AN ANALYSIS OF SKEW MOTION OF ROLLER-TAPPETS IN AN OHV TYPE DI DIESEL ENGINE

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Keywords: Skew, Roller-tappet, Measurement, Calculation, Cam-wear

INTRODUCTION
Roller-tappets have been gradually adopted to the valve train systems of Japanese OHV type diesel engines in the past decade, due to their low friction losses, and hence improved engine efficiency and fuel economy. When a roller-tappet is actuated by the cam, it moves upwards and downwards in the guide with a slight skew motion. This motion affects the life of cam and tappets and therefore the durability and reliability of the valve train system. Proper design of the cam and roller-tappets requires an understanding of the factors that influence the integrity of the contact surfaces. Tappet skew motion is one of the factors which will be investigated in the present study.

MEASUREMENT OF ROLLER SKEW
The skew motion of the roller-tappet was measured in this study. To remove the lateral motion factor in the skew measurement results, two gap-sensors were used (Fig. 1). They were positioned in parallel and measure the distance to the plates connected on the tappet. The difference of the sensors' output, which shows the skew motion only, was calculated and analysed.

CALCULATION OF ROLLER SKEW
Measured data leads to a hypothesis of the skew that it was caused by force F along the horizontal axis (Fig. 2). When the roller has a misalignment against the cam and skews, it cannot maintain a symmetrical pressure distribution along the roller-axis. The force F acts on one side of the contact and causes the roller to skew. Calculation based on this hypothesis considered the roller and cam profile effect [1] as well as cam/roller misalignment under operating condition.

MEASURED AND CALCULATED RESULTS
Fig. 3 shows the typical measured and calculated results. It shows that the major features of the calculations are very similar to those of the measured results. The orders of the predicted skew angle also show good correlations with the measurement.

The calculation method suggested that the roller and cam profile have much effect on the roller skew motion. In this study, the correlation between roller profile and skew motion and that between cam wear and skew motion are also discussed.

REFERENCE