PERFECT SURFACES WORLDWIDE

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KAM Ingenierías Superficie

presented to CUSTOMER LOGO

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AEROSPACE INDUSTRY

- Aerospace industry components must withstand extreme environmental influences
  - Combustion temperatures above 1000°C
  - Very high demands on the used surfaces, materials as well as manufacturing and processing methods

- Often only manual or slow processing
  - High costs
  - Fluctuating machining results

→OTEC machines as a first-class alternative to conventional processes

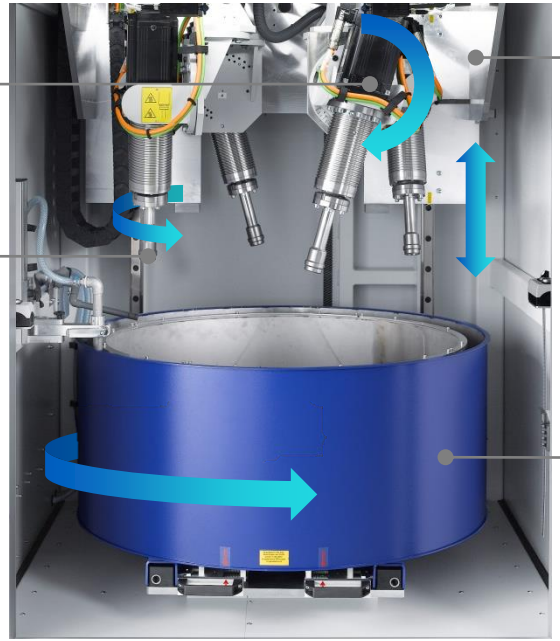
→ Reproducible, highest quality, short processing time

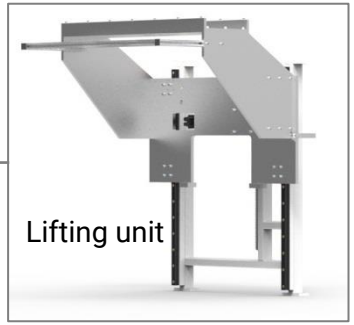
STREAM FINISHING FOR AEROSPACE INDUSTRY

Principle

Angular adjustment for work piece holder (immersion angle)

Rotating workpiece holder





Rotating process container filled with abrasive media

STREAM FINISHING FOR AEROSPACE INDUSTRY

Properties

- Up to five workpiece holders*
- Manual or automatic loading and clamping*
- Manual or automatic angular adjustment of the workpiece holders
- Manual or automatic workpiece loading
- For dry and wet processing
- Easy change of process container
- Easy change between different kind of workpieces

*) depending on workpiece

PROCESSING OF BLADES AND VANES

Task

- After manufacturing a surface treatment might be necessary since the initial roughness is too high or the edges are too sharp

→ This leads usually to the following tasks:

  - Homogeneous smoothing, in general to R_a 0,4 … 0.06 µm
  - Only minimal change to blades' shape
  - Rounding of the leading and trailing edge to a defined radius
  - High output (by clamping several workpieces simultaneously)
  - Maximum blade length ~ 300 mm
  - Blisks diameters up to 500 mm

