Surface Finishing Solutions for Space Applications

Image Courtesy of NASA MFSC

REM's Extreme ISF® Process, utilizing both chemical and chemical-mechanical polishing technologies, is capable of removing the extreme roughness and surface/near-surface defects inherent to metal additive manufacturing. REM's processes have been used on mission-critical part applications for multiple lunar and Martian rover expeditions, and REM is proud to have supported NASA MSFC's recent RAMPT project culminating in multiple successful AM rocket engine hot-fire tests. Further, REM has won multiple SBIR awards with rocket propulsion and related AM component surface finishing application goals, is a supplier to NASA JPL for their AM surface finishing needs, and is supporting numerous commercial space AM component applications.

Space Component Applications:

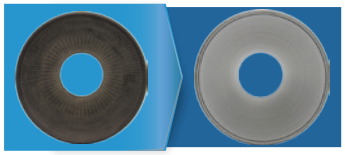
- Nozzles
- Combustion Chambers
- Cooling Channels
- Fuel Injectors
- Turbomachinery Components (Impellers, Blisks)
- Structural Components (Brackets, Lattices, Honeycomb Structures)
- Power Transmission Components
  - Precision, Fine Pitch Gears
  - Housings and Carriers

Ti-6Al-4V EBM

Cooling/Internal Channel Benefits:

- Pressure Drop Reduction
- Foreign Object Debris (FOD) Removal
- Oxide Layer Removal
- Controlled Diameter Increase

NASA HR1-1 LBP-DED



Hot Wall/External Surface Benefits:

- Controlled Wall Thickness Reduction
- Increased High Cycle Fatigue Resistance
- Increased Corrosion Resistance

Turbomachinery Benefits:

- Improved Flow Dynamics
- Increased Cleanliness

Ti-6Al-4V L-PBF

Power Transfer Component Benefits:

- Increased Contact Fatigue Resistance
- Reduced Lubrication Requirements

General Benefits:

- Roughness/Waviness Reduction
- Uniform Material Removal

All sites are ISO 9001:2015 and AS9100:2016 Rev D certified

Surface Finishing Solutions for Space Applications

NASA SBIR's:

Phase I:

Internal/External Surface Finishing of Additively Manufactured IN-625 Components (Z3.01-5453)
***2018-2019,* Complete**

Phase II:

Post-Process Optimizing of Additive-Manufactured Nickel-Based Superalloys (Z3.01-5453)
***2019-2022,* Complete**

Phase II Extended:

Process Scaling of Phase II Technology for Large Nozzle Applications
***2022,* Active**

Phase III:

Surface Enhancement Using ISF of Additively Manufactured Hardware
2020, Active

Air Force SBIR's:

Phase I:

Internal/External Surface Finishing of Additively Manufactured Aluminum-6061-RAM2 Components (FA864920P0930)
2020, Complete

Phase I:

Internal Channel Surface Polishing of GRCop-42 for Liquid Rocket Engine Applications (FA864922P0396)
2021-2022, Complete

Phase II:

Internal/External Surface Finishing of Additively Manufactured Aluminum-Based Components (FA864921P0815)
2021, Active, OO-ALC (Hill Air Force Base)

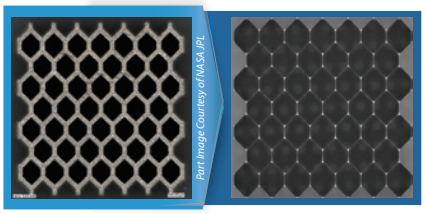
Phase II (Direct):

Development of Manufacturing, Heat Treatment, and Surface Finishing Guidelines to Yield Ready-to-Use IN-718 Additive Manufacturing Components (FA864921P0854)
2021, Active, EBW/LCMC (Warner Robbins Air Force Base)

Phase II (Direct):

Additively Manufactured Heat Exchanger and Channel Fabrication Optimization via Chemical Powder Blockage Removal, Surface Roughness Reduction, and Wall Thickness Optimization/Component Lightweighting (FA864922P0969)
2022, Active, OO-ALC (Hill Air Force Base)

A6061-RAM2 Honeycomb Lattice



All sites are ISO 9001:2015 and AS9100:2016 Rev D certified

www.remchem.com

REM Surface Engineering
325 W Queen Street
Southington, CT 06489 USA
Phone: (860) 621-6755
Fax: (860) 621-8822
Email: sales@remchem.com

REM Surface Engineering
2107 Longwood Drive
Brenham, TX 77833 USA
Phone: (979) 277-9703
Fax: (979) 277-0309
Email: sales@remchem.com

REM Surface Engineering
8912 Mississippi Street
Merrillville, IN 46410 USA
Phone: (860) 736-1477
Email: sales@remchem.com

REM Surface Engineering, Ltd.
Alington Road, Little Barford
Cambridgeshire PE19 6YH UK
Phone: +44 (0) 1480 210756
Fax: +44 (0) 1480 476339
Email: sales-eu@remchem.com