

**PERFECT SURFACES WORLDWIDE**



## A WELCOME FROM THE TECHNOLOGY LEADER

in mass finishing



Proverbial ingenuity, coupled with German efficiency and a love of perfection, are the best qualifications for developing successful ways of creating immaculate surfaces. Driven by these attributes of German engineering, OTEC, with its innovative technologies, has grown into the industry trendsetter in just a few years.



## MARKETS



**AUTOMOTIVE INDUSTRY**



**TOOLMAKING INDUSTRY**



**STAMPED, TURNED AND MILLED PARTS**



**AEROSPACE INDUSTRY**



**MEDICAL AND PHARMACEUTICAL  
INDUSTRY**



**CERAMIC AND PLASTIC PARTS**



**JEWELLERY AND WATCHMAKING  
INDUSTRY**

## AUTOMOTIVE INDUSTRY



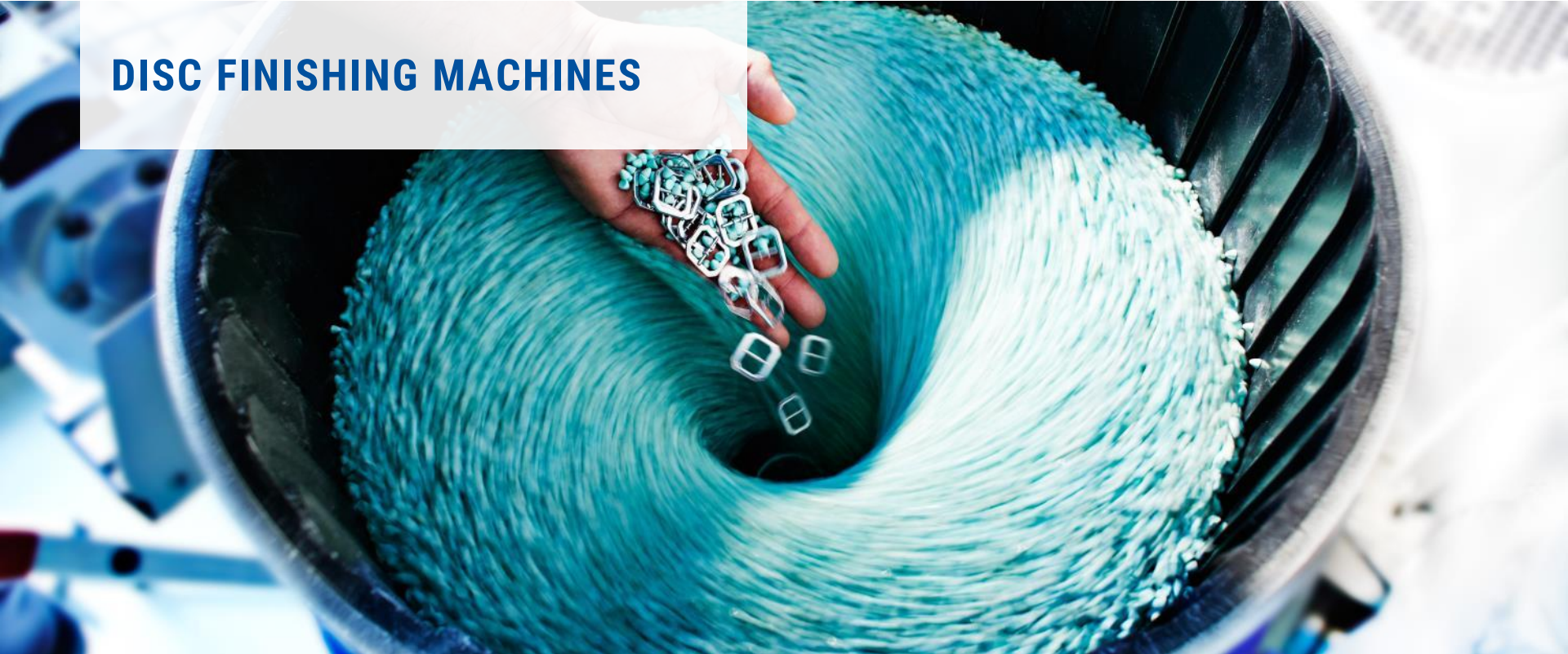
# **MASS FINISHING** for automotive industry

DISC FINISHING UNITS  
DRAG FINISHING UNITS  
STREAM FINISHING UNITS





## DISC FINISHING MACHINES



## DISC FINISHING TECHNOLOGY (CF)

- Processing in an open drum (the process container) with a base plate in the form of turntable or disc
- Workpieces, together with a suitable polishing or grinding media, are set in motion by the rotation of the disc to create a toroidal stream inside the stationary drum
- Contact between the workpieces and the media generates a very intense finishing effect
  - up to 20 times more efficient than with systems such as conventional vibrators
- In the wet finishing process, a water/compound mixture is continuously added and drains off, taking with it the residues of the material removed
- Highlights:
  - Fast, absolutely reliable and reproducible results
  - Extremely cost-effective finishing, even for very small parts (e.g. turned parts 0.5 mm Ø, material thickness 0.08 mm)
  - Simple handling
  - Wide range of applications, from deburring to mirror-finish polishing