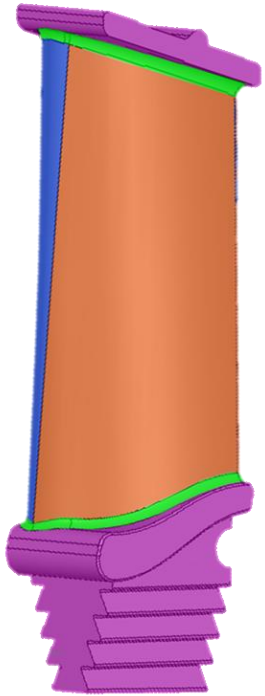
PROCESSING OF BLADES AND VANES

The Finishing Process

PROCESSING OF BLADES AND VANES

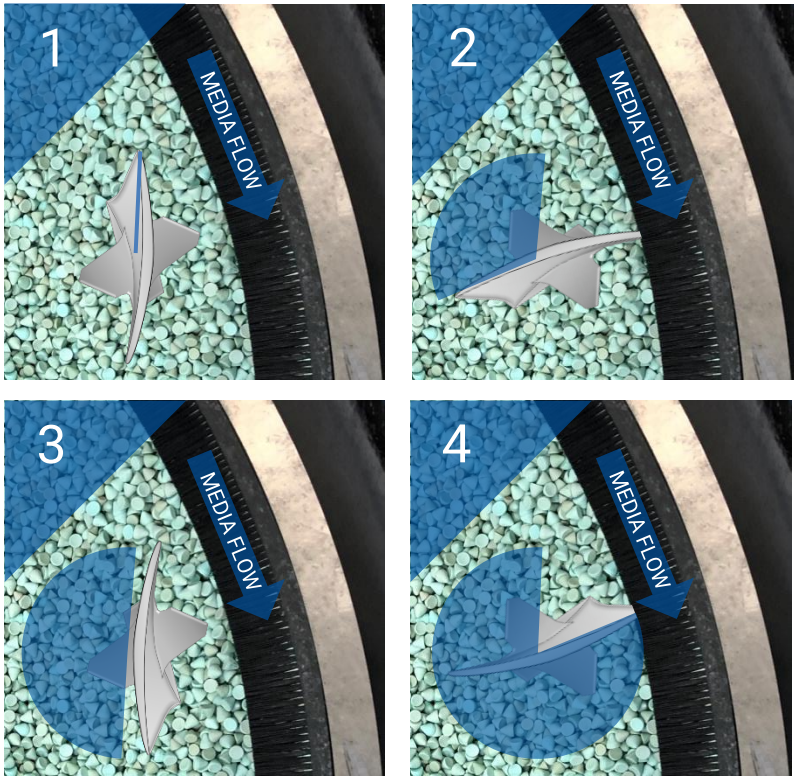
What we can do for you

- **Airfoil / Blade Body**
  - Surface smoothening: To get a balanced/uniform low surface roughness
- **Leading and Trailing Edge**
  - *Edge rounding: Fixing of edge radius when damaged by previous production process (e.g. shotblasting)*
- **Junction between Airfoil & Roots/Head (Fillet)**
  - Surface smoothening: To get a balanced/uniform transition and low surface roughness
- **Root & Shroud**
  - Deburring: To prevent the blade getting stuck in it‘s holder (hub)



