Post-EDM Surface Finishing of Inconel® 718 using the FARADAYIC® Process

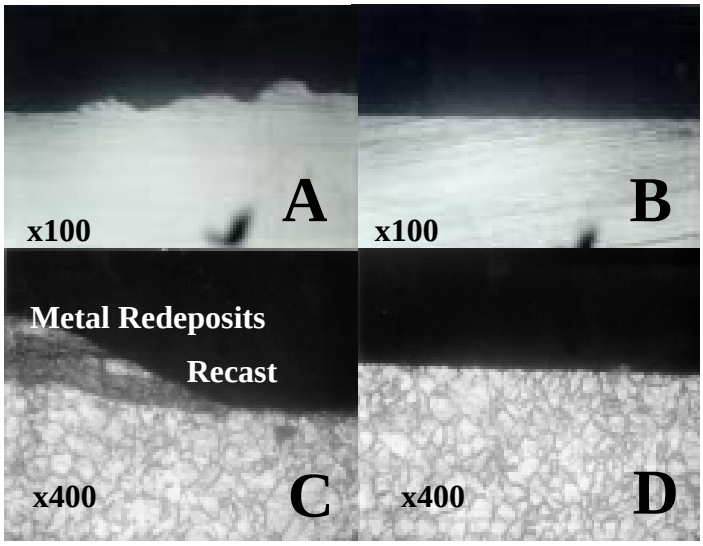
Objective:

This project demonstrated the capability of the patented FARADAYIC® Process for removal of an EDM-damaged surface and final surface finishing of INCONEL® (IN718) coupons.

Summary:

EDM-damaged IN718 coupons (initial roughness ~7μm) were finished using the FARADAYIC® Process. The final surface finish was better for the FARADAYIC® Process than DC and pulse current electrochemical machining processes. The micrographs indicate that the FARADAYIC® Process improves the surface roughness and demonstrates the removal of the EDM damaged layer. The damaged layer was removed in a relatively short time, 20 to 30 seconds, and utilized a water based electrolyte containing sodium nitrate ($NaNO_3$).

Waveform	Current Density (A)	Removal Depth (μm)	Surface Roughness (μm)	
			R_a	R_{max}
DC	71-57	248	0.60	2.38
Pulse Current	61-49	244	0.77	3.10
FARADAYIC	69-58	298	0.18	1.29



Surface profile/microstructure: A/C) before and B/D) after FARADAYIC® Processing

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.

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