

Examples
from the
automotive
industry

SAINT-GOBAIN
—
ABRASIVES

Grinding of journals on camshafts

Roughing with electroplated grinding wheels

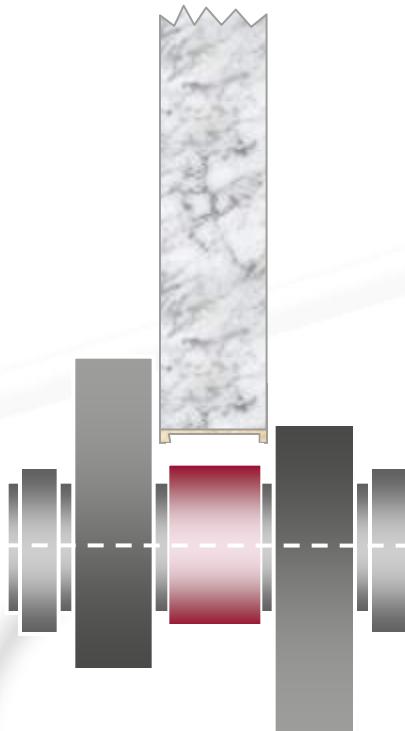
Machine	Schraudt CF 41 CBN
Workpiece	camshaft
Material	GGG 60, 58 HRC
Coolant	Öl, low viscous
Coolant pressure	25 bar
Cleaning pressure	40 bar
Grinding wheel	1S 700 – 400 – 22 100 B252 G825 S33

Grinding parameters

Cutting speed	$v_c = 145$ m / s
Stock removal	$a_e = 1,8 - 2,0$ mm

Result

Wheel life	$m_T > 75.000$ shafts
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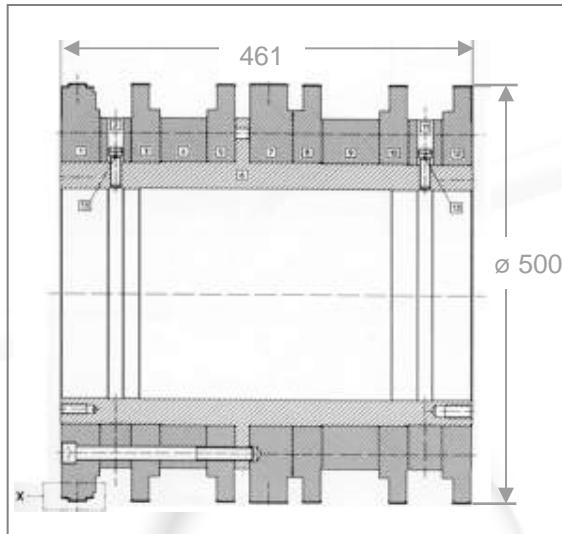


Grinding of journals on camshafts

Roughing with electroplated grinding wheels

given situation

- 11 parts grinding wheel set,
consisting of
 - ▶ 7 grinding wheels
 - ▶ 4 spacers
 - ▶ 1 carrier



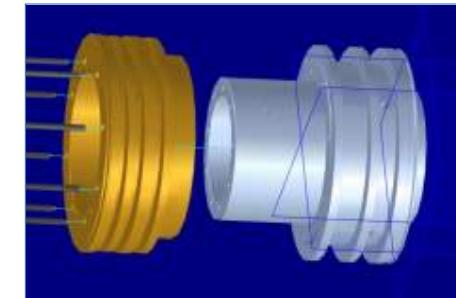
Grinding of journals on camshafts

Roughing with electroplated grinding wheels

Step 1: 2 parts grinding wheel set

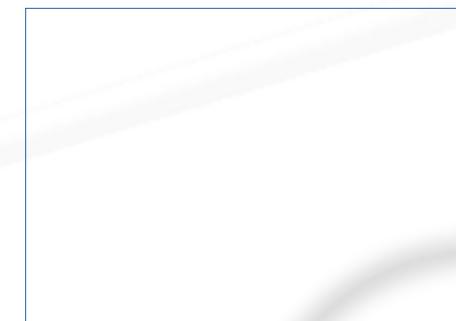
Dimension

- diameter 500 mm
- width 500 mm



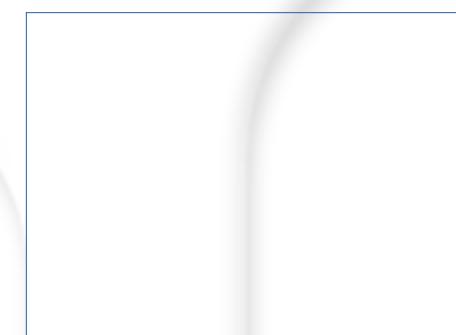
Weight

- 2 parts set: 200 kg and 325 kg
- inclusive spindle appr. 700 kg



Superabrasives

- | | |
|--------------------|-----------|
| ● bonded | 630 ct |
| ● need for plating | 25.000 ct |