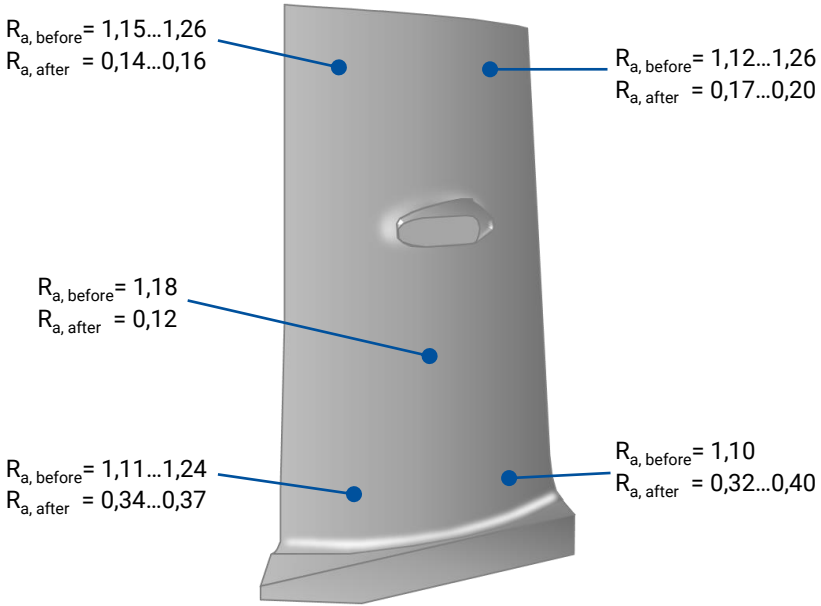
PROCESS (BLADES)
Example Process

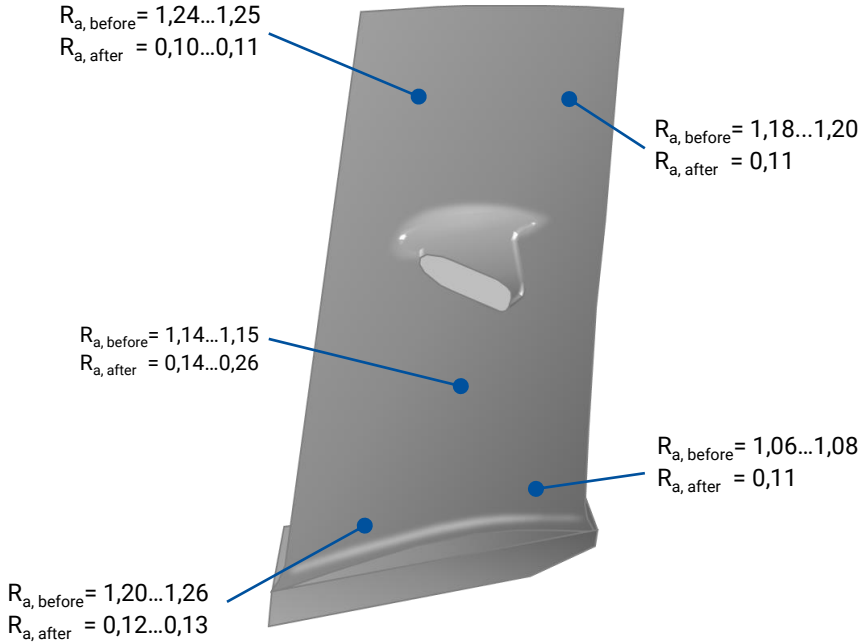
- Our process for a titanium blade:
  - Machine: SF
  - Process time: 9 min / cycle
  - Position:
    1. Angle 1 (5 sec)
    2. Angle 2 (3 sec)
    3. Angle 3 (5 sec)
    4. Angle 4 (3 sec)



