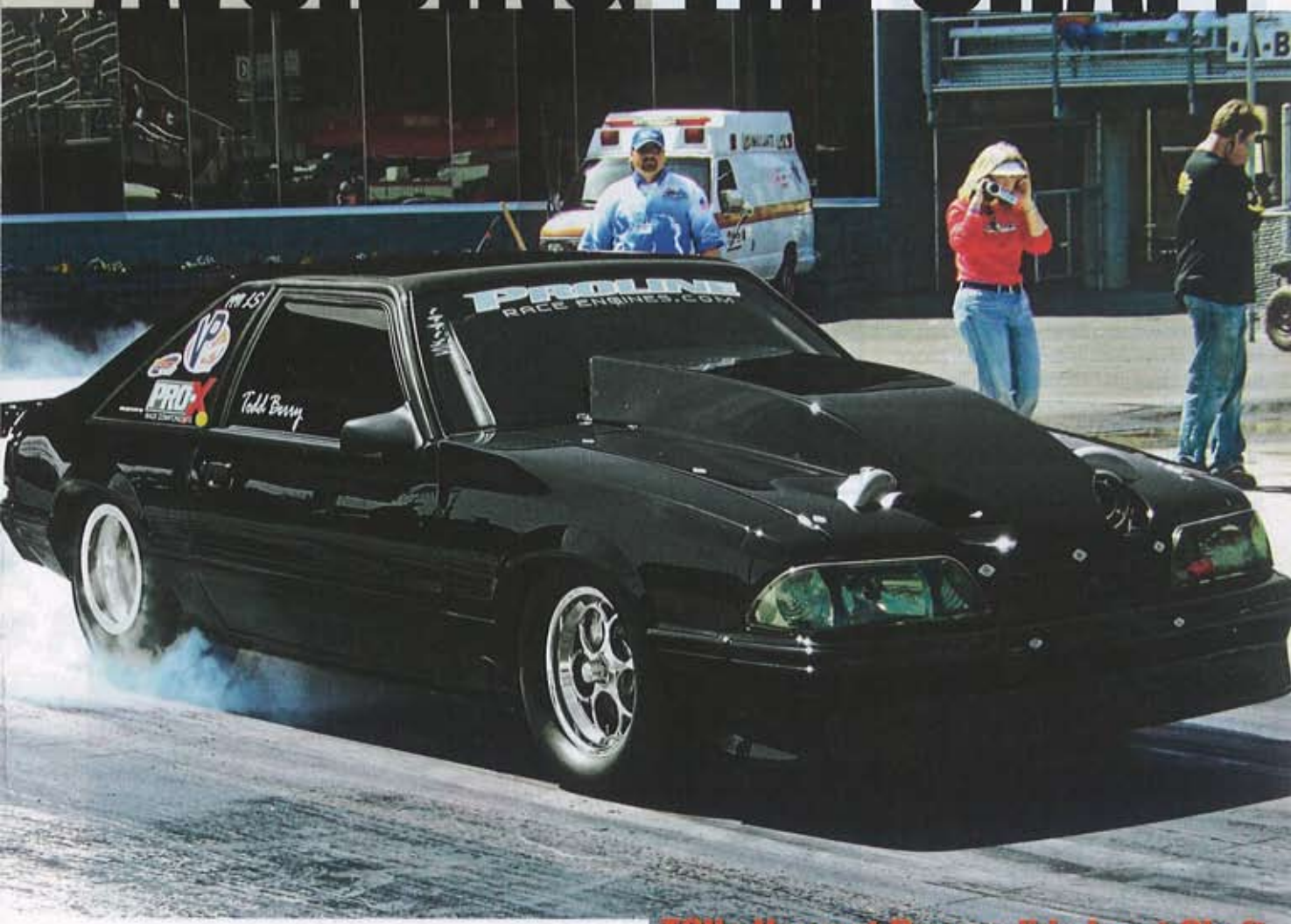
AVOIDING THE SHAFT



TCI's Newest Powerglide Input Shaft

BY JOHN DiBARTOLOMEO

The venerable Powerglide transmission has been around in aluminum form since the early '60s. Prior to that, a cast iron equivalent was available in General Motors vehicles as early as 1950. But when that first production car rolled off the assembly line with an aluminum Powerglide in 1962, it marked the beginning of a new age which has transformed that exact design into the most popularly used transmission in motorsports today.

The unique lightweight design, which incorporates only two speeds, was earlier known as the "Slip-n-Slide Powerglide." Not so today. Drag racers have poked, modified, tweaked and even redesigned that once unwanted transmission to live behind horsepower never before imagined in 1962.

The venerable aluminum Powerglide transmission has been around since the early '60s and has been poked, prodded and re-engineered to be the most popularly used transmission in drag racing today.

