Automated, Free-Form Surface Finishing for Longer-Lasting Biomedical and Aerospace Components

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Technology description

Force Acting on Magnetic Particles and Abrasives Creates Better Hip and Knee Implants and More Effective Turbines for Engines

By altering the surface pattern for complex-shaped metal parts, this magnetic field assisted finishing process improves the performance of components for biomedical and aerospace uses. Perfecting the metal surfaces of hip or knee replacements lengthens the useful life of these prosthetics. For example, the femoral component of a knee prosthetic requires a specific surface pattern and level of roughness to function properly. An imperfect surface can cause improper wear on the implant as well as discomfort for the patient. In the aerospace industry, the surface attributes of a turbine in an engine determine the effectiveness of the engine. Though these industries seem worlds apart, each require optimal surfaces in their components. While these surfaces may be shaped and buffed by hand, bringing in specialized workers significantly increases production costs, increases the chance of deviations in surface quality, and limits possible variations in surface topography. Researchers at the University of Florida have overcome these obstacles with an automated process for free-form surface finishing, decreasing costs, while increasing efficiency and overall quality.

Technology

By mixing magnetic particles with abrasives, this magnetic field assisted finishing process produces surfaces with nanometer- and micrometer-scale characteristics that achieve improved functionality and desired values of parameters such as wettability, corrosion resistance, and friction. A magnetic field is used to locally manipulate abrasives to generate precise location instructions such as removing material or deforming the surface to precise specifications. The developed magnetic field assisted finishing (MAF) process is applicable to free-form biomedical or aerospace components.

Application area

Automated finishing for free-form surfaces in biomedical and aerospace devices

Advantages

Perfects surfaces of metal components, improving performance and longevity
Automates finishing process, reducing production costs while ensuring quality control
Uses magnetic and abrasive materials, crafting surface patterning and smoothing on a nanometer scale

Institution

University of Florida

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