PROCESSING OF BLADES AND VANES

Result: after 9 minutes of processing

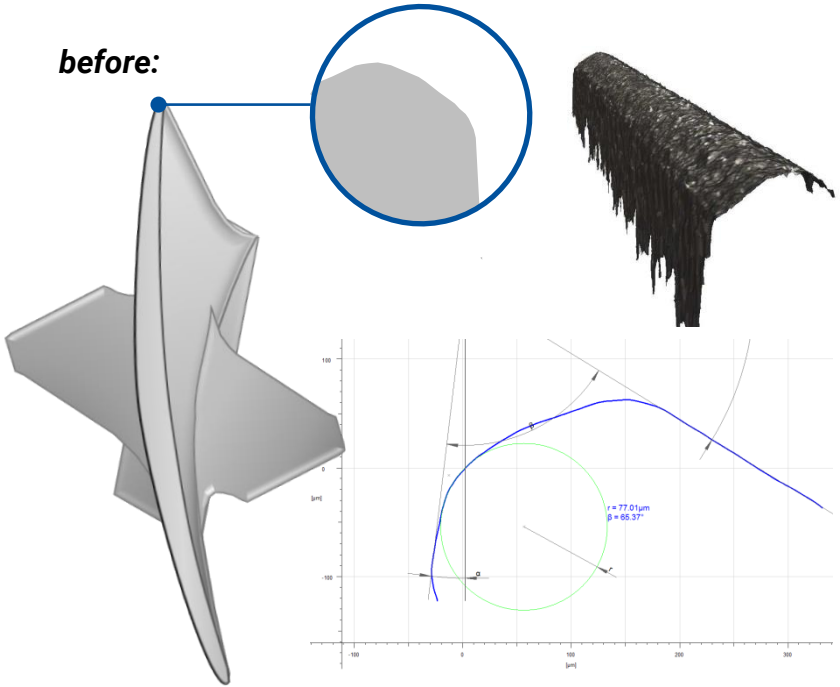




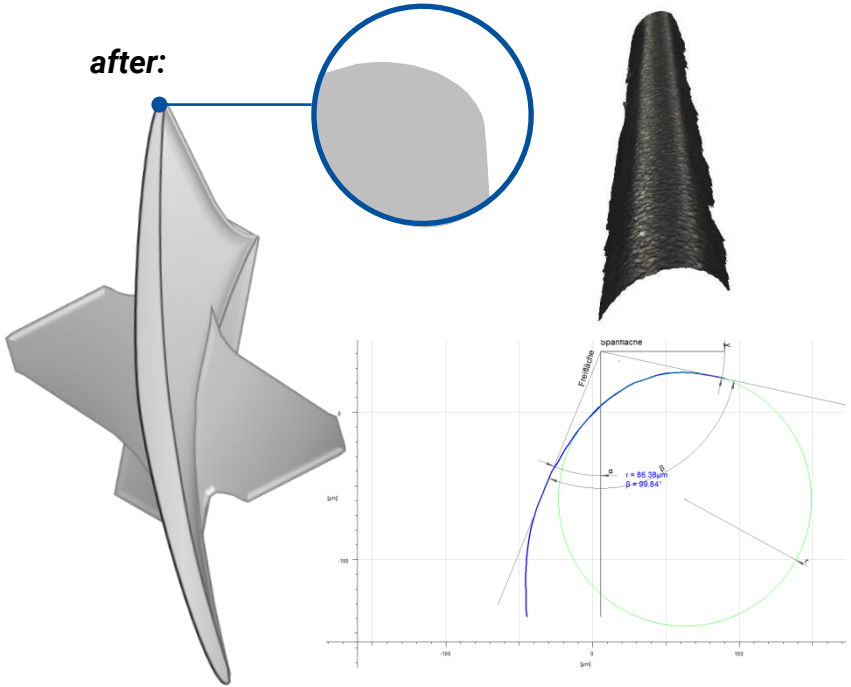
PROCESSING OF BLADES AND VANES

Result: after 9 minutes of processing

before:

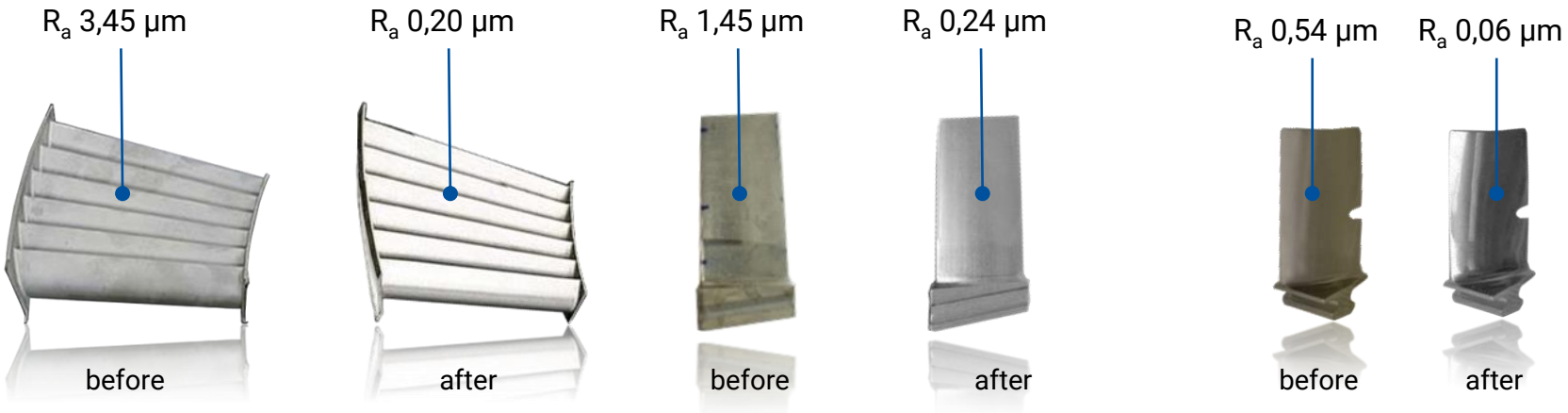


after:



PROCESSING OF BLADES AND VANES

Some examples



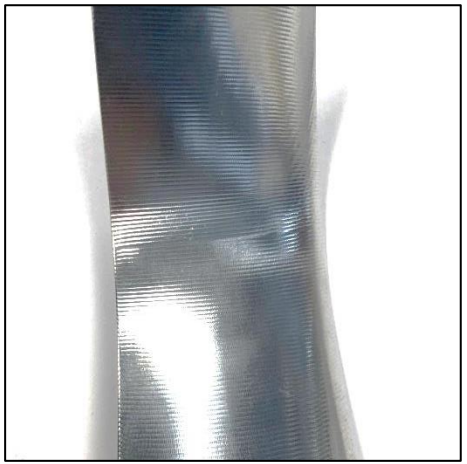
process time 100 min / cycle

process time 12 min / cycle

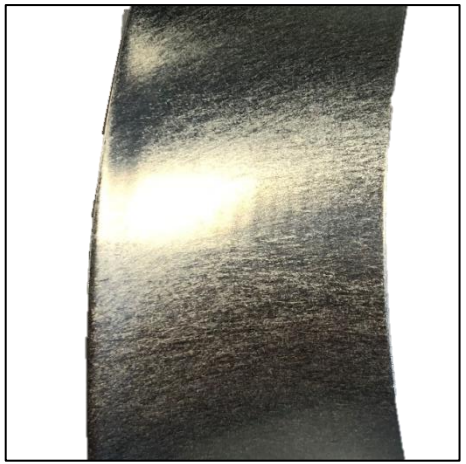
process time 2 min / cycle

PROCESSING OF BLADES AND VANES

Some examples



Ra 63 µinch (~ 1,6µm)



Ra 6 µinch (~0,15µm)

