# OPTIMIZATION OF MANUFACTURING CONDITIONS FOR SPLINE OF DRUM CLUTCH HUB TAGUCHI METHOD

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**ABSTRACT**: A large variety of metal forming processes is required in manufacturing for automotive applications. Traditionally the design process for metal forming tools is based on trial-and-error and on the skill of experienced die-makers. This approach results in high development cost and long lead-times. Especially spline of drum clutch hub requires tight dimensional accuracy in its inside diameter and gear shape because it is used as the main component for the automatic transmission. In this paper, the most desirable or feasible manufacturing conditions for spline of drum clutch hub were found or determined by using Taguchi method and FE-simulation(FORGE-3D). Taguchi's optimization approach was used to obtain the optimal parameters. The significant parameters were identified and their effects on Manufacturing of spline were studied. As a results, a confirmation experiment with the optimal levels of manufacturing parameters was carried out in order to demonstrate the effectiveness of the Taguch method.

***Keywords**: FE-Simulation, Drum Clutch Hub, Spline, Manufacturing Conditions, Design of Experiment, Taguchi Method*

## 1. INTRODUCTION

At present, most of the automobile components responsible for providing rotatory motion, such as gears and clutches, are produced through such cutting processes as hobbing, shaping, and shaving under the demand that they be highly precise, highly robust, and highly durable. However, research on component forming depending on plasticity processing methods such as drawing, extruding, and forging is being actively conducted in order to do away with the simplicity of processing methods that rely primarily on cutting processes, for the purpose of increasing the productivity of these components.

Plastic working has the advantages of bringing about high productivity, low rates of material consumption, low costs of production per product, and a high quality of the products themselves. A number of developments of higher value-added plasticity processing techniques have been made recently in order to meet the demands for higher competitive power of the products. Among those techniques, the deep-drawing processing method used in the forming of cylindrical containers that make use of thin plates whose surface area is infinitely larger than their thickness is difficult to implement particularly with regard to measurement precision and forming load. Technical developments are being made through various forms of research that utilize FEM(Finite Element Method) and a number of experiments based on basic theories on this topic.

The automobile drum clutch hub, for which this research focuses on developing the preform, is a main component that directly affects torque transmission needed for automobile movement and that is directly related to the overall quality of automobile performance. Products have been manufactured based on the recommendation for a new preliminary forming process required for developing precise products demanded by the automotive industry with respect to the preforms of drum clutch hubs that are manufactured in progressive dies.

These products are expected to increase the degree of precision in the manufacture of drum clutch hubs by