STUDY ON EHL OIL FILM BEHAVIOR OF TEXTURED SURFACE BY THREE-WAVELENGTH INTERFEROMETRY METHOD

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ABSTRACT
The three-wavelength interferometry method [1] is sucessfully applied for the high presicion, wide range and one shot EHL oil film thickness measurement method on the textured surface under the rolling contact. The effect of textured surface on the distribution of ultrathin EHL oil film thickness and the behavor is observed under the fully flooded lubrication condition and the starved lubrication condition.

INTRODUCTION
It is effective to reduce the quantity of lubricant to decrease the agitating resistance and the rolling viscosity resistance of rolling bearing. However, the reduction of lubricant quantity decrease the EHL oil film thickness. The break of EHL oil film causes the short life of rolling bearing. In order to improve the lubrication condition of rolling bearings, the effect of textured surface is studied under the fully flooded condition and the starved conditon. In this paper, the EHL oil film distribution and the EHL oil film behavior on the textured surface are observed by the three-wavelength interferometry method.

EXPERIMENTAL METHOD
The test rig is shown in Fig. 1. The intensity of each reflected light of RGB is different in oil film thickness, therefore the film thickness is measured by the three-wavelength interferometry method. It is possible to measure a minute oil film change in the textured surface with to use this method and an intermittent light by xenon flash lamp.

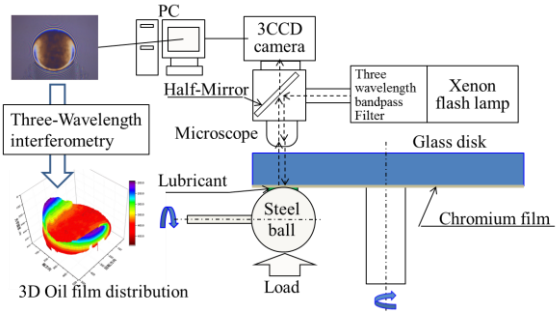

Fig.1 Schematic of test rig

RESULTS AND DISCUSSION
The cross-hatching type surface texture is processed on the part of steel ball for the rolling bearing. The shape of surface texture is shown in Fig. 2 and Fig. 3.

Under the fully flooded condition, the EHL oil film thickness is decreased around the groove (Fig. 4). The decrease of EHL oil film thickness is caused by the oil leak from the groove [2].

On the other hand, the starved condition is induced by the control of initial lubricant quantity to only 5μL. Under the starved condition, the oil flow from inlet side is small [3]. The EHL oil film thickness is not decreased because of the lubricating oil is held in the groove (Fig. 5).

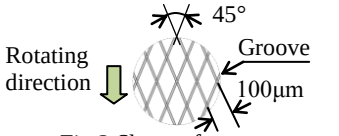

Fig.2 Shape of texture

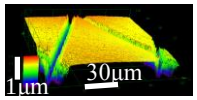

Fig.3 Microscope observation result of textured surface

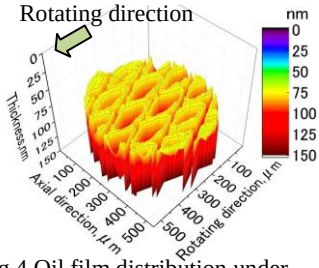

Fig.4 Oil film distribution under the fully flooded condition

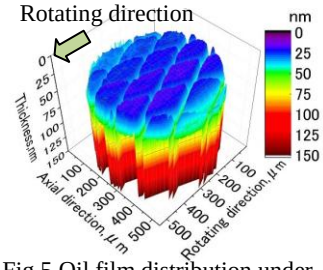

Fig.5 Oil film distribution under the starved condition

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