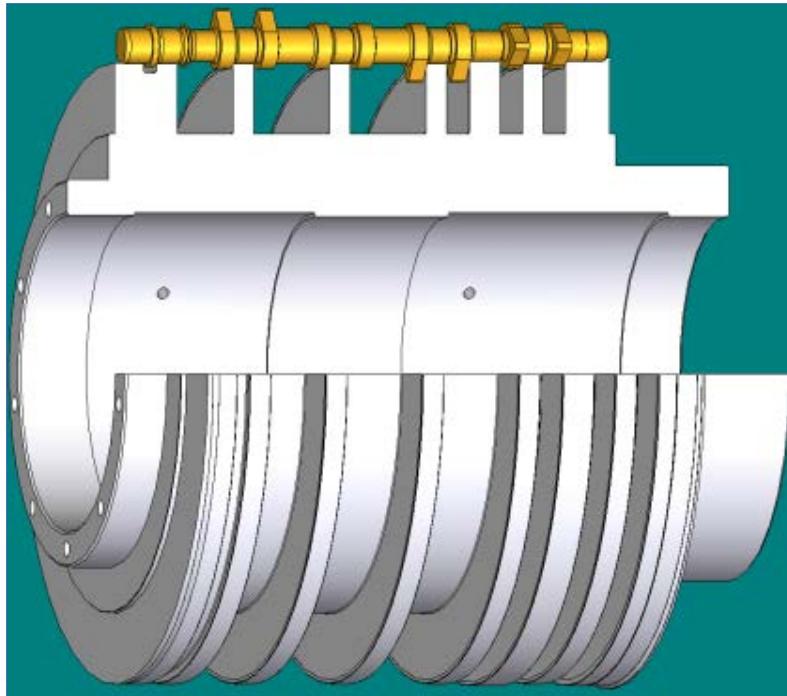
$v_c = 120$ m/sec

Grinding of journals on camshafts

Comegui
S.L.
Abrasivos técnicos

Roughing with electroplated grinding wheels

Step 2: One-piece grinding wheel body



Grinding of journals on camshafts



Roughing with electroplated grinding wheels

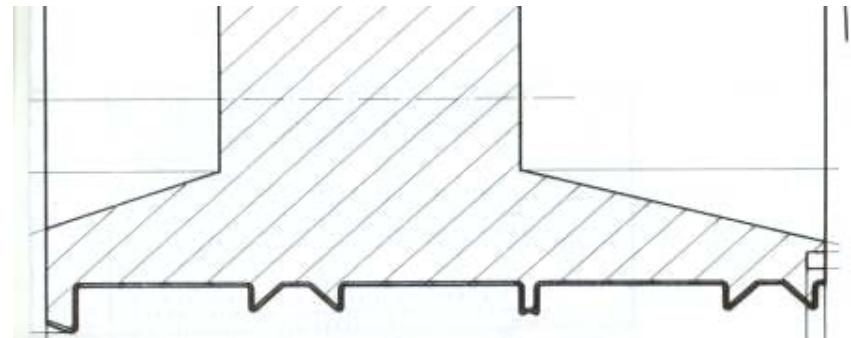
Step 2: One-piece grinding wheel body

Machine	Mikrosa Kronos
Coolant	Oil
Workpiece	Camshaft, 8 journals, GGG, Ø 35,3mm
Grinding wheel	50SE – 700 – 165,5 - 2M B 251 / G 825 / S 33
Grinding parameter	$v_c = 90 \text{ m/s}$ $Q'_w = 15 \text{ mm}^3/\text{mm s}$ $a_e = 5,15 \text{ mm}$
Grinding time	$t_s = 13 \text{ s inclusive sparking out}$
Wheel life	> 600.000 camshafts

Grinding of grooves into gearshafts

Challenge and concept

rotary
dresser(s)



bonded
wheel(s)

Grinding of grooves into gearshafts

Implementation and result

Machine	Overbeck 600 R CNC HGS
Coolant	oil, low viscosity 30 bar
Workpiece	gearshaft 16MnCr5, HRc 63
Wheel	electroplated bond 400 – 220
Parameter	$v_c = 105 \text{ m/s}$ $a_e = 2 - 3,5 \text{ mm}$
Result	100.000 part / wheel

Centerless grinding with vitrified cBN

Wheel whilst setup



Centerless grinding with vitrified cBN

Centerless wheel

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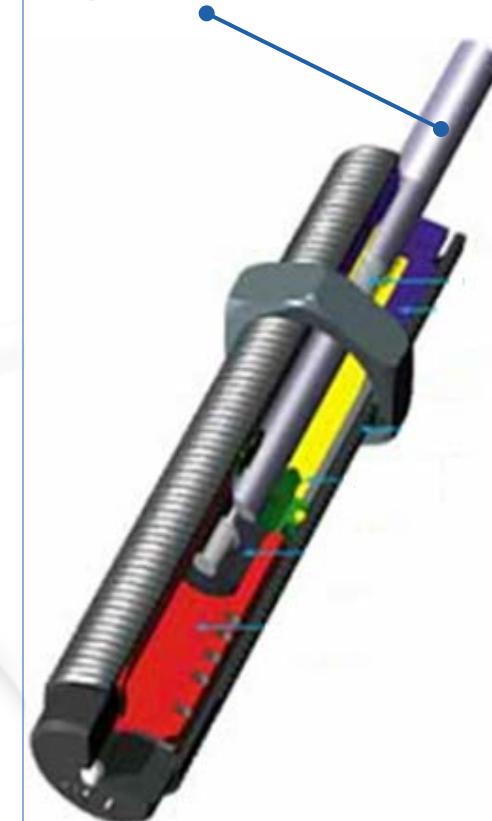
Centerless grinding with vitrified cBN

Circumferences of hydraulic bolts

- machine
- workpiece
- grinding wheel
- Parameter
- dressing tool
- coolant
- result

