

*Conprofe **Ultrasonic-Green** Machine Tools*

Innovative Application Cases



Semiconductors



Aviation



Medical



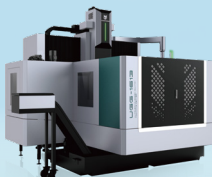
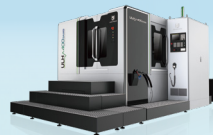
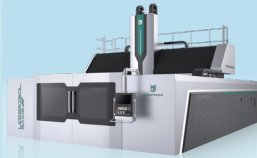
Automotive



3C



General Machining



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Website



YouTube



LinkedIn

Curved Electrode of Single Crystal Silicon

Challenges

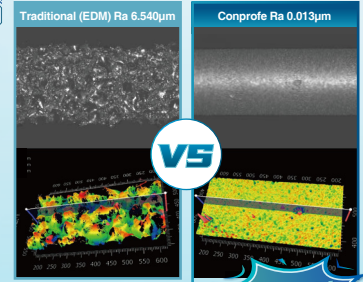
- Immature machining solution
- Hole wall roughness $\geq Ra\ 6.54\mu m$
- Hole roundness $\geq 0.025mm$
- Hard to control hole perpendicularity

Conprofe Solution

- **Ultrasonic Precision Engraving and Milling Center**
ULM-600
- + **Ultrasonic** Machining System
- + **Solid PCD Drill**

Conprofe Benefits

- Continuous machining of over **2,000** D0.45x24.75mm ultra-deep holes
- With ultra-deep micro-hole drilling, no obvious chipping around hole edges
- Hole roundness **0.003mm**
- Hole wall roughness down by **99.8%**, from $Ra\ 6.54\mu m$ to $Ra\ 0.013\mu m$



AlSiC Threaded Hole Machining

Challenges

- Cycle time >180s/hole
- Vulnerable to hole edge chipping
- High cost (Tool life <1 hole)
- Unstable workpiece quality
- Low precision

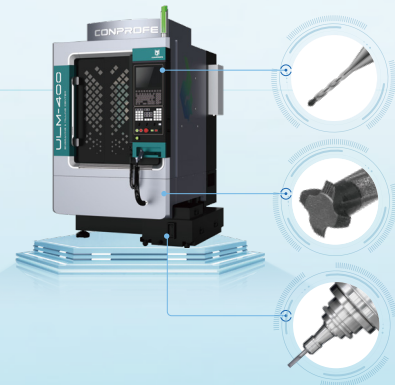
Conprofe Solution

- **Ultrasonic Precision Engraving and Milling Center**
ULM-400
- + **Ultrasonic** Machining System
- + **Solid PCD Drill** + **Solid PCD Thread Mill**

Conprofe Benefits

- Tool life improved by **800 times**, from 1/4 hole to 200 holes
- Wall thickness of 0.5mm, without any cracks or chippings

Tool Life (No. of Holes)



Nomex Honeycomb Contouring

Challenges

- Uneven machined surface, severe burrs and excessive dust
- Vulnerable to workpiece deformation, tearing and buckling due to compression

Conprofe Solution

- **Ultrasonic Gantry 5-Axis Machining Center**

UGA4020H-5AXIS

- + **Ultrasonic** Machining System
- + **Ultrasonic** Cutting Disc
- + **Ultrasonic** Straight-Edge Cutting Blade
- + Cryogenic Air Blasting Technology



Material: Nomex Honeycomb
Feature: Contouring

Conprofe Benefits

- Efficient 3D contouring of complicated shapes with angles < 18°.
- Mitigated dusting and no observable burrs
- Effectively lower cutting force with even stress on the workpiece
- Flat and smooth cutting surface without buckling



Superalloy Blisk Milling

Challenges

- Thin-wall (chord-thickness ratio > 40:1), with obvious chatter marks
- Poor surface roughness (Ra 0.93μm)
- Blade displacement
- Uneven blade edge



