実施報告

田口の実験計画法によるスラスト軸受の熱処理条件最適化と特性値の探求

Optimization of Thrust Bearing Heat Treatment Conditions and Search for Characteristic Values by Taguchi's Experimental Design Method

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The purpose of this study was to find the optimal heat treatment conditions for a new thrust bearing heat treatment furnace, using Taguchi's experimental design method as a guide. The characteristic values proposed by the engineers were warp and roundness. Although these values are not additive, engineer enthusiasm was given priority. Factors and levels were assigned to an ' array by the asobi sequence method, using a line and dot diagram. Noise conditions were set based on the workpiece posture during hardening, which was a major factor in the contribution ratios for warp and roundness, The data were analyzed as a smaller-is-better characteristic. Estimated values for row No. 30 in the array, which included the optimum condition for warp, and row No.27, which included the optimum condition for roundness, were obtained from a factor-effect diagram. The difference between the estimated and experimental values was 2.20 db for row No.30 and 1.72 db for row No.27. The optimum condition was taken to be row No.30, which was in the most favorable part of the L_{32} array and included the optimum condition for warp, with a difference of about ±3 db between the estimated and experimental values. Finding the optimal condition took only about 1/10th the usual time, and it gave almost the same outcome as the high-quality heat treatment currently being performed. We then devised a development plan based on these experimental results, using the amount of deviation in the timing of boiling of the steam film as a characteristic value. In addition, we proposed a development plan incorporating a single but highly effective press factor into a new heat treatment furnace.

Key words：robust quality engineering, Taguchi methods, design of experiments, line and dot diagram, asobi sequence, heat treatment, thrust bearing

1. 緒　　言

1.1　背景

スラストニードル軸受は，多くは自動車のトラン

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