開発と研究

ハイポイドギヤ高速加工条件の最適化

Optimization of High Speed Cutting for Hypoid Gears

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A study of the optimization of high-speed cutting conditions for machining the hypoid gears used in the differential units of automobiles was performed. In the past, as the tooth-cutting of hypoid gears is very complex, machining conditions were evaluated by repeatedly testing separate factors and evaluating the condition of the cutting tool and the cutting accuracy. In this study, we attempted to break away from the conventional evaluation method by performing parameter design. An initial evaluation was performed using electric power consumption and the amount of metal removed as intrinsic functions. However, as the cutting mechanism differs from the mechanism in general machining, a new type of analysis which can clearly express the machining characteristics was proposed. In this analysis, the mechanism was examined in terms of how the cutting tool and the object to be cut make contact, noting that the cutting load varies and that cutting is performed intermittently, and these two properties were reflected in the parameter design. The results demonstrated the effectiveness of this approach, providing one example of a versatile method that is applicable not only to gear machining but also to the machining of various cutting tool shapes and various machining mechanisms.

Key words : Taguchi methods, quality engineering, parameter design, automobile, differential units, hypoid gears, face hobbing, high speed cutting, S/N ratio

1. はじめに

図1に示すハイポイドギヤは，自動車のリヤデフユニットやPower Take Offと呼ばれる4WD用駆動伝達ユニットに内蔵されるギヤセットに用いられる。今回，この部品加工の近年の主流であるフェイスホブ歯切加工にパラメータ設計を適用し，従来の技術開発アプローチからの脱却を図った。

この加工方案のメカニズムは以下の通りである。

①**図2**に示すカッタと被削材が互いに逆方向に異な

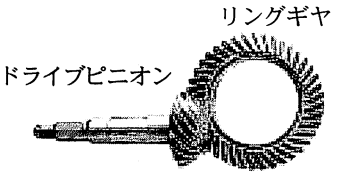

図1　ハイポイドギヤ

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