## DISC FINISHING TECHNOLOGY (CF)

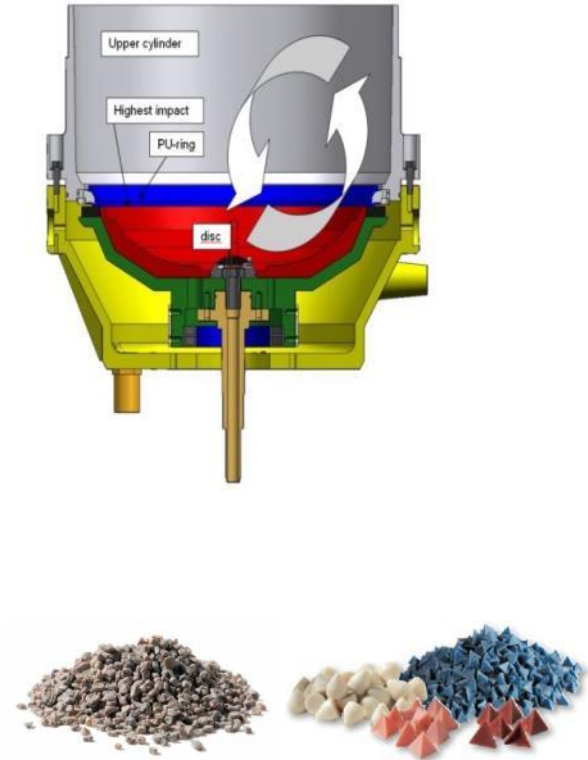
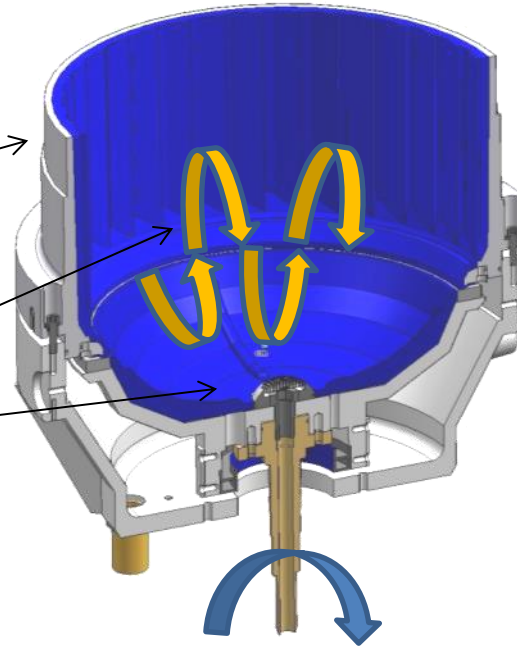
- CF Series are available with the right gap system between the disc and the upper cylinder for all processing techniques:
- Zero gap system:
  - For the wet finishing of very fine workpieces, the gap is reduced to zero
  - Benefit: It is possible to use very fine microfinishing media, no workpieces can get lodged in the gap
- Ceramic gap system:
  - With this system, the gap can be set to a precision of 0.05 mm
  - Benefit: use of very fine polishing granulates for best polishing results
- Ceramic/polyurethane gap system:
  - OTEC's standard system
  - suitable for the most common wet finishing applications
  - Benefit: prevents anything from lodging in the gap and blocking the disc, ensuring a high degree of process reliability, low maintenance requirement



# DISC FINISHING UNITS

## Principle

- Stationary cylinder
- Movement of media
- Rotating disc



# DISC FINISHING UNITS

## Properties

- Modular concept - up to 6 process containers
- For dry and wet finishing process
- Process drums with hot moulded PU lining
- Aluminium profile chassis - easy to add on optional equipment
- Chassis of anodized aluminium profile (resistant to corrosion)
- Speed control via frequency inverter
- PLC touch screen control unit with digital display of:
  - processing time, speed, rinse cycle, dosing and other key process parameters
  - storage for up to 200 different finishing programs



[Video](#)