Mikrosa Kronos M
hydraulic bolt
9SMn28K, soft
500 – 250 – 5
multi layer specification
 $v_c \leq 125$ m/s
 $v_w = 18$ m/min
CNC dresser
double sided plated
emulsion, 5 %
25.000 parts/dress
 $R_z \leq 1,2$ μm

hydraulic bolt



Plunge grinding of cam lobes with cBN

3 cylinder camshaft

■ Machine	Junker Jucam 5002/20s
■ Workpiece	pump/injector 2V camshaft 16MnCr5, base cycle Ø 52,8 * 13
■ Grinding wheel	3VG 700 - 400 - 34 - 5 127 B126 T2L - 150 - G5 E
■ Cooling	Houghton Wiolan SH 10 cooling pressure 10 bar cleaning pressure 50 bar
■ Results	dressing cycle m_T 180 shafts dressing amount a_{ed} 12 μm surface finish $R_z \text{ max}$ 2,5 μm Increase of tool life 30 %



Grinding of journals on camshaft

Plunge grinding with vitrified cBN

Machine

Workpiece

Grinding wheel

Dressing tool

Coolant

Parameter

Result

Schaudt

4 cylinder camshaft
steel, hardened
journal diameter 28 mm

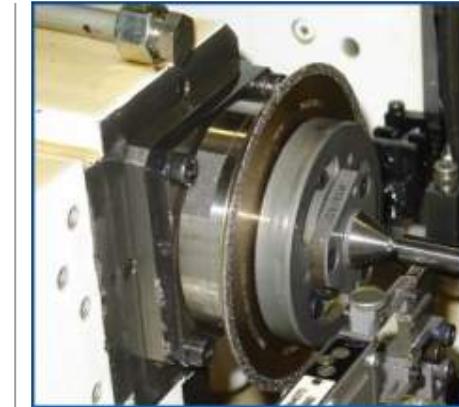
190 – 17,5 – 5
vit. cBN
B151 V30 W0E0VG2

CNC dresser
double sided plated

oil

$v_c = 100$ m/s

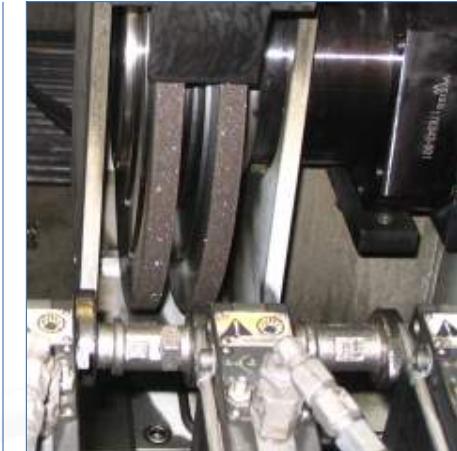
150 lobes / dress
 $R_z \leq 1,0 \mu\text{m}$



Finish grinding of cam lobes

Plunge grinding with vitrified cBN-wheels

■ Machine	EMAG Kopp SN204, 30KW		
■ Workpiece	6 cylinder camshaft chilled cast iron		
■ Grinding wheel	2 part set 14A1 - 400 - 18 - 5 127 B181 I9VM V48		
■ Dressing tool	CNC dresser 502 SG 71P-140-0,5		
■ Cooling	emulsion cooling pressure 14 bar cleaning pressure 18 bar		
■ Results	cycle time decrease 60 % tool life increase 100 %		



Plunge grinding of camshafts

Journals

- Machine Landis Lund
- Workpiece camshaft
chilled cast iron
- Grinding wheel 400 – 22 – 5
vit. cBN V-B100 J208 V660
- Dressing tool CNC dresser
single sided plated
- Coolant emulsion
- Parameters $v_c = 125 \text{ m/s}$,
 $a_e = 3,4 \text{ mm}$
 $R_a \leq 0,6 \mu\text{m}$
- Result increase of ppd by factor 5



Grinding of bearing seats on gearshafts

Peeling with vitrified bonded cBN

Machine

Junker Quickpoint,
3 grinding spindles

Workpieces

several gearshafts
input-, counter-, output-shaft

Task

reduction of set-up time

Challenge

grinding of all shafts with 1 specification

Result

savings of appr. ca. 900 k€/a

Grinding wheel

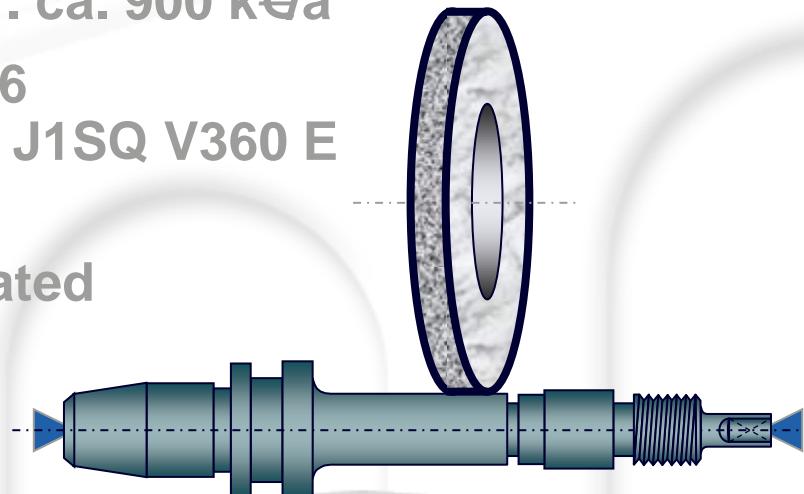
1VG 700-350-6-6
B151 VSS 2046 J1SQ V360 E

