duplicate new conditions. In this article I cover a few of these modifications that are well accepted and practiced in our industry today for you to think about. You may disagree with my thinking, but you also may feel differently about some of your “improvement methods” after pondering these thoughts.

We start with the topic of raising line pressure, which many technicians believe is an acceptable practice. In extensive testing, I've had a chance to see the results of raising line pressure. Yes, it does make shifts and engagements feel better, but what else happens? Now I don't want to alarm anyone who has raised static line pressure by only 10 psi, this works well. But when we raise line pressure significantly higher, we may begin to affect other transmission operations in a negative way. One notable observation made during testing was the drastic rise in fluid temperature.

I was doing some testing on a 4L60-E with increased line pressure. Thanks to engineers, we now can monitor transmission-fluid temperature. Before modifications, I first noticed that line pressure was 110 psi at 65 mph. The transmission-fluid temperature was fluctuating between 165° and 190° F with converter-clutch apply. At 75 mph, line pressure was 120 psi.

After modifications, line pressure at 65 mph was 120 psi and at 75 mph was 150 psi. The transmission-fluid temperature now ran as high as 246° F. My first response was to try a cooler, which lowered the temperature by 26°. I also decided to try a bottle of LUBEGARD to see whether it really worked as claimed. Much to my amazement, it lowered the transmission temperature by an additional 15° F (No, the company didn't pay me to say that).

This rise in temperature more likely is the cause of the unexplained dark fluid you see soon after the overhaul that we like to blame on coolers or customer abuse. Raising line pressure directly affected temperature, so is this an improvement? With this understanding, if we look at a hydraulic circuit we see that high line pressure also can affect converter charge. On the 4L60-E, GM placed two flats on the pressure-regulator valve to overcome this problem. Other units, however, are not so lucky. When high line pressure is present, the pressure-regulator valve actually cuts off converter charge. Blue converters, blue planets, the blue bushings and spun-out oil-distributor sleeves are the evidence of this condition. The industry fix to this lube problem is to connect a line-pressure circuit to the lube circuit by drilling through a wall in the valve body. This is a great fix in my book. Not only does it help converter charge in high-line-pressure conditions, but it also increases cooler flow, helping to improve lube. But when we perform this procedure, we are exposing ourselves to yet another potential problem.

With line pressure being introduced directly into the lube circuit, high line pressure may result in converter ballooning. I may not be able to prove this theory, but I do know that this problem has affected nearly all of us. Some of the damage I have seen as a result of high line pressure in the converter is extreme stress on the pump and turbine fins – so much so that they actually bend or break. Damaged washers and bent converter-clutch pistons are some of the other effects seen. Working in a facility that rebuilds torque converters has been very educational.

I also have seen how high line pressure has caused damage to pumps. In a gear-type pump in which the inner gear has been cutting into the crescent, this condition may not be the result of a worn bushing. Bushing wear and/or excessive clearance between the converter hub and bushing most certainly contributes to worn pumps. Note the approximate location where the inner and outer gears mesh. Since fluid is not compressible, the natural tendency because of force is for the gears to push away from each other. With higher line pressure, the gears are forced apart to even a greater degree.

What is in the opposite location of the gear-mesh area for the inner gear? The crescent. I have seen C-6 pumps in which not only had the inner gear worn into the crescent but also the outer gear had worn into the pump body at its point of contact. Vane pumps tend to wear into the slide under these conditions. Many times, technicians install larger-diameter TV boost sleeves, thinking they will improve both drivability and durability; in fact, they may do more harm than good.

Another interesting observation is premature wear of steel sealing rings due to excessive side loading. I'm not talking about poor quality aftermarket rings; I'm talking about OE or OE-direct-replacement rings. You may recall seeing this yourself on 350,400, C-6 and C-4 transmissions, just to mention a few. Broken clutch drums, pressure plates, cases and bands and bent band struts are other signs of high line pressure. With this in mind, can you imagine what high line pressure can do in a transmission with cross-leak problems?

After two years of doing root-cause failure analysis, I have found that so-called “improvement modifications” are the very reason for many premature failures. I'm not talking about low mileage failures after rebuilds but units that went only 12,000 to 20,000 miles after overhaul. When faced with these failures you may have said to yourself, “Hey, it made the warranty period.” I believe that if I am going to improve a transmission during rebuild, it should last at least as long as it did before the rebuild. When you make changes to the original calibration, we hope you will consider the possible side effects.

Another point is that many of the newer vehicles have changes designed to improve customer satisfaction. Garage shifts and shift feel are important to consumers when they pay \$20,000 plus for a vehicle. They do not want to feel jerking during shifts. Engineers have spent many hours calibrating and designing the transmissions in these vehicles to meet consumer preferences.

After years of studying oil circuits and electronics, I am continually amazed by the design of the circuits. Just think for a moment; if all you do is replace the original frictions with a different type or, for that matter, use a different type of fluid, you have changed the calibration of the transmission. That is just how tightly the newer units are being calibrated.

When we find ourselves saying, "This unit just doesn't shift right" or "It didn't do this when it came in," consider some of the changes you made that altered the original design. Could it be the clutches or bands? Is it the transmission fluid you used? Did you enlarge any holes in the spacer plate? Did you modify the valve body?

One other note: Examine valves and valve bores closely for wear. In today's transmissions, these items wear very quickly. Thanks to companies such as Sonnax, we now have the ability to correct these problems at a low cost.

I hope this article has been helpful to you. If it has, please respond, as I would like to continue with this subject.

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