## SMALL GEAR WHEELS

CF Series



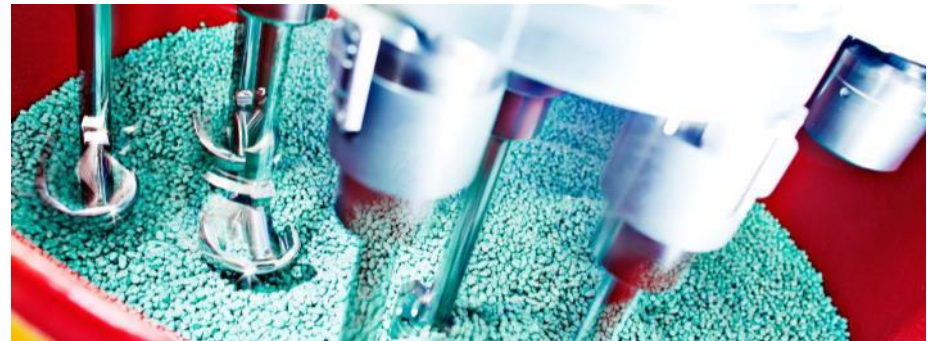


## DRAG FINISHING MACHINES



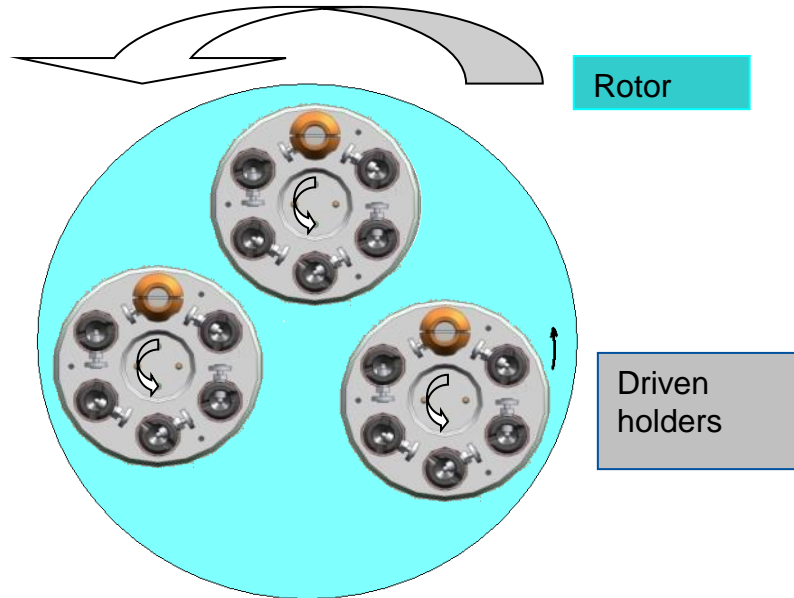
## DRAG FINISHING PROCESS (DF)

- Workpieces are clamped in specially designed holders
  - prevents collision of the workpieces
- These holders are dragged in a circular motion through a process drum containing grinding or polishing granulate
- This high-speed motion generates high contact pressure between the workpiece and the media, which in a very short time produces perfect results:
  - high-precision edge rounding
  - smoothing
  - mirror finish
- Absolute reliability
- Maximum cost-effectiveness
- Perfect finishing results
- Short processing times
- Realisation of multi-stage processes
  - Fine grinding and polishing
- ✓ Quality equivalent to that obtained by manual polishing



# DRAG FINISHING MACHINE

## Principle





# DRAG FINISHING MACHINES

## Properties

- Custom-designed workpiece holders ensure that the workpieces are mounted as quickly and efficiently as possible and considerably simplify batch processing
- Over 100 different types of holder
- Water cooling system keeps the polishing granulate at a constantly low temperature
  - Extends the life of the process medium
  - Constant process quality
- Fast and easy change of the process container
- For dry and wet finishing process



[Video](#)