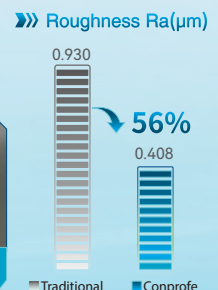
Material: Superalloy (GH4169)
Feature: Blisk Milling

Conprofe Solution

- **Ultrasonic Vertical 5-Axis Simultaneous Machining Center**

MVA400-5AXIS

- + **Ultrasonic** Machining System
- + Supercritical CO₂ (-78°C) Cryogenic Cooling System
- + Minimum Quantity Lubrication (MQL)
- + Ultrasonic Shrink-Fit Tool Holders
- + Coolant-Through Cutting Tools



Conprofe Benefits

- 3-in-1 technology reduces chatter marks on the blade surface and improves contour accuracy
- Blade surface roughness down by 56%, from Ra 0.930μm to Ra 0.408μm, shortening after-polishing time

Tibial Plateau Machining

Challenges

- Long cycle time
- Short tool life
- Low polishing efficiency and high manual labor cost

Conprofe Solution

- **Ultrasonic Drilling and Milling Center**

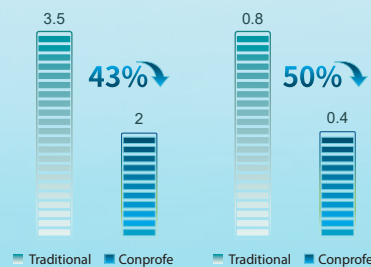
UGT-500

- + **Ultrasonic** Machining System
- + Minimum Quantity Lubrication (**MQL**)
- + Spindle-Through Cutting Tool

Conprofe Benefits

- Only very slight observable cutter marks on the surface
- Grinding and polishing cost down by **45%** vs. traditional machining
- Cycle time shortened by **43%**, from 3.5h to 2h
- Surface roughness down by **50%**, from Ra 0.8μm to Ra 0.4μm

»» Cycle Time (hour) »» Roughness (μm)



Material: CoCrMo Alloy
Dimension: 79x51x32.5mm

3D-Printed Titanium Alloy Spinal Cage Milling

Challenges

- Long cycle time
- No cutting fluids allowed
- Short tool life
- Severe burring and poor surface quality with dry cutting

Conprofe Solution

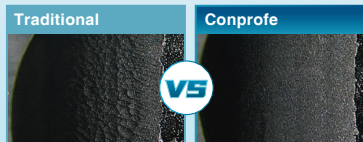
- **Ultrasonic Vertical 5-Axis Machining Center**

UGV200-5AXIS

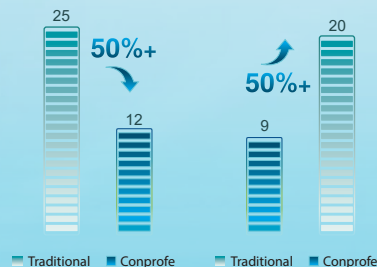
- + **Ultrasonic** Machining System
- + Supercritical CO₂ Cryogenic Spindle-Through Cooling System (**ScCO₂**)

Conprofe Benefits

- Surface roughness **Ra<0.6μm**
- Significant burr reduction, no need for manual deburring
- Achieve efficient, high-quality green processing and reduce workpiece scrap rate



»» Cycle Time (min) »» Tool Life (pcs)



Material: 3D-Printed Titanium Alloy TC4

Sapphire Through-Hole Machining

Challenges

- Poor hole wall surface quality
- Long polishing time for mass production

Conprofe Solution

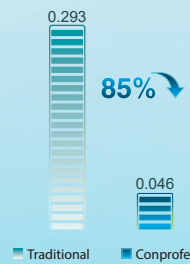
- **Ultrasonic Engraving and Milling Center**
ULM-400
- + **Ultrasonic** Machining System
- + **Solid PCD Micro-Edge** Cutting Tool

Conprofe Benefits

- Hole wall roughness Ra down by **85%**, from 0.293 μ m to 0.046 μ m
- No need for polishing



»» Hole Sidewall Roughness Ra (μ m)