Dressing tool

CNC dresser
single sided plated

Coolant

oil





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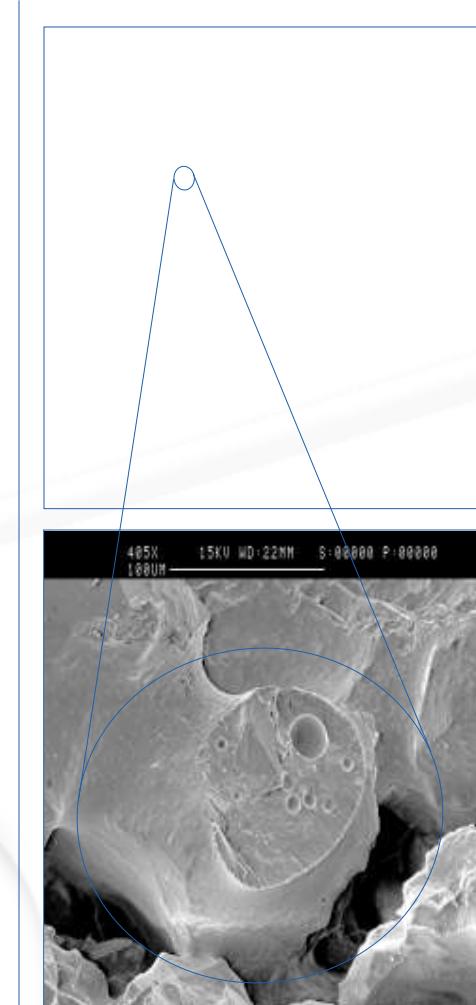
Grinding of camshafts with vitrified cBN - journals

- customer: Automotive Industry
- machine: Schaudt
- grinding wheel: 190 – 17,5 – 5
B151 V30 W0E0VG2
- cutting speed: $v_c = 100$ m/s
- journal diameter: $d_w = 28$ mm
- dressing tool: double sided CNC dresser
- material: cilled cast iron
- coolant: oil
- result SGA: 150 journals/dress
 $R_z \leq 1,0 \mu\text{m}$



Plunge grinding of camshafts with vitrified cBN wheels - journals

- customer: Automotive Industry
- machine: Landis Lund
- grinding wheel: 400 – 22 – 5
vit. cBN V-B100 J208 V660
- conditions: $v_c = 125 \text{ m/s}$, $a_e = 3,4 \text{ mm}$
 $R_a \leq 0,6 \mu\text{m}$
- dressing tool: CNC dresser
- material: chilled cast iron
- coolant: emulsion
- result competitor: 20 shafts / dress
- result SGA: 100 shafts / dress



Plunge grinding of camshafts with vitrified cBN wheels

customer:	Automotive Industry *)
machine:	Schaudt Twin CF41
grinding wheel:	400 – 2*18 – 5 vit. cBN V-B181 F200 VT2
cutting speed:	$v_c = 100$ m/s
dressing tool:	CNC dresser
material:	chilled cast iron
coolant:	neat oil
result competitor:	70 lobes / dress **)
result SGA:	90 lobes / dress



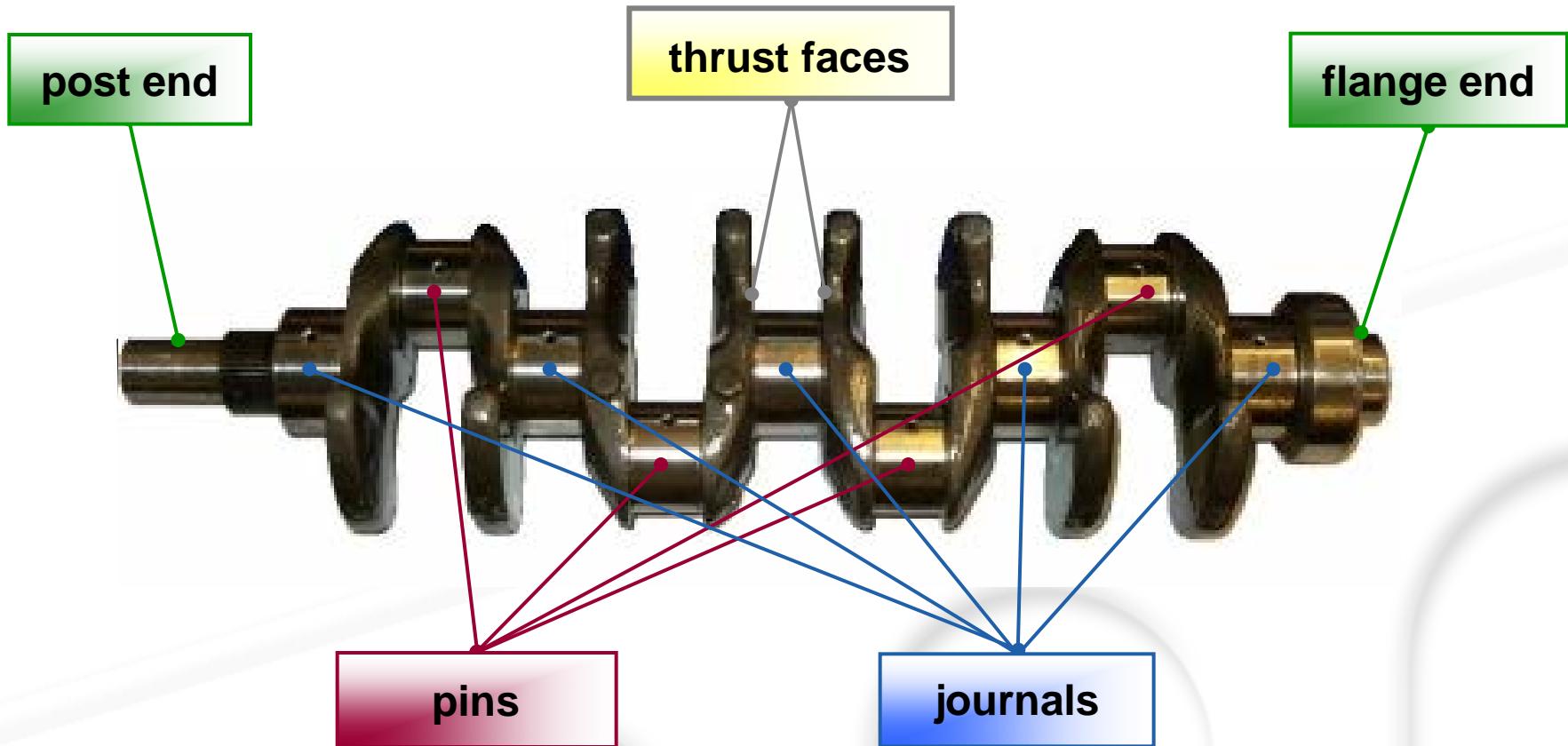
Plunge grinding of balance shafts with vitrified cBN Wheels