# GEARBOX- AND ENGINE PARTS

## DF Series

unprocessed

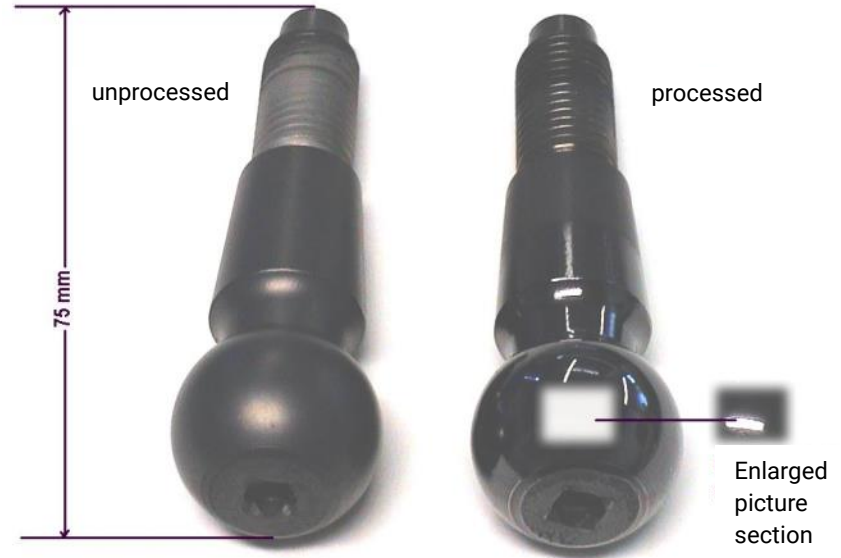


processed



## BALL PIVOTS CAR STEERING SYSTEM

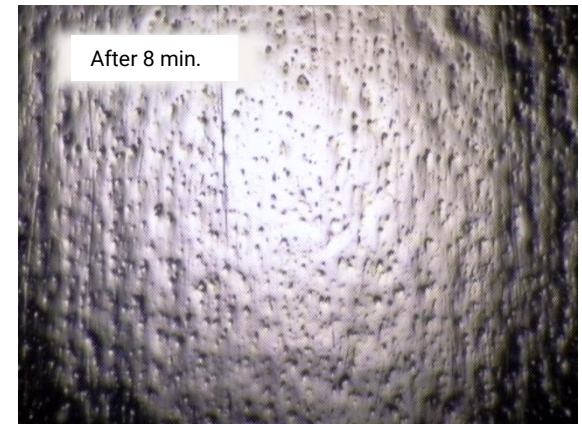
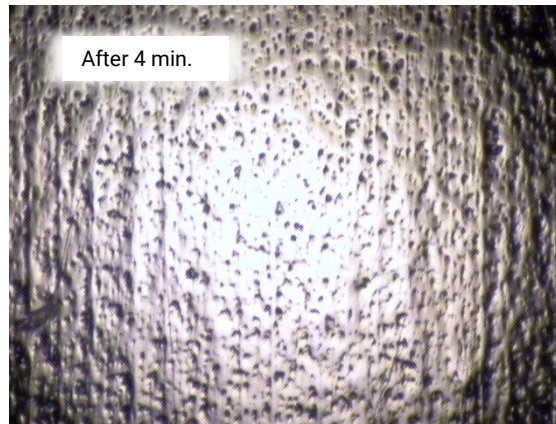
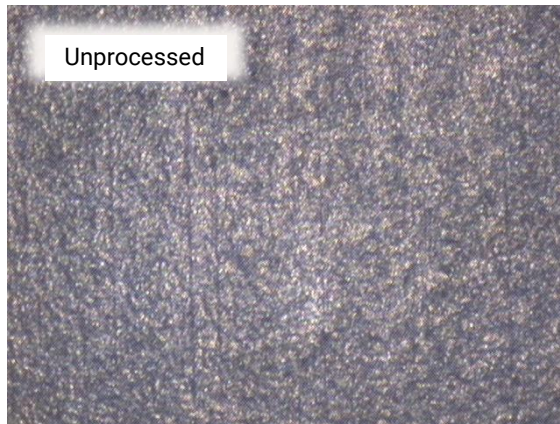
- Removal of the oxide-layer after hardening
- Polishing of the sliding surface





## BALL PIVOTS CAR STEERING SYSTEM

- Example of a ball pivot



## STREAM FINISHING MACHINES





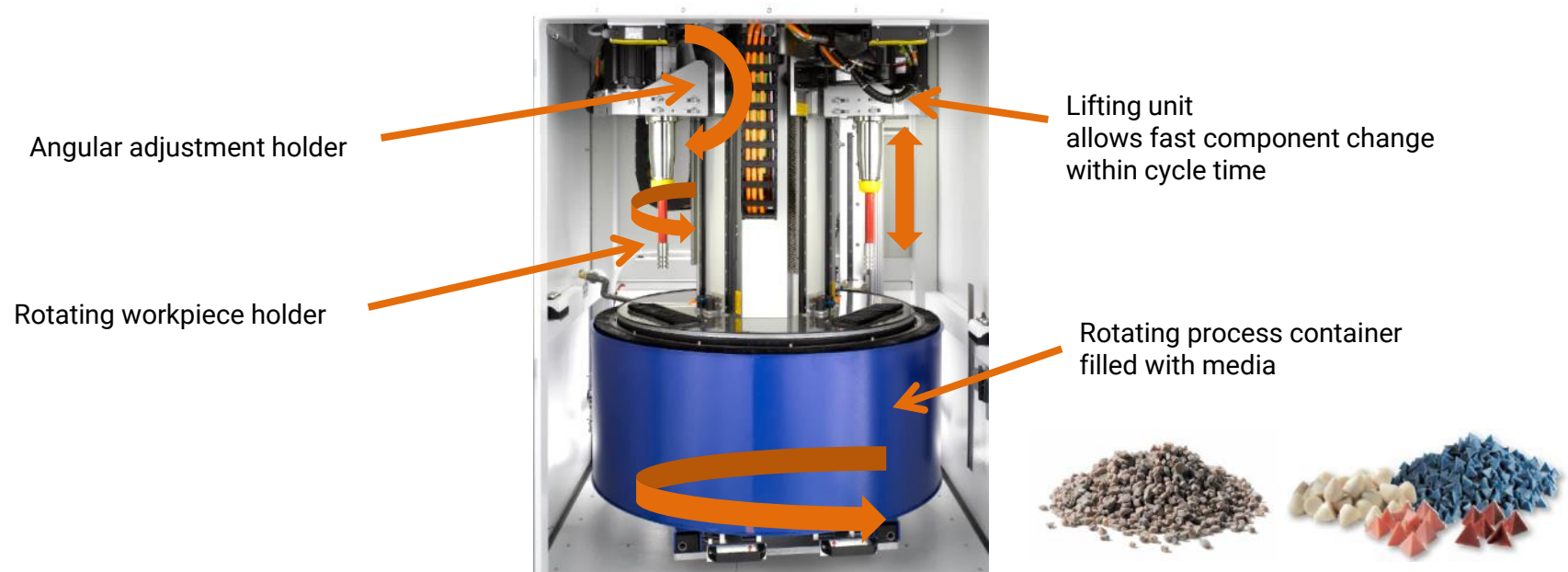
## STREAM FINISHING PROCESS (SF)

