

Examples
from the
automotive
industry

Grinding of journals on camshafts

Roughing with electroplated grinding wheels

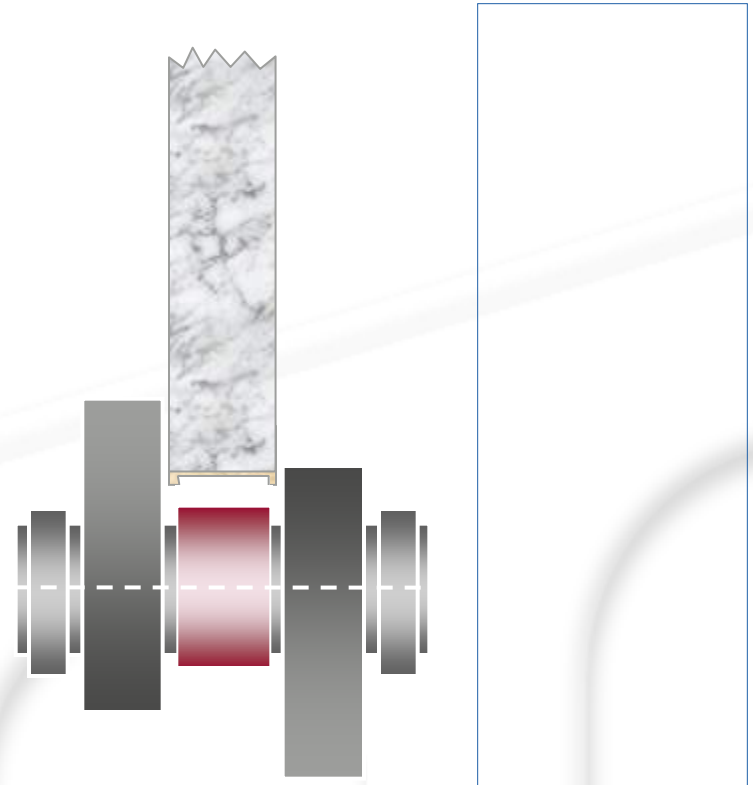
Machine	Schaudt CF 41 CBN
Workpiece	camshaft
Material	GGG 60, 58 HRC
Coolant	Öl, low viscous
Coolant pressure	25 bar
Cleaning pressure	40 bar
Grinding wheel	1S 700 – 400 – 22 100 B252 G825 S33

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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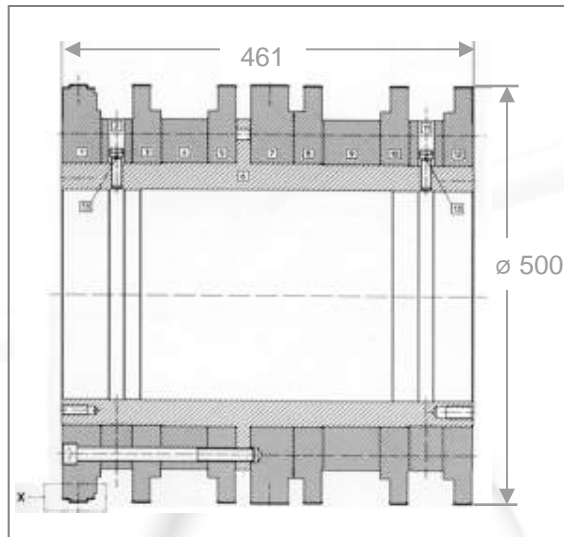


Grinding of journals on camshafts

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

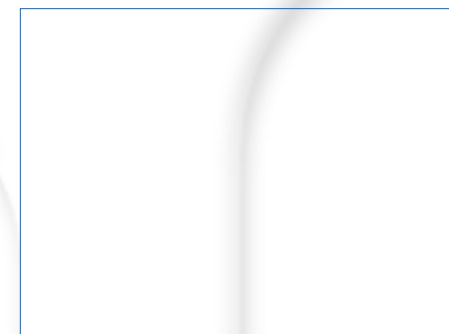
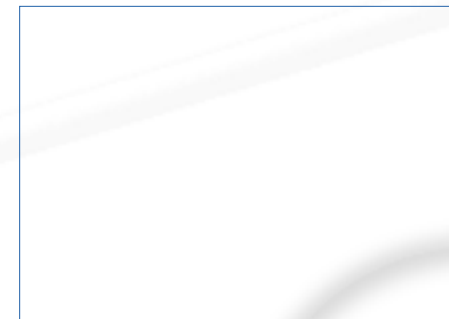
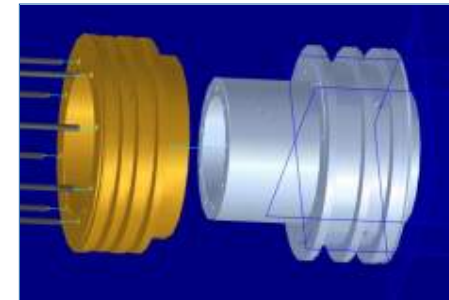
■ Weight

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

■ Superabrasives

- bonded 630 ct
- need for plating 25.000 ct

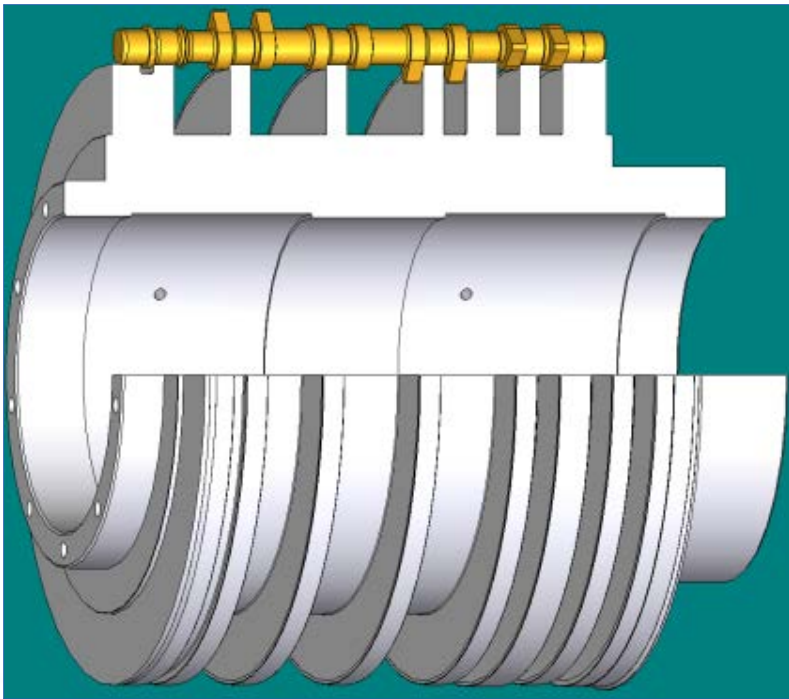
■ $v_c = 120$ m/sec



Grinding of journals on camshafts

Roughing with electroplated grinding wheels

Step 2: One-piece grinding wheel body



Grinding of journals on camshafts

Roughing with electroplated grinding wheels

