

For most fans of Top Fuel drag racing, the usual focus of attention is the sound and fury of 5,000-horsepower monsters thundering down a quarter-mile strip of asphalt in less than five seconds. For Gates Rubber Co. engineer Jim Shepherd, however, the real action is in the last few feet of track, at the end of the shutdown area. That's where he often can be found during races, checking the condition of supercharger drive belts as the cars are being pushed off the track.

"When the cars are coming off the track, you don't have much time to do anything scientific," said Shepherd. "I always inspect any belt I can get to for belt condition and tension. I have a pretty good feeling for whether one side of the belt is tighter than the other side, which can signal misalignment. If the belt has failed, I try to find out what happened. Most of the time, if something really unusual has happened, I try to go back and follow up on it."

Belts face tough challenge

Shepherd's interest in supercharger drive belts is understandable given that Gates belts are used in every Top Fueler and Funny Car in the NHRA Winston Series and on all supercharged Federal-Mogul cars. For the last 12 years, Shepherd has been involved in making sure these belts can handle the incredible loads placed on the blower and crankshaft.

"By developing belts in a racing environment, we can test the outer boundaries of our products," said Shepherd. "Out of this racing involvement comes a wealth of engineering data that can be applied to our overall understanding of factors that affect belt performance, such as shock loads, acceleration loads, vibration, and alignment."

The supercharger is a crank-driven air/fuel compressor used to increase horsepower in the engine, explained Shepherd. Superchargers first began appearing on drag racing cars in the late 1950s. Since those early days, horsepower in Top Fuel dragsters has increased dramatically.

"Many of the early superchargers were driven directly off the front of the engine," Shepherd said. "A typical run for a dragster from that time was 8.5 seconds at 150 mph compared to today's records that exceed 320 mph and fall well into the four-second range."

"Today's blowers are on top of the engine and driven by a very special urethane timing belt," said Shepherd. "The size of the blower has at least doubled from earlier models, and blower speed now can be as much as 2.2 times the engine rpm. It is reasonable to predict that shaft loads on the blower and crankshaft reach nearly 3,000 pounds under some conditions. These shaft loads on the blower and crank are equivalent to hanging a small-sized car on the end of the blower pulley."

Belts for top-mounted blowers have gone from a 1 1/2-inch-wide H (1/2-inch pitch) Gilmer



For Gates blower-belt expert Jim Shepherd, the real action is at the end of the track

by Tom Gitter

belt to a two-inch rubber HTD belt, and more recently to a 75mm-wide, 14mm-pitch special-construction Poly Chain GT belt. The Poly Chain belt is made of a highly compounded urethane material and has more than twice the horsepower capacity of typical rubber belts.

Typical belt lasts four runs

The service life of today's supercharger drive belt is normally about four runs at most tracks, compared to an average of eight runs for a typical crankshaft, according to Brett Anderson,

assistant crew chief with the Team Mopar Top Fuel dragster.

"It's estimated that the supercharger turns at 11,000 rpm, which requires about 1,000 horsepower," said Anderson. In higher elevations, such as in Denver, up to twice as much horsepower may be required to turn the blower, which places much higher demands on the belt.

"When we go to Denver, we're putting a new belt on every run so we don't have to worry about breaking them," added Anderson.

Testing, testing

Team Mopar is one of several NHRA teams testing new belt and pulley designs that may improve the technology for longer service life on the dragsters as well as for other industrial applications.

"Obviously, we don't do any testing on race day," said Anderson, "but we'll throw them on during test runs. After each test, we'll send Jim the belt to cut apart and analyze."

Other NHRA teams participating in tests include those of Top Fuel competitors Eddie Hill and Kenny Bernstein and Joe Gibbs, with his Top Fueler driven by Cory McClenathan and his Funny Car driven by Cruz Pedregon.

Throughout the years, Shepherd has collected hundreds of used belts from Top Fuel and Funny Car teams for testing at the Gates Belt Testing Laboratory in Denver. According to Shepherd, "This year, we'll get around 200 belts back, which we'll test for tensile strength in the laboratory."

"From this testing, and from testing we do with top snowmobile racers like Wayne Nicholson and Normand Pilote, we can define the ultimate limits of the compounds, cord materials, fabrics, and adhesives that go into our products. From this research, we can provide vehicle manufacturers and consumers with serpentine and Micro-V engine belts that meet the durability and performance requirements of today's most demanding engine drives."



(Above) Darrell Gwynn's Mopar-backed Top Fueler is involved in blower-belt testing for Gates Rubber Co. Other cars involved are the Top Fuel dragsters of Eddie Hill, Kenny Bernstein, and Cory McClenathan and Cruz Pedregon's Funny Car. (Left) The service life of today's supercharger drive belt is normally about four runs at most tracks. Gates has collected hundreds of used belts from Top Fuel and Funny Car teams for testing at the Gates Belt Testing Laboratory in Denver. This year, the company will test about 200 broken belts for tensile strength.