- customer: Automotive Supplier Ind.
- machine: Tacchella
- grinding wheel: 400 – 29/25 – 5
V-B126 F200 VT2
- cutting speed: $v_c = 125$ m/s
- dressing tool: CNC dresser
- material: steel, hardened
- coolant: emulsion
- result competitor: 50 parts / dress
- result SGA: 70 parts / dress,
no burn, facets, waviness



Crankshaft

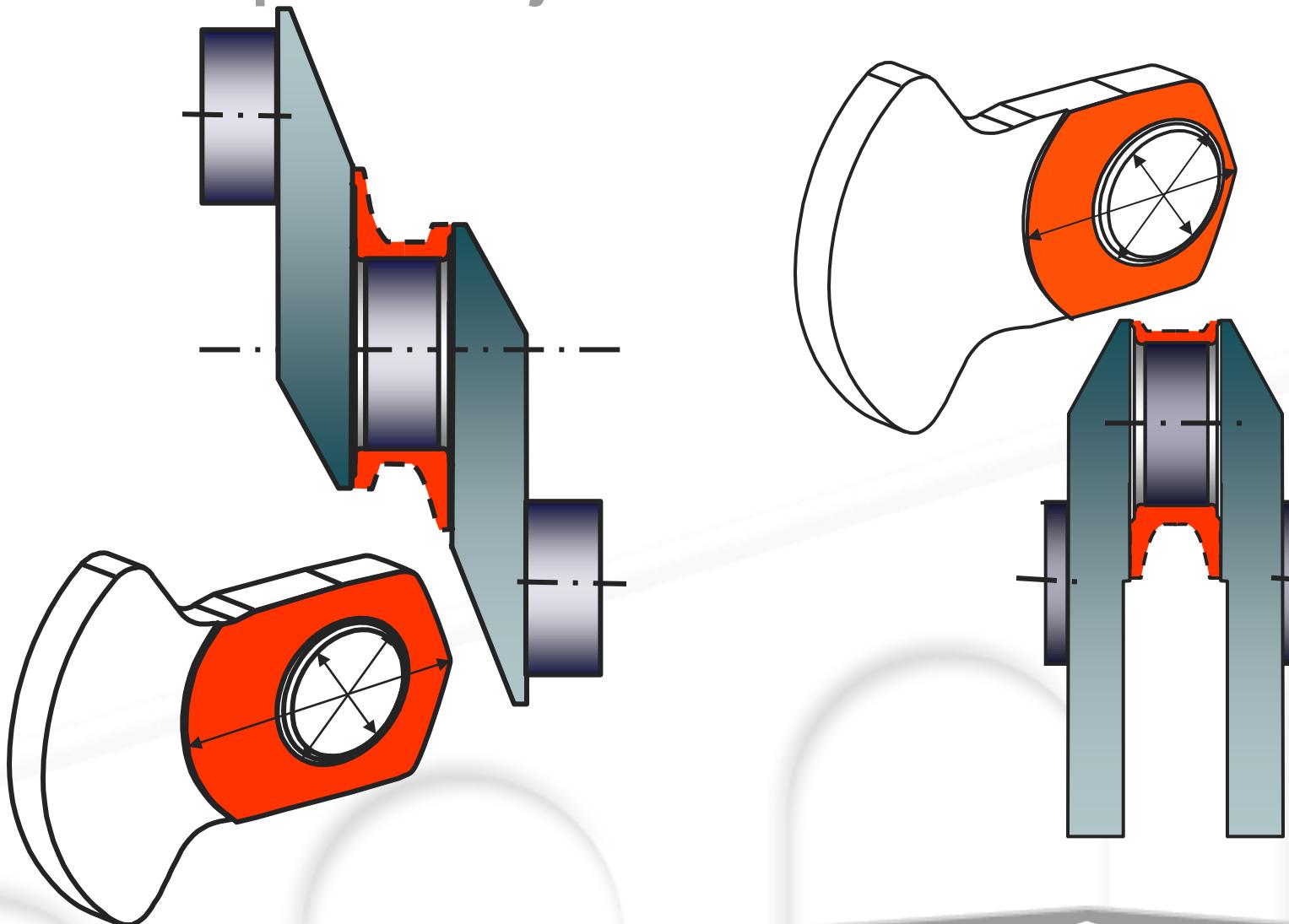
Results are impressive



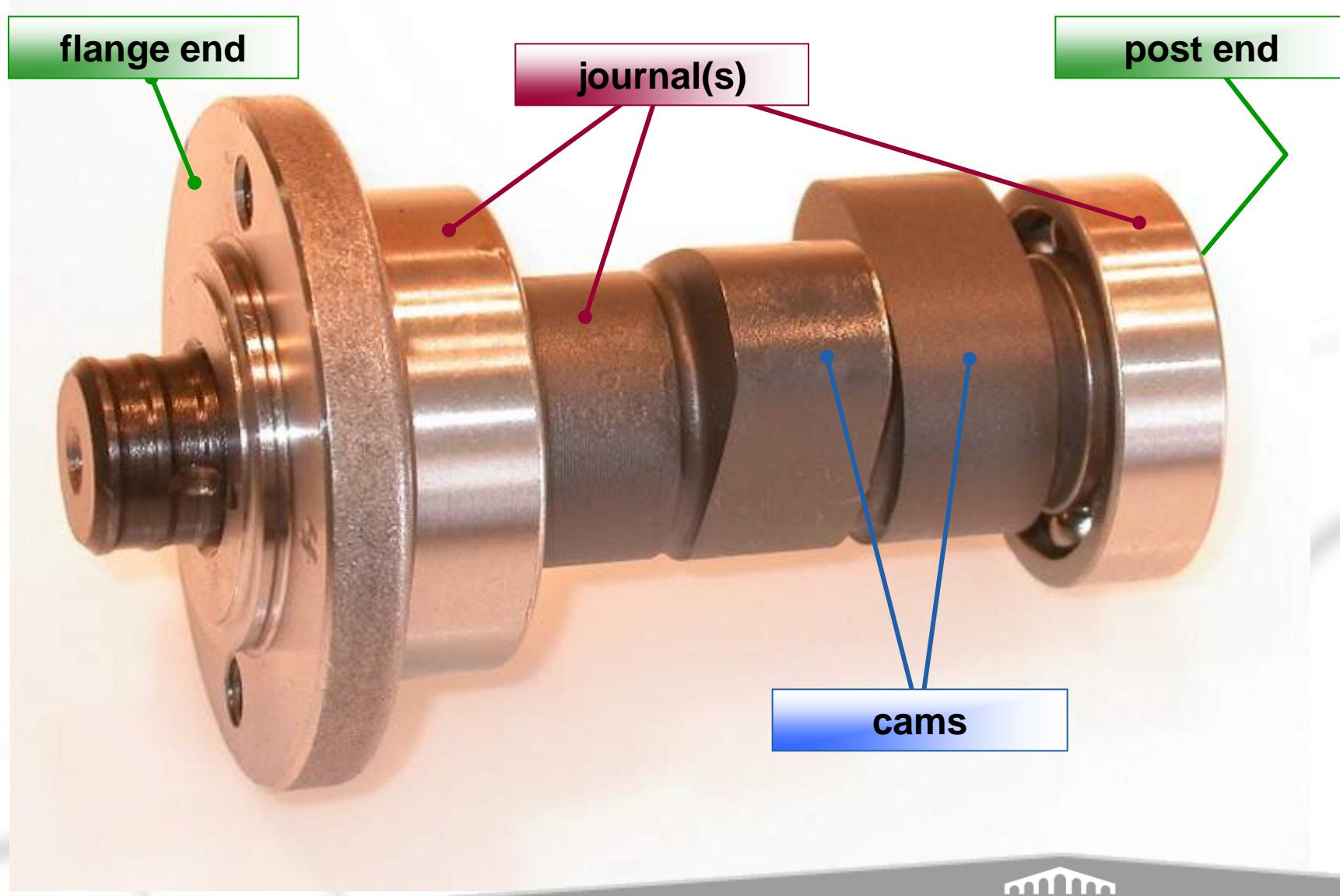
Grinding areas on crankshafts

