



Technical Service Bulletin

Date: 9/29/2005

Product Description: AMSOIL XL 5W-20 Engine Oil

Subject: Using AMSOIL XL 5W-20 in the Mazda Renesis Rotary Engine

OBJECTIVE:

To provide information about the use of synthetic engine oil in the Mazda RENESIS rotary engine.

ISSUES:

According to bulletin #06010010 dated 10/27/2006, published by Mazda Corporation Engineering, injecting synthetic engine oil into the combustion chamber may lead to carbon buildup adversely affecting the performance of the engine. Mazda conducted a case study with the use of synthetic engine oil in the rotary engine finding it caused a large amount of viscous carbon buildup on the side housing. Mazda did not conclude that this carbon buildup contributed to adverse engine performance. Mazda's bulletin also stated if carbon 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.

At this time, AMSOIL does not have any test data to support Mazda's position. However, there is also no test data to know if there are any long-term effects of using synthetic engine oil are in the RENESIS engine.

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

TECHNICAL DISCUSSION:

Mazda has produced different versions of the rotary engine over the years. The design of this engine 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 that of a typical piston design engine. To lubricate the rotor and seals, a metering oil pump injects a small amount of the engine oil into the rotor chamber.

There are numerous articles and technical discussion boards that claim that synthetic engine 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 this claim.

OIL PROPERTIES:

There are two physical properties that should be taken into account regarding the burning potential of engine oil:

1. **Flash point:** The temperature that engine oil will briefly ignite, but not sustain a flame.

Fire point: The temperature that engine oil will sustain a flame.

There are assumptions that synthetic oil will not burn in an engine combustion chamber based on the assumption that synthetic engine oils handle higher temperatures better than conventional petroleum-based engine oils.

For the RENESIS engine, Mazda's engine oil recommendation is to use SAE 5W-20 engine oil meeting API SL and ILSAC specifications. The following is a comparison chart of typical flash points various SAE 5W-20 and SAE 0W-20 engine oils found in the marketplace:

FLASH POINT COMPARISON:	(Celcius)
AMSOIL XL 5W-20 (XLM)	226
Mazda 5W-20	221
Mobil Clean 5000 5W-20	200
Mobil 1 5W-30	228
Mobil 1 Supersyn 0W-20	236
Motorcraft 5W-20	220
Castrol GTX 5W-20	228
Valvoline Conventional 5W-20	220
Valvoline Durablend 5W-20	236
Valvoline Synpower 5W-30	221
Pennzoil Conventional 5W-20	229
Pennzoil Synthetic 5W-20	224

Submitted By: DW

Reviewed By: DP

Approved By:

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As you can see, the flash points between these petroleum and synthetic engine oils are very similar meaning each of them should burn at about the same temperature in the combustion chamber of the RENESIS engine.

CARBON DEPOSITS:

As Mazda noted in their bulletin, carbon formation can be found in the RENESIS engine leading to engine misfire and knocking. Carbon deposit formation may not be due to the type of base oil used, but can also be related to the ash content of the oil additive package. Higher ash content oils can form more carbon deposits than lower ash containing engine oils.

In recent years, the API and ILSAC have required lower additive levels reducing the ash content below 0.80% (max) by weight to meet API SL, ILSAC GF-3 specifications. Since all 5W-20 engine oils are required to have low ash contents, there will be less of a tendency to have issues with carbon formation when burned in the combustion chamber.

MAZDA'S RECOMMENDATION:

Mazda Engineering is recommending the use of designated genuine engine oil and the following:

- Engine oil should be changed regularly.
- Only designated genuine oil be recommended to customers.
- Under severe conditions, oil should be changed at 5,000km or every 6 months.

The Mazda owner manual for the RX8 models with the RENESIS engine calls for the use of SAE 5W-20 engine oil that meets API SL and is ILSAC rated. However, it does not state any preference on what type of oil to use, or issue any warnings about the use of synthetic engine oil.

AMSOIL'S RECOMMENDATION:

AMSOIL XL 5W-20 is the recommended oil to use in this engine. The XL 5W-20 is a premium oil meeting API SL and ILSAC requirements. We recommend to follow Mazda's recommended oil change interval and monitor closely the performance of the engine.

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