- Workpieces are clamped in a holder and immersed in the rotating process drum filled with grinding or polishing media
- Abrasive effect by relative motion between the workpiece and the process media
- Deburring, edge rounding and polishing in a single operation
- Very short finishing cycles from 10 sec to max. 5 min
- Easy to automate
- High process reliability



# STREAM FINISHING MACHINES

## Principle



# STREAM FINISHING MACHINES

## Properties

- Fastest finishing machine worldwide
- Up to 5 workpiece holder
- Manual or automatic loading and clamping
- Manual or automatic angular adjustment of the workpiece holders
- Automatic change of the workpiece holders possible
- For dry and wet finishing process
- Fast and easy change of process container
- Easy change between different kinds of work pieces possible



[Video](#)



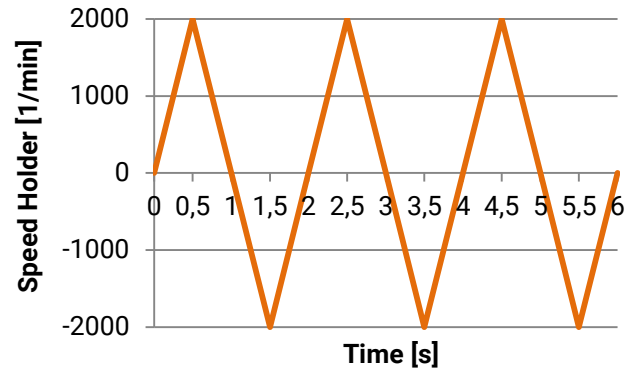
## SF MACHINES FOR SERIES PRODUCTION

- SF for series production with automatic loading and unloading



# SF Pulsfinish

- Alternating twist of the workpiece up to  $\pm 2000$ /min
- Tangential acceleration up to 40G
  - Extremely intense and precisely controllable abrasive effect
  - Very short finishing cycles
- Very low Rpk-values ( $< 0.1 \mu\text{m}$ ) in a short time
- Processing also in inaccessible areas of intricate workpieces



## SF ACCESSORIES

### Workpiece holders

- Custom-designed workpiece holders
- Depending on the machine, up to 4 holders per machine can be used
- Ready for automatic loading
- Clamping on internal and external surfaces
- Optional: with HSK 63 interface
- Optional: with blocking air
- The clamping situation is analysed individually
- Standard holder (automatic clamping)
  - Multi blade mandrel
  - Collet
  - Gripper



Multi blade mandrels



Collets

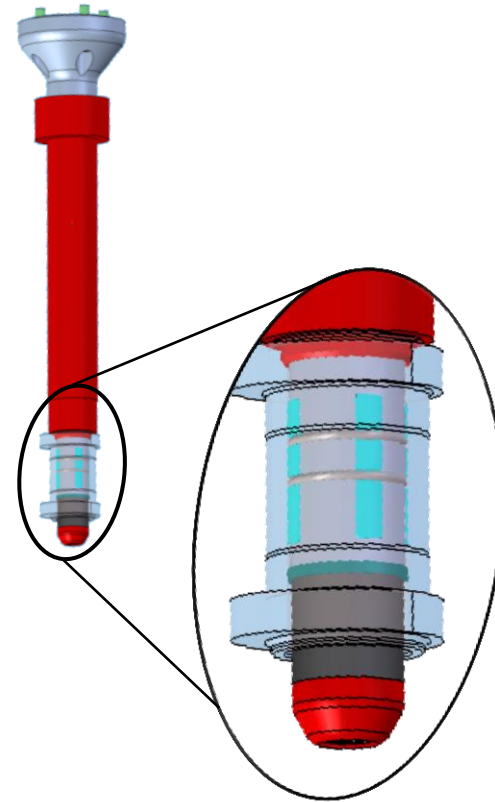


Grippers

# FINISHING OF CAMSHAFTS

## Workpiece holders

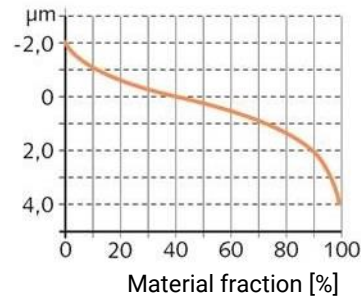
- Fixing of the work pieces in a multi blade mandrel
  - Not necessary to change the work pieces manually



