

Spark Plug Demands

Racing Places Enormous Demands on Spark Plugs



BOSCH

Racing improves the breed. This is an old automotive adage, and today more than ever, racing definitely improves the breed when it comes to spark plugs – especially premium spark plugs. Racing is the ultimate test for a spark plug, and other than the given fact that the plugs must fire on command; spark plugs must not fail in a race! It doesn't matter whether it is a 200-mile dirt track event, the Indy 500, or the 24 hours of LeMans – the plugs cannot fail, and they have to work perfectly

- ▶ The spark plugs must exhibit absolute, rock-solid durability
- ▶ They must ignite the fuel-air mixture for maximum power
- ▶ They must provide maximum fuel efficiency
- ▶ They must operate with minimum draw on the ignition system
- ▶ They must operate effectively with the particular fuel being used
- ▶ They must provide a strong, consistent spark from the start to finish, however many hundreds of miles that may be

Racing, as it has for at least 100 years, provides a great developmental impetus and test bed for spark plug durability and performance, and what is learned at Indy or Darlington or LeMans helps improve the spark plugs installed in today's cars and trucks.

Take Indianapolis for instance. In addition to Ray Harroun's Marmon Wasp that won the very first Indy 500 in 1911, the past 16 Indy 500 winners and many in between have run specially developed premium spark plugs to get to victory lane. Spark plugs in today's Chevrolet, Honda, or Toyota Indy racing engines undergo tremendous stress, heat, and harmonic vibrations from running full throttle at 10,000-plus rpm for several hours without letup.

Although most spark plugs for Indianapolis and most other major racing events are actually hand made, they use the same basic design and the same premium metals and ceramics as the premium plugs used in passenger cars. The primary difference is in the center ground electrode configuration.

Rather than welding the multiple ground electrodes onto a steel shell, the entire outer shell and ground electrodes on racing plugs are machined from a single piece of steel. This helps ensure maximum reliability under the extreme stress of racing.



Premium plugs use “race-bred” technology

Similarly, many premium passenger car spark plugs use multiple ground electrodes and precious metals, which are a direct result of their development and testing in long distance racing. In long distance racing, the voltage and the spark must remain constant for the entire race, and multiple electrodes minimize the effects of metal losses on both the center and ground electrodes, which can actually widen the plug gap and degrade the spark. Multiple electrodes – and the use of precious metals – ensure the integrity of the spark plug for an entire race. Spark plugs for the most major race series use two or more ground electrodes and precious metals.

This is important for a couple of reasons.

First, the spark jumps in the cylinder radially from the multiple electrodes rather than axially from a single electrode. This provides better mixture accessibility, and multiple ground electrodes provide greater assurance of creating a strong, consistent spark every time it is needed – whether flat out in the straightaway at Indy or in heavy traffic on the freeways in L.A. or the Cross Bronx Expressway in New York.

Every time a spark plug fires, a tiny bit of metal is lost in the electrical discharge. Over the course of 500 miles at 10,000 rpm – or 50,000 miles at 2500 rpm in a passenger car – this can degrade the plug’s performance. Multiple electrodes and precious metals minimize this degradation from metal transfer.

Precious metals and multiple electrodes ensure ultimate reliability and durability, provide the correct, consistent spark to keep the engine running smoothly and efficiently, and keep emissions under control.

There are many variations in multiple electrodes. A new plug is just being developed for the Honda Indy engine utilizing three ground electrodes. These electrodes protrude slightly into the combustion chamber, providing better mixture accessibility for more power.

Another trend on the racetrack is the demand for smaller and smaller plug diameters. Smaller diameter plugs have been growing in popularity for years, and increasingly racing plugs are changing from 14-mm plugs to 12-mm and 10-mm plugs, and 8-mm plugs. Why? It gives engine builders more room for water jackets and bigger valves in already constricted cylinder heads. This has the engineers working nights, and these smaller plugs are already starting to appear in performance oriented sports cars. Soon they will be in conventional automobiles as well.

Racing gives invaluable testing of advanced spark plug designs, durability and performance in an incredibly harsh environment. Increasingly, what is learned at the racetrack influences everyday spark plugs. And much of what is designed into premium spark plugs could well represent the future of spark plug use for efficient, economical driving.