Material: Sapphire

Hole: \varnothing 2.5x0.8mm

Forged Titanium Alloy Deep Blind Cross-Hole Drilling

Challenges

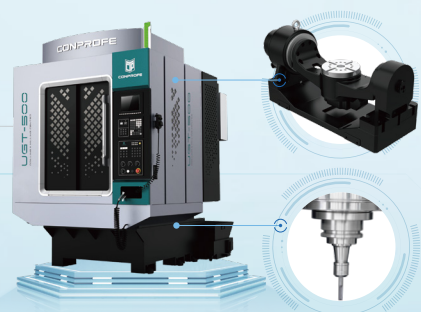
- Long cycle time
- Poor hole wall quality: heat discoloration, high roughness and severe burring

Conprofe Solution

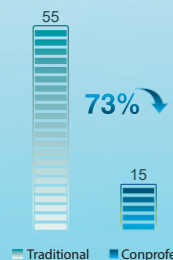
- **Ultrasonic Drilling and Milling Center**
UGT-500
- + **Ultrasonic** Machining System
- + Through-Spindle Cooling System
- + **Smartguy 5-Axis Rotary Table**

Conprofe Benefits

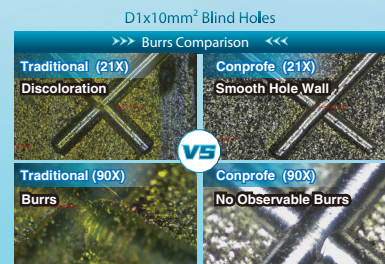
- Cycle time down by **73%**, from 55 seconds to 15 seconds
- Smooth hole wall without discoloration
- No observable burrs and no need for manual deburring



»» Cycle Time (s)



Material: Titanium Alloy



Carbon-Ceramic Brake Disc for New Energy Vehicle

Challenges

- Severe tool wear
- Low machining efficiency (C/T 120 min)
- Chipping, delamination and fiber pull-out and hole edge cracking

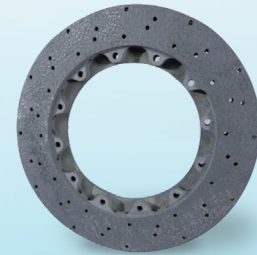
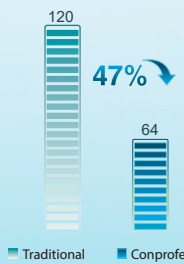
Conprofe Solution

- **Ultrasonic Precision Engraving and Milling Center**
ULM-600
- + **Ultrasonic** Machining System
- + **Solid PCD Drill**

Conprofe Benefits

- Improved surface quality without obvious chipping, cracking, delamination or fiber pull-out
- Cycle time down by **47%**, from 120 min to 64 min

»» Cycle Time (min)



Material: Carbon-Ceramic Composite

Dimension: D380x20.5mm

Features: I.D, Contouring, Step Milling and Hole Drilling

General Precision Manufacturing

Deep Hole Drilling in Quartz Glass Optical Fiber Preform

Challenges

- Poor hole side-wall surface quality
- Poor hole parallelism
- Hole edge chipping
- Machining failure due to tool breakage

Conprofe Solution

- **Ultrasonic Drilling and Milling Center**
UGT-500
- + **Ultrasonic** Machining System
- + Through-Spindle Cooling System

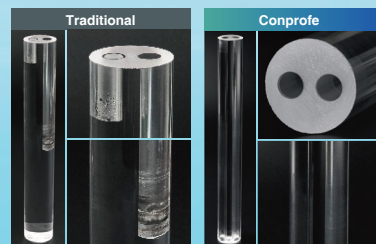
Conprofe Benefits

- Hole wall roughness **Sa < 0.122μm**
- Hole parallelism **< 0.0385mm**, meeting customers' requirements



Material: Quartz Glass
Hole: D30x250mm

Feature: Two D7.8x250mm Through-Holes
Hole Wall Roughness: Sa<0.8μm



Failure due to tool breakage