# FINISHING OF CAMSHAFTS

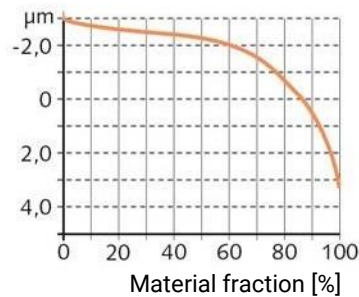
## Conventional grinding

$R_a = 2,0 \mu m$      $R_z = 6,1 \mu m$   
 $R_{max} = 8,0 \mu m$      $R_{pk} = 1,8 \mu m$   
 $R_k = 2,8 \mu m$      $R_{vk} = 3,4 \mu m$



## Pulsfinish

$R_a = 2,0 \mu m$      $R_z = 5,2 \mu m$   
 $R_{max} = 8,0 \mu m$      $R_{pk} = 0,1 \mu m$   
 $R_k = 1,0 \mu m$      $R_{vk} = 6,8 \mu m$

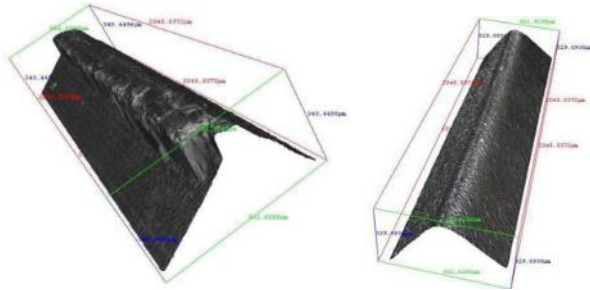




# FINISHING OF CAMSHAFTS

## Racing

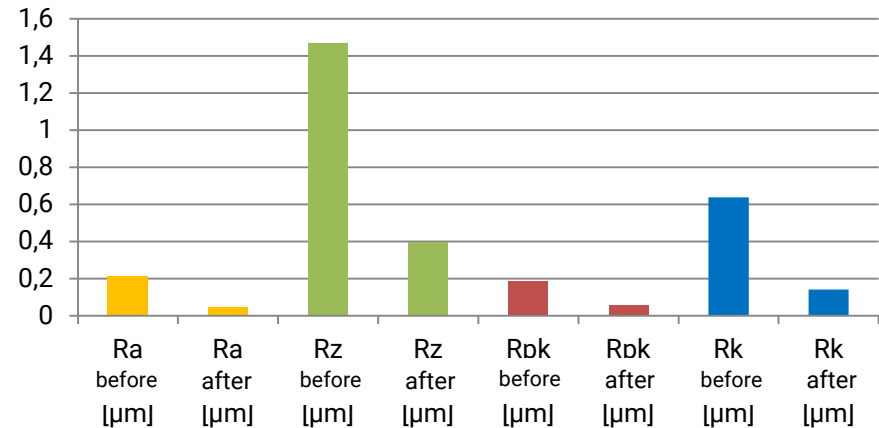
- Camshaft of a racing car
- Process time < 2 min
- Huge improvement of surface quality



Edge before (left) and after (right) process



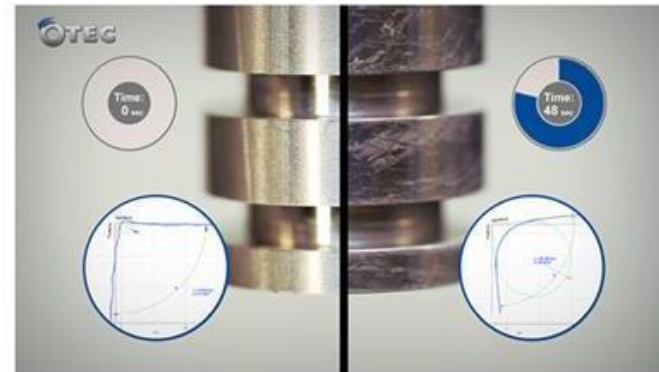
## Surface quality



# SF PROCESS

## Deburring & edge rounding

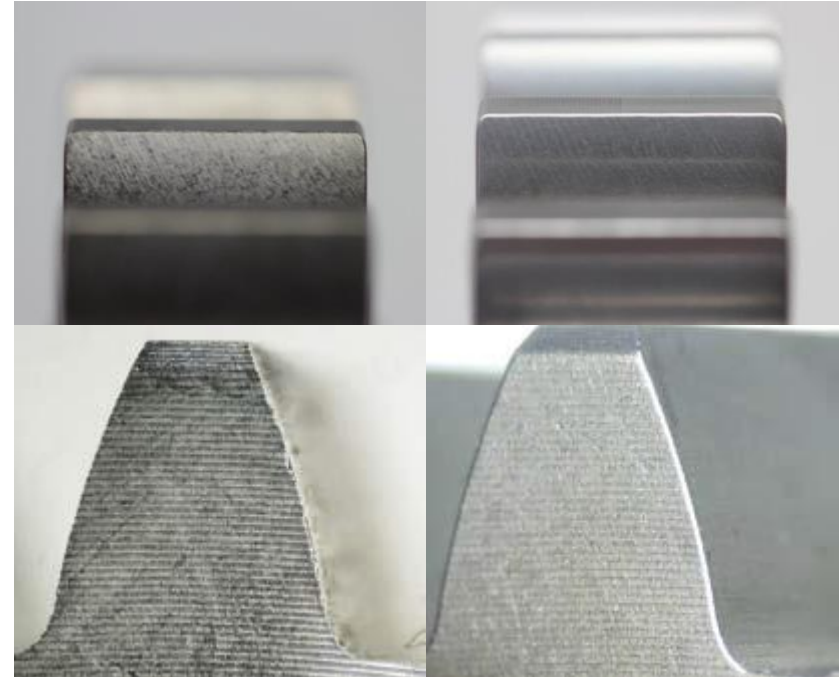
- SF Process combines smoothing of the surface with
  - Deburring
  - Edge rounding
  - While the contours of the workpieces remain largely intact



