



## Edge and Surface Finishing of Ti-6Al-4V for Contoured Shapes Using the FARADAYIC Process

### Objective:

This project demonstrated the capability of the patented FARADAYIC Process for polishing and radiusing passive materials, such as Ti-6Al-4V for contoured shapes, such as fan blades.

### Summary:

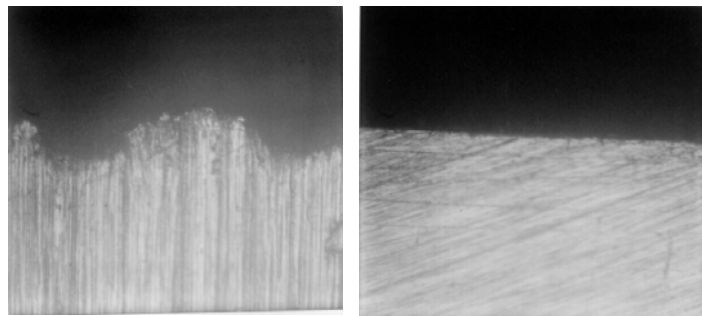
A 3-axis ECM positioning system was designed and built to accommodate batch mode part processing. This machine enables a contract services capability for its FARADAYIC Edge and Surface Finishing technology area, which is critical for processing evaluation parts for potential clients, as well as for pursuing services revenue from batch mode part processing. The cross-sectioned surface profile before and after ECM surface finishing for Ti-6Al-4V specimens indicate that the FARADAYIC Process improves the surface quality (such as reduction in surface roughness). The processing time for a successful removal can be very short, and often utilizes a water based electrolyte containing sodium nitrate ( $\text{NaNO}_3$ ) and sodium chloride ( $\text{NaCl}$ ), the latter being essentially table salt.



**3-Axis, Batch Mode ECM Positioning System for the FARADAYIC Process**

### 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.



**Surface Profile: Original Coupon (left), FARADAYIC Process Polished Surface (right).**

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