



Technical Service Bulletin

Date: Rev. 2: 5/17/13

Product Description: AMSOIL XL and OE 5W-20 Synthetic Motor Oils

Subject: Using Synthetic Motor Oil in the Mazda RENESIS Rotary Engine

OBJECTIVE:

Provide information about the use of synthetic motor oil in the Mazda RENESIS rotary engine.

ISSUES:

According to Mazda Corporation Engineering bulletin #06010010, dated 10/27/06, injecting synthetic motor oil into the combustion chamber of the RENESIS engine may lead to carbon buildup that adversely affects engine performance. Mazda conducted a case study with the use of synthetic motor oil in the rotary engine, finding it caused a large amount of carbon buildup on the side housing. If the buildup adheres near the spark plug hole or to the seals in the combustion chamber, it may lead to adverse effects such as engine misfire or knocking.

Mazda Engineering stated that “not all synthetic oil is at a disadvantage in terms of carbon buildup, but use of untested, non-genuine oil should be avoided.”

Mazda owner’s manuals also caution against the use of synthetic or semi-synthetic motor oil in the RENESIS engine, stating that “engine starting performance could worsen.” Starting performance is addressed in Mazda Service Bulletins 01-013/12 and 01-015/08, titled “Engine Cranks No Start,” stating the issue may occur when the vehicle is driven short distances and turned off before the engine can reach operating temperature. The causes identified are flooding the spark plugs with fuel or carbon accumulation causing low compression.

TECHNICAL DISCUSSION:

Mazda has produced different versions of the rotary engine over the years. The design is comprised of a three-lobed rotor that rotates inside an oval-shaped chamber to create combustion. Because of this design, its lubricating requirements are slightly different than those of a typical piston design engine. To lubricate the rotor and seals, a metering oil pump injects a small amount of the motor oil into the rotor chamber.

Numerous articles and technical discussion boards claim synthetic motor oils do not burn completely in the rotary engine, leading to the formation of carbon deposits. Although this claim comes from several sources, there is no

scientific evidence to support it.

OIL PROPERTIES:

Two physical properties should be taken into account regarding the burning potential of motor oil:

1. **Flash point:** The temperature at which motor oil will briefly ignite, but not sustain a flame.
2. **Fire point:** The temperature at which motor oil will sustain a flame.

The following chart compares the flash and fire points of conventional Mazda 5W-20 motor oil with AMSOIL XL and OE 5W-20 Synthetic Motor Oils:

| Oil | Flash Point (°C) | Fire Point (°C) |
|-----------------|------------------|-----------------|
| AMSOIL OE 5W-20 | 226 | 242 |
| AMSOIL XL 5W-20 | 226 | 242 |
| Mazda 5W-20 | 220 | 232 |

As seen in the chart, the flash and fire points of the products are very similar. Although AMSOIL synthetic motor oils provide excellent performance at elevated operating temperatures, they burn at about the same temperature as conventional oils in the combustion chamber of the RENESIS engine.

CARBON DEPOSITS:

As noted in the Mazda bulletins, carbon formation in the RENESIS engine can lead to engine misfire, knocking, low compression and poor starting performance. A certain amount of carbon deposits naturally occur in engines, and inefficient combustion can accelerate the rate of buildup. Carbon deposit formation may be linked to fuel or the lubricant base oil or additive package. Aftermarket fuel additives are often used to clean-up the carbon deposits that naturally occur over time. However, high-quality motor oils use base oils that better manage deposits and contain the appropriate detergents and dispersants to further resist the formation of carbon deposits.

Submitted By: DW

Reviewed By: DP

Approved By: AA

Approval Date: 5/17/13

Distribution: Internal _____

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MAZDA RECOMMENDATION:

For the RENESIS rotary engine, Mazda recommends the use of 5W-20 motor oil that meets API and ILSAC specifications. Due to the deliberate oil consumption of this engine, Mazda recommends checking the oil level at every other fuel filling. Mazda cautions against the use of synthetic and semi-synthetic oil, claiming it may worsen starting performance.

AMSOIL RECOMMENDATION:

AMSOIL recommends using AMSOIL OE 5W-20 Synthetic Motor Oil (OEM) or AMSOIL XL 5W-20 Synthetic Motor Oil (XLM) in the Mazda RENESIS engine, and following Mazda's recommended drain intervals and oil level monitoring practices. AMSOIL OE and XL motor oils are both premium products designed to fight deposits and meet the latest API and ILSAC specifications.

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