Crankshaft

Stock on pins and journals



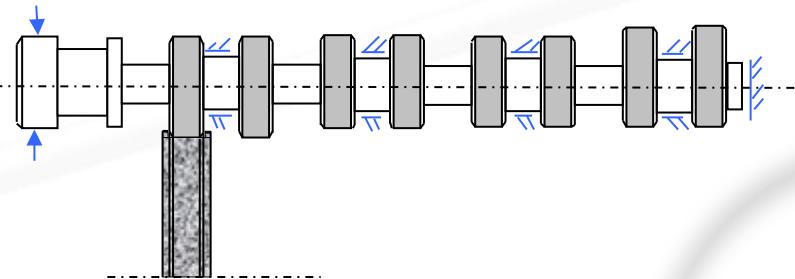
Grinding areas on camshafts



Roughing of cam lobes

Plunge grinding with vitrified cBN wheels

- Machine Schaudt CF41, 40KW
- Coolant
Oil
Fuchs Ecocut HD 15 LE
- Workpiece
3- and 4-cylinder camshaft,
chilled cast iron
- Grinding wheel
1VG1A1-400-18-5-100 WB
B213-T2L-160-G10E, $v_c = 110\text{m/s}$
- Dressing wheel
CNC dresser, $b_{\text{eff}} = 0,6$
- Result
Increase tool live 150%



