

Understanding Ignition Systems

The advantages and disadvantages of four common ignition systems

While cars have changed drastically throughout the history, there's one constant that all combustible engines have in common: an ignition system. Currently, we recognize four types of ignition systems used in most cars and trucks: conventional breaker-point ignitions, high energy (electronic) ignitions, distributor-less (waste spark) ignition and coil-on-plug ignitions. In this article, we touch on the features of each system, as well advantages and disadvantages of each.

Conventional Breaker-Point Ignition System

The conventional breaker-point ignition system is the oldest type of ignition system and has been used since the early days of the automobile, especially through the 1970s. The mechanical nature of these ignition systems, as well as the length of time these systems have been used, they are relatively easy to diagnose and repair. However, they do incorporate a large number of moving parts, increasing the potential for breakdowns. Additionally, deterioration of these systems can negatively affect the maximum spark energy throughout the life of the engine, causing frequent misfires and increasing emissions.

High Energy (Electronic) Ignition System

After 70-plus years of using conventional breaker-point ignition systems, automotive manufacturers turned to a more advanced, high energy ignition system. This system replaces the breaker points and condenser with a transistorized switch within an ignition module that also handles the task of triggering the ignition coil to generate high-voltage current. This can prove advantageous, as the use of this electronic switch means there are fewer moving parts than in a breaker-point ignition system while still being relatively easy to diagnose and repair. They can also provide a consistent, high voltage spark throughout the life of the engine, meaning fewer misfires.

But while the breaker points have been replaced in a high energy ignition system, these systems still use a distributor cap and rotor to perform the same job of distributing current to the spark plugs. Using a conventional distributor means they will eventually wear and require replacing, adding to potential repair costs. Also, the ignition timing cannot be as precisely controlled as with more sophisticated systems, resulting in poor fuel efficiency and lethargic acceleration.

Distributor-less (Waste Spark) Ignition System

Knowing the potential issues associated with a conventional distributor, this aptly named system eliminates the distributor entirely. Instead, multiple ignition coils are used – one for each pair of cylinders. Using engine sensors to determine crankshaft position and camshaft position, an Electronic Control Unit triggers the appropriate ignition coil and directs the distribution of electrical current to the spark plugs. This system also uses a “Waste Spark” for one of the paired cylinders, pairing two pistons that will be at the top dead center at the same time - one at the end of its compression stroke, and the other at the end of its exhaust stroke. Each of the spark plugs in these cylinders will fire at the same time using the high voltage from one coil. This is beneficial, as this system can be designed to generate high voltage, and ignition timing can be precisely controlled for lower emissions. In addition, the lack of moving parts means lower maintenance costs. Unfortunately, this also means that it can be much harder to diagnose and is more expensive than a traditional system. This system also requires double platinum plugs due to reverse firing.

Coil-on-Plug (Direct) Ignition System

The most sophisticated of all ignitions systems, this system places an ignition coil directly on the top of each spark plug and is ideal for modern engines. All of the ignition timing is handled by the Engine Control Unit, based on input from various sensors. Because each spark plug has its own dedicated coil, high-voltage spark plug wires are completely eliminated. This is beneficial for a number of reasons: there are no moving parts and lower maintenance costs. It should be noted that this can make it more difficult to diagnose and more expensive to repair than a traditional system, but with lower maintenance costs, repairs are less frequent. Through the use of the Engine Control Unit, this system can be designed to generate high voltage, and the ignition timing can be precisely controlled for lower emissions.

Conclusion

Knowing the advantages and disadvantages of each ignition system type is beneficial in choosing a spark plug that works in tandem with the performance requirements of the system. And when speaking specifically about choosing a spark plug, Autolite provides premium spark plug options for each of these ignition systems. To see which Autolite spark plug works best with each vehicle, visit www.autolite.com/parts-finder for more information.