PROCESSING OF BLADES AND VANES

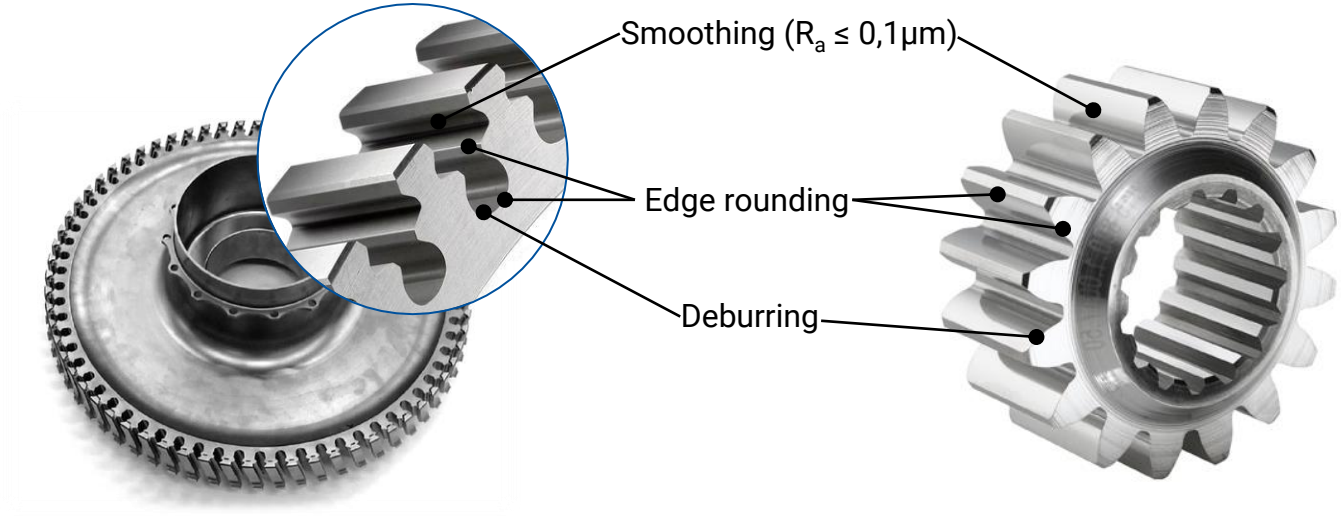
Some examples

before: ***after:***

process time 12 min / cycle

PROCESSING OF GEARS AND DISKS

What we can do for you



Disks

Accessory / Transmisson Gears

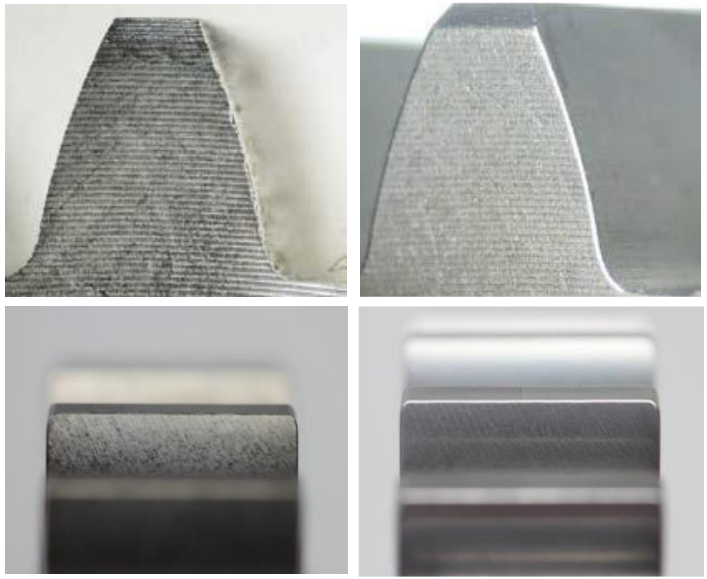
PROCESSING OF GEARS AND DISKS

The Finishing Process

PROCESSING OF GEARS AND DISKS

Some Examples

before: ***after:***



ADVANTAGES OF STREAM FINISHING

Blades and Vanes

- Only minimal rounding of tip edges
- No rounding root edges (when blades get fixed by the roots)
- If applicable, fast and reliable deburring / edge break of the roots
- High-quality preparation before coating (when applicable)
- Positive results in tests for residual stress, fatigue strength and fluorescence control
- Increase of the blades' lifetime and efficiency of turbines
- One machine suitable for blades, blade segments , blisks, disks and gears

ADVANTAGES OF STREAM FINISHING

Gears and Disks

- Surface adapted for improved lubrication (“lubrication valleys”)
- Little notching effect
- Up to 10% less heat development
- No roughness peaks (Rpk < 0,1 µm)
  - Less wear, no running-in necessary, longer oil life
- The coefficient of friction can be reduced by up to 30%
  - Higher efficiency, lower energy consumption
- Uniform edge rounding to defined radii
- Fast & efficient: deburring, edge rounding & smoothing in one step

ADVANTAGES OF STREAM FINISHING

In General

- Deburring, rounding, smoothing and super polishing
- High repeatability and reliability: Low fluctuation within the tolerance band
- Low operating costs
- Very short time of processing (2-30 min/per cycle) compared to common industry processes (up to 24 h)
- Low surface roughness (0.06-0.16 µm) in just a few minutes
- Uniform and minimal material removal
- For handling of process liquids no special, protective wear required
- No scratches or notches on surfaces after processing (parts are fixed and don’t contact anything than media)
- Environmental friendy process
- Easy to automate

FINISHING CENTER

We find your process

- Finishing of sample workpiece with no obligation and costs:
  - Individual customer advice
  - Detailed documentation
  - Finishing concept tailored to your needs
- State of the art measurement technology
- Very experienced and highly qualified staff members
- Process research together with institutes and universities

THANK YOU FOR YOUR ATTENTION.