Before (left) and after (right) the SF process

# GEARS

- Smoothing
- Deburring
- Edge rounding
- Surface adapted for improved lubrication
- Little notching effect



Gears before (left) and after (right) SF process

## CONTROL ROLLER

### Complex geometries

- Finishing of complex geometries
  - Deburring
  - Smoothing
  - Edge rounding
- Improvement of the whole surface in a short process time





## INJECTOR NOZZLES

- Nozzles
- Needles
- Parts of pumps
- Guides
- Pump shafts
- Gear parts
- Customer requirements:
  - Polishing before and after coating
  - Rounding of edges to 1-2  $\mu\text{m}$
  - Smoothing
- Average process times are around 5-15 sec!



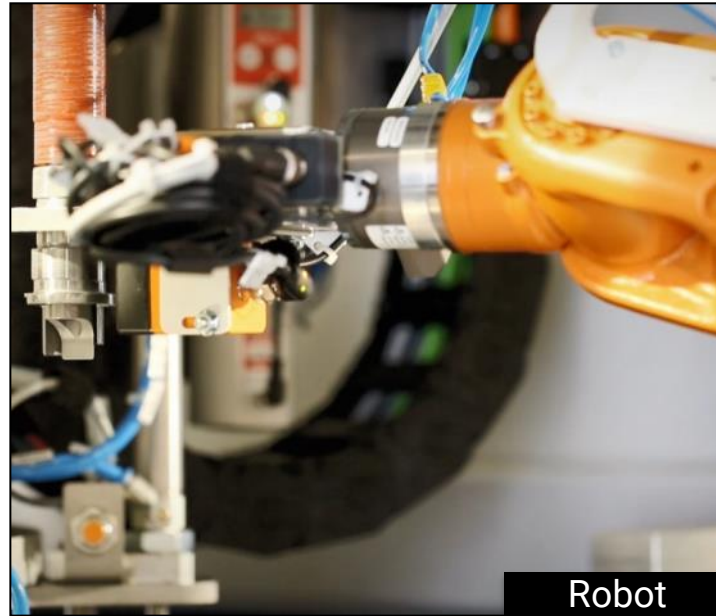
## WORM GEAR SHAFTS

- Jets
- Needles
- Pump parts
- Guideways
- Pump shafts
- Transmission parts
- Customer requirements:
  - Polishing before and after coating
  - Rounding of edges
  - Smoothing



# AUTOMATION

## Options

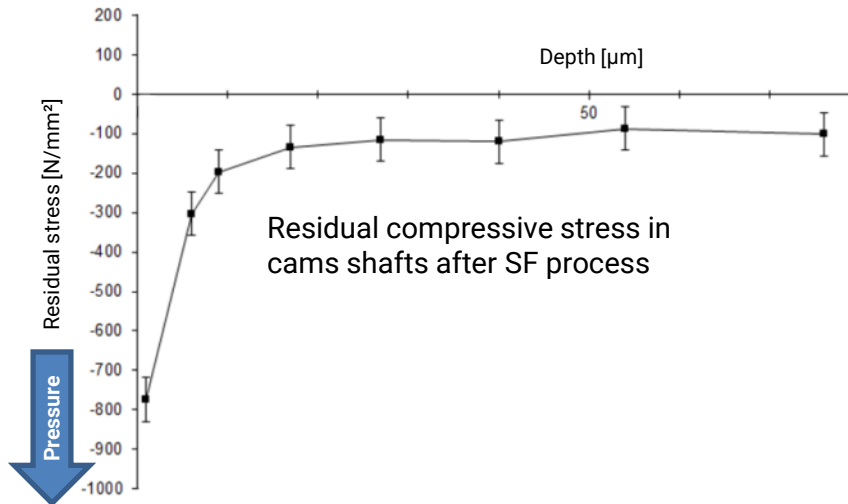


Automation of machines:

- Easy automation by robot or loading and unloading system
- Can easily be integrated into a customer's system