Finishing of cam lobes

Plunge grinding with vitrified cBN

- Machine Schaudt CF41, 40KW

- Coolant

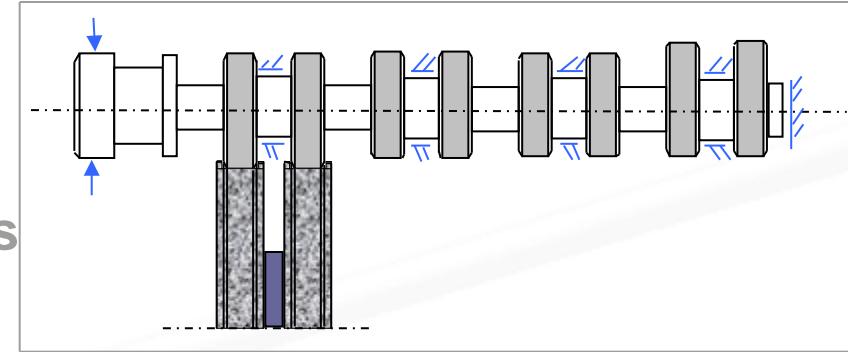
Oil, Fuchs Ecocut HD 15 LE

Coolant pressure 12bar

Cleaning pressure 70bar

- Workpiece

4-cyl – camshaft, 4 pairs of cams
chilled cast iron



- Grinding wheel, two wheel kit

1VG14A1-404-23-7

B213 T2J-160-G10E, $v_c=110$ m/s

- Dressing wheel

1SG71P-135-0,6-50, D602

- Result

Increase of tool live of 25%

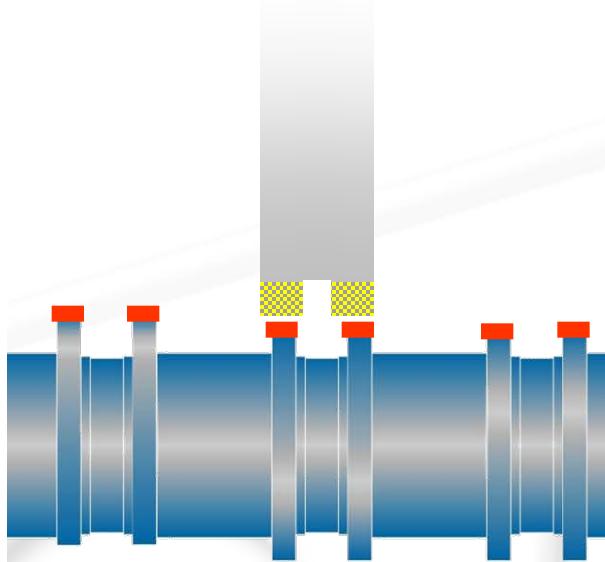
Finish grinding of cam lobes with vitrified bonded cBN

- Machine Schaudt Zeus Machine, 55KW
- Coolant
Emulsion
- Workpiece
8 cams, chilled cast iron
(GGG 70), Ø-base circle=34mm
- Grinding wheel
1VG-700-480-30-5-H=100
B151 VSS 3495 G1SN V360 E,
 $v_c=100\text{m/s}$
- Dressing wheel
1SG71P-140-0,6 50, D602
- Result
Increase of tool live of 160%



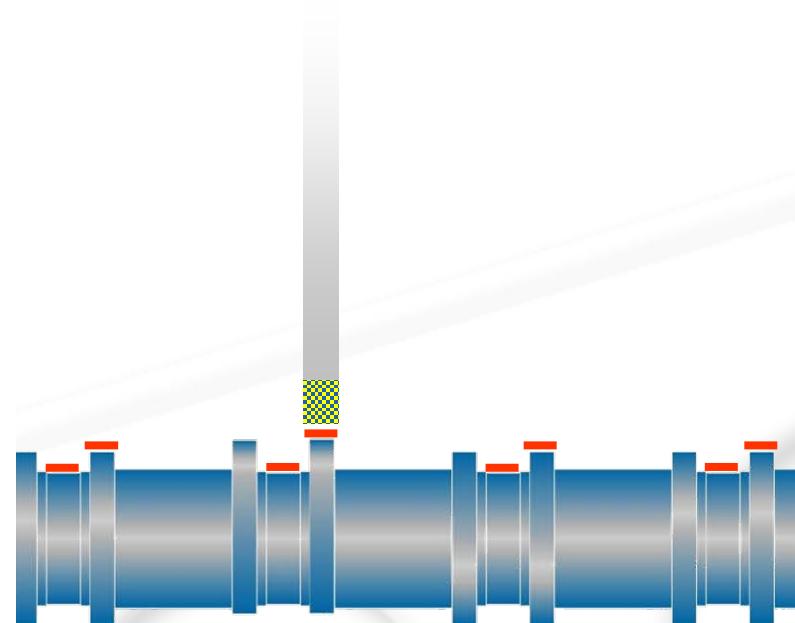
Finish grinding of cam lobes with vitrified bonded cBN

- Machine Schaudt Zeus M2
 - coolant oil
 - Workpiece
6 Cyl. Camshaft
Cam lobes 100Cr6 hardened
 - Target
Increase of life time
 - Grinding wheel
6A1D D105 U18 U18 X5 H50 T70
B126 A5 VK C150 A
 - Dressing roller
CNC-Formroller, Ø 130 mm, D501
 - Result
800 plunges/dress
- Life time doubled!