A stock Powerglide input shaft, besides being small in diameter, has numerous holes machined in it which creates stress risers that lead to failure behind any kind of horsepower more than stock. The purpose of the holes is to oil the planetary gears from the center outward.

Any shaft is the strongest when there are no cuts or holes machined into it. The stock shaft not only has holes, but is also machined for sealing rings, all of which can lead to failure.

General Motors stopped building Powerglide transmissions a long time ago, but the 'Glide remains the only OEM transmission today where each component is available brand new in the aftermarket. Every component from the case to any of the smaller internals can be purchased to build a "brand new" 'Glide. Each time an OEM component failed, the aftermarket took it upon themselves to build a stronger unit.

One of the first components swapped out from stock was the input shaft of the transmission. As horsepower levels, tire sizes and suspension modification increased, the stock diameter shaft, which is only roughly little more than 3/4" in diameter, commonly failed, leaving many a racer stranded on the starting line.

The aftermarket answered with a "new" shaft built to the OEM spec sizes, but manufactured with a stronger material. Still, failures continued as a result of increased horsepower. Bear in mind that, today, horsepower is extremely easy and economical to attain.

One of the biggest design flaws with any shaft are the stress risers which occur at a point on the shaft where a machine cut or a hole exists. An object is stronger when force is evenly distributed over its area. Cutting a hole, or even just machining a set of splines, causes an interruption in the load capacity, which causes a stress riser. Of course, it would be rather hard to not have a set of splines on an input shaft, but I think you understand the reasoning.

The stock shaft uses a series of holes cross drilled into it to coincide with a hole down the center of the shaft to supply oil to the planetary gear set. One area where we would consistently see failure was at the intersection of those drilled holes. But of course, they can't be eliminated, or was there a better way?

TCI engineers sat down and figured out how to run a solid shaft. Bob Harrison, TCI engineer, said, "The new shaft we designed is uniform in diameter—solid with no oil holes drilled in it."

However, a way to oil the planetaries is still required. With no oil fed to them, damage was sure to occur. "We then looked at it from a different direction," said Harrison. "It would have been impossible to simply externally oil the gear set as the oil would have simply slung outward and never oiled the inner gears. That meant having to oil the gear set from the center outward."

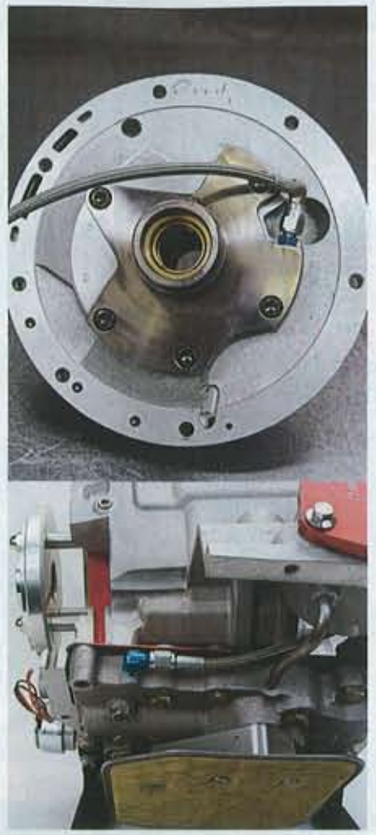
The cure for TCI engineers was to reroute a line from the front pump to circulate lubricating oil through the valve body and up through the back of the case and into the output shaft. This allows the oil to come into the gear set from the opposite direction of the input shaft. It's the same principle, just in from the other direction.

This allows for an input shaft built from proprietary material but of 1-1/8-inch diameter with no holes whatsoever. Of course, an input of that size requires more than just that one single part. Anytime you redesign one component, it becomes a matter of cause and effect. This new input shaft also required a special sun gear for the center of the gear set, a new high gear clutch hub, flange gear and bronze "wedding band" inside the planet set. In addition, a larger stator support inside the front pump became necessary. However, when you're building things from a clean sheet of paper, there are no limitations.

And this patent pending design fits the bill perfectly. *DRA*

Over the years, Powerglide input shafts have increased in size leading up to this new massive 1-1/8-inch unit (right) from TCI with no cuts or holes.

Necessary oil is fed from the input shaft into the planetary gears to both lubricate and cool the gear set. Without that oil, failure of the gear set is certain.



TCI engineers took a different approach to oiling the gear set by taking pressurized oil from the back of the front pump, routing it through the valve body and up through the output shaft and into the gear set from the back rather than front.

The design of the new TCI shaft required several other components to be re-engineered, from a new front pump stator support, high gear clutch hub and flange gear, right down to something as "minor" as a new "wedding band," the bushing which fits on the end of the input shaft and rides inside the sun gear.

SOURCES

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