# RESIDUAL COMPRESSIVE STRESS

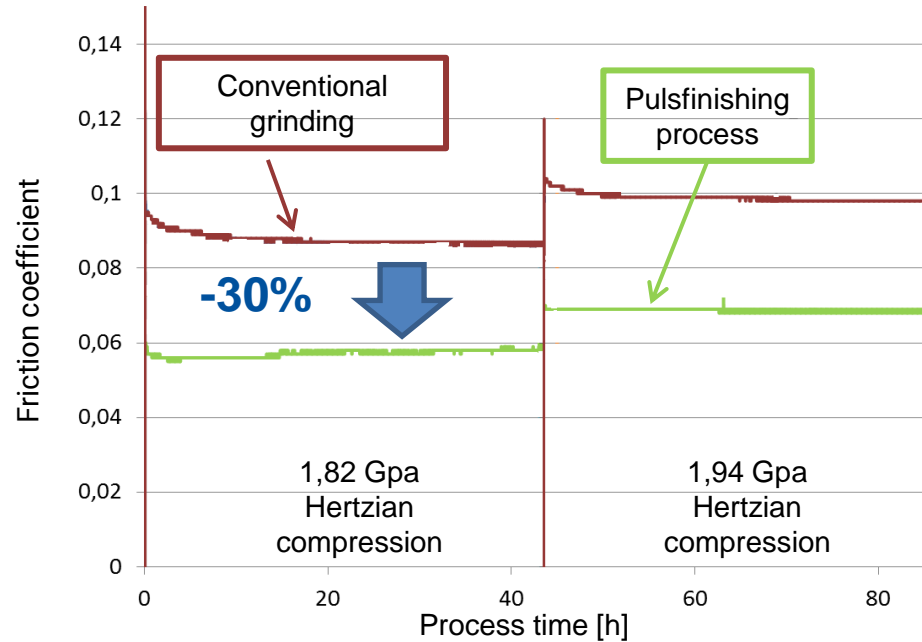
- SF process introduces residual compressive stress into the workpiece
- Higher resistance to bending load
- Higher bending fatigue strength
- Longer lifetime
- Lower notching effect





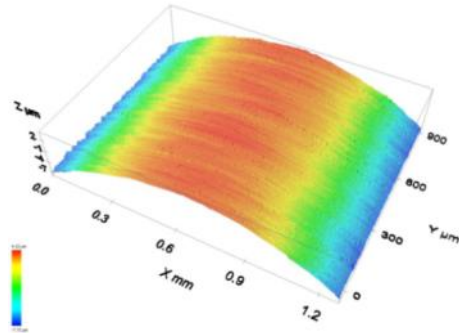
# REDUCTION OF FRICTION COEFFICIENT

- Friction measurement in the "2-disk rolling test" (Amsler)
- With drops of Mobil SHC 624 oil and 10% slip
- Friction value reduced by up to 30%

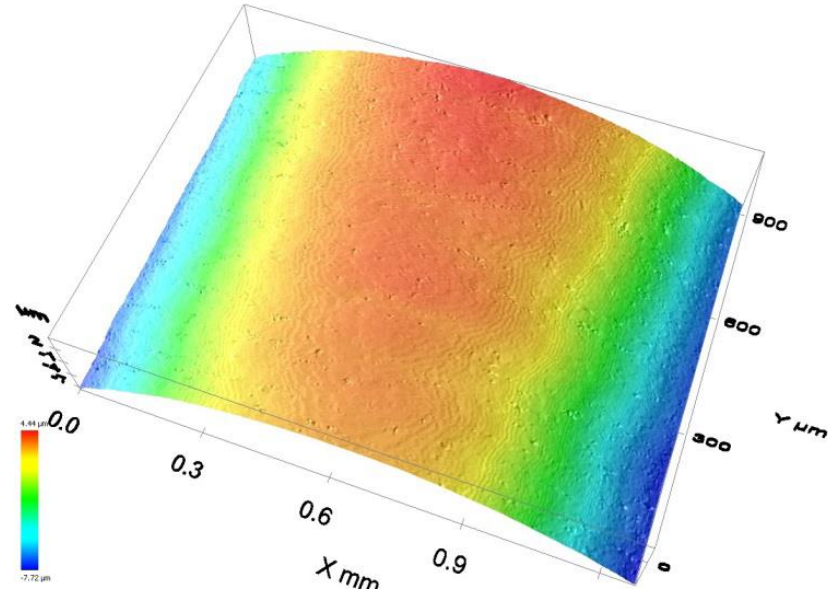


# SURFACE IMPROVEMENT

- Removal of grinding grooves
- Significant reduction in roughness
- Granule impact results in the formation of closed micro-cavities for an improved lubrication



Surface before Pulsfinishing process




Surface after Pulsfinishing process

## BENEFITS FOR CUSTOMERS

- Noise reduction (up to 3dB possible, for example, with gears)
  - Up to 10% lower heat development
  - Better lubrication of surfaces
  - No roughness peaks ( $R_{pk} < 0.1 \mu\text{m}$ )
    - 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
- Entire improvement of component properties

## FINISHING CENTRE

- 
- State of the art measurement technology
  - Very experienced and highly qualified staff members
  - Process research together with institutes and universities

## FINISHING CENTRE



- Finishing of sample workpiece with no obligation and costs
  - Individual customer advice
  - Detailed documentation
  - Finishing concept tailored to your needs





**THANK YOU FOR YOUR ATTENTION.**