Sacrificial Core Removal Using the FARADAYIC® Process

Objective:

This project demonstrated the capability of the patented FARADAYIC® Process for removal of a sacrificial steel core from a titanium block.

Summary:

The FARADAYIC® Process was used for the removal of a sacrificial core resulting from a near net shape process such as casting or hipping. The objective of this technology is to enable the manufacture of components with internal channels resulting in reduced cost, weight or processing time and improved tolerances. In comparison to two current practices, 1) mechanical removal of a ceramic core and 2) chemical removal of a steel core, the FARADAYIC® Process is superior in terms of process control and time. The difficulties encountered in removing sacrificial cores from castings have been alleviated by the method of this technology wherein the sacrificial core is electrolytically dissolved. The electrochemical potential may be established during electrolytic removal such that the sacrificial core is removed preferentially compared to the cast part. The technology is particularly suited for preparing shaped articles from refractory metals and alloys such as nickel, cobalt, titanium and the like. Two methods of electrolytic dissolution are:

1. an electrode used externally from the sacrificial core inserted into the cast part and moved in a drilling fashion, or
2. an integral electrode embedded in a hollow shell within the sacrificial core and electrically insulated from the shell.

Background:

The patented FARADAYIC® Process is an electrochemical manufacturing technique that utilizes a controlled electric field to either polish or shape a metallic work piece. Since the FARADAYIC® Process is electrically mediated, it does not require aggressive chemicals to facilitate the metal removal as needed in conventional chemical processes (e.g. chemical etching). The material removal rate is determined by the applied electric field, which is user-defined and computer controlled. This provides the means for precise control of the length of the process and the total material removed. Additionally, the use of neutral salt solutions (e.g. sodium chloride and sodium nitrate) as the electrolyte makes the process both worker and environmentally safe.

The FARADAYIC® Process technology illustrated above is protected by a substantial patent portfolio including issued, allowed, and pending patent actions.

Faraday Technology, Inc. • 315 Huls Drive • Clayton, OH 45315-8983
(937) 836-7749 • Fax (937) 836-9498
http://www.faradaytechnology.com