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ABSTRACT

In order to achieve the highest power output and lowest fuel consumption for the rotary engine in endurance race such as Le Mans, two types of lubricating oils were developed by conducting a single rotor engine test at the rotational speed of 7500 rpm under full load. One was the engine oil for the lubrication of the combustion chamber. The other was a so-called system oil for lubrication of the engine system outside the combustion chamber.

The conclusions obtained from the development are as follows:

1) Engine oil for the combustion chamber

The engine oil greatly influences spitback phenomenon which can cause rotary engine trouble in an endurance race. The spitback phenomenon is decreased by the decrease of carbonaceous deposit and ash in the apex seal grooves. The newly developed oil to improve this phenomenon consists of conventional ashless dispersant and synthetic base stock, which easily burns without forming a deposit.

2) System oil

The system oil significantly influences the fuel consumption of rotary engines. A thermally stable, high VI synthetic base stock was used as the base oil for the system oil in order to ensure engine reliability. Fuel

saving was successfully achieved by the addition of an organic molybdenum compound as a friction modifier (FM) and lowering base oil viscosity without interfering with the protection from bearing surface failure. The addition of FM is expected to improve fuel consumption by 1 to 1.5% as well as lowering the surface temperature of the bearing metal to a significant extent. These two oils have been used for racing cars fitted with rotary engines since the 1989 Le Mans Race.

INTRODUCTION

The rotary engine was developed by fundamental joint work of Doctor Felix Wankel and NSU Motorenwerke AG. The rotary engine has an ideal engine design because the rotational motion of the rotor is directly converted to engine power output by use of an eccentric shaft. However, there were many difficulties to be solved before it could be applied for practical use.

It had been about twenty-five years since Mazda commercially manufactured a rotary engine in 1967. Passenger cars with rotary engines have been in steady use in worldwide markets since then. However, there are few published technical reports regarding the lubricating oil for the rotary engine.

This report intends to clarify the influence of the lubricating oil composition on the