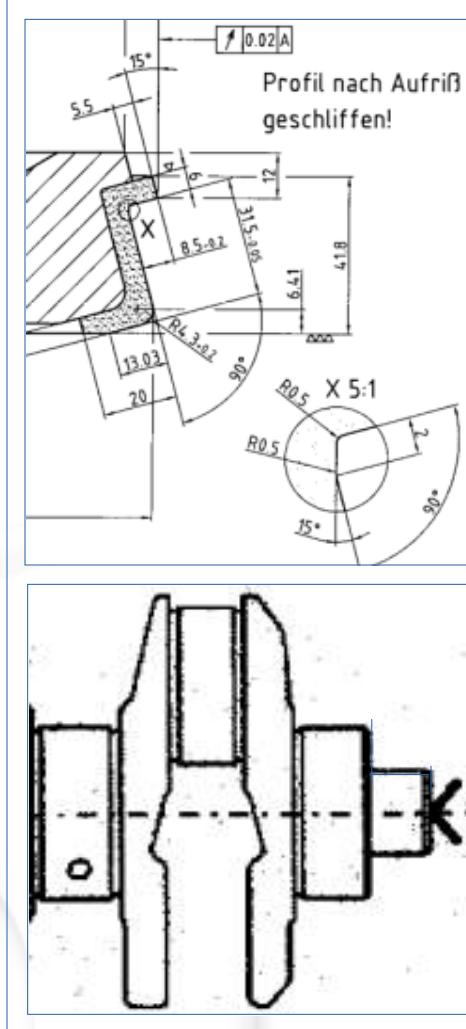
Roughing of cam lobes and finishing of bearings with vitrified bonded cBN

- Machine
Schaudt Zeus M2
Coolant oil
 - Workpiece
6 Cyl. Camshaft
Cam lobes: 100Cr6 hardened
Bearing seats: St 52
 - Target
Increasing of life time
 - Grinding wheel
1VG-700-480-30-5-H=100
B126 VSS 2846 J1SN V360 E
 - Dressing roller
CNC Formroller, Ø 130 mm, D501
 - Results
1200 plunges/dress
Decrease of dressing amount about 40%
- life time doubled



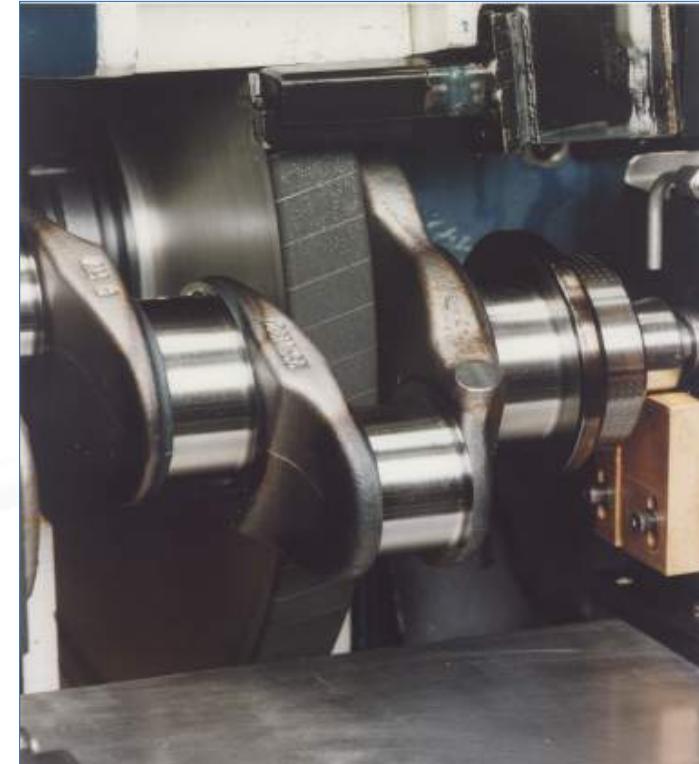
Grinding of bearing seats at crankshafts with cBN

- Machine
Junker Jumat 5000
 - Coolant
Houghton Violan SH 10
Coolant pressure 8 bar
Cleaning pressure 71 bar
 - Workpiece
VR6 Crankshaft, post end GGG70, Ø35x31,5
Angle approach grinding
 - Grinding wheel
1VG 700-400-41,8-6 H127
B151 VSS 1425 L8SV V360E
 - Results
Dressing cycle m_T 1.000 ppd
Dress amount a_{ed} 9 μm
Surfacefinish $R_z \text{ max}$ 3,0 μm
Increase of life time 100%



Grinding of pin journals at crankshafts with vitrified bonded cBN (T2)

- Machine
Landis Twin Pin Orbital coolant emulsion
- Workpiece
4 Cyl.-crankshaft for cars
steel (C38)
chilled cast iron, 253-300 HB
- Target
Increasing of life time
- Grinding wheel
VB 3A1-600-20-5--132
B126 T40 G S0 16 T2 00A 01 0GD
- Dressing roller
2 SG 71P-120-0,5-92
- Results
Improvement of dressing cycle from 300 ppd to 600 ppd with the same dressing amount



Grinding of inner races on cages of CV joints with vitrified bonded cBN

- **Machine**
Meccanodora M2.321/340
 - **Coolant**
Castrol, Syntilo 9954
 - **Workpiece**
CV-Joint, AC 2600i, Inner-Ø 56,3 mm
 - **Grinding wheel**
1F1-44-30-5--28,2;
B151 C5VA2 V36
 - **Dressing roller**
8DS 71P-120-1-2—52
 - **Results**
Dressing cycle: $m_T > 150$ ppd
Dress amount: $a_{ed} = 6 \mu\text{m}$
- Enormous saving potential of set-up- and tool costs,
customer switched to CBN !



Grinding of compressor worms with vitrified bonded cBN

Machine

KLINGELNBERG H 35



Coolant

Oil



Customer



Grinding of compressor worms with vitrified bonded cBN

■ Workpiece

Compressor worms

Cast iron GGG-25



■ Target

Changing from conventional

to cBN grinding technology

Cutting speed $v_c = 80$ m/s



Grinding of compressor worms with vitrified bonded cBN

■ Grinding wheel

1VG 700-350-40-27-126,94
B151 VSS 0927H8SR V360 E



■ Dressing roller

300SG 71P-100-8 40
D 602



■ Results

Improvement of cycle time,
decrease costs per piece

