



# 大型超硬合金金型の一貫体制製造技術の構築に関する研究

## —高効率直彫り加工を実現する切削工具形状および最適加工条件の検討—

*A Study of Integrated Technology Development for the Manufacture of Large Cemented Carbide Molds*

*—Research on Tool Shape and Cutting Conditions for Highly Efficient Direct Cutting—*

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Cemented carbide molds are used in high-pressure closed die forging, and in high-pressure punch forging when sharp edges are required. These cemented carbide molds have conventionally been manufactured by sinker EDM and polishing with diamond abrasives. Molds formed by EDM, however, are plagued by short lifetimes due to EDM cracks. There is also a demand for increased precision, creating a growing need for manufacture by direct cutting. The main obstacle to the direct cutting of comparatively large cold-forging cemented carbide molds, for which the need is greatest, has been the high tooling cost. Here, this issue is addressed with respect to the direct cutting (milling) of a cemented carbide mold with a diameter of about 100 mm. Because of the high tooling cost, tools were developed in-house, starting from the basics. Parameter design was employed and many control factors were tested. When the results were applied in a trial manufacturing run, molded products of hitherto unachieved quality were obtained. This accomplishment was brought about by an integrated organization in which industry, academia, and government were given clearly defined goals and each party performed a different task in pursuit of its goal.

**Key words** : robust parameter design, cemented carbide molds, direct cutting, process optimization, tools development, cooperate work, quality engineering, Taguchi methods, S/N ratio

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### 1. はじめに

超硬合金製金型(以下, 超硬金型)は高荷重がかかる閉塞鍛造用金型や高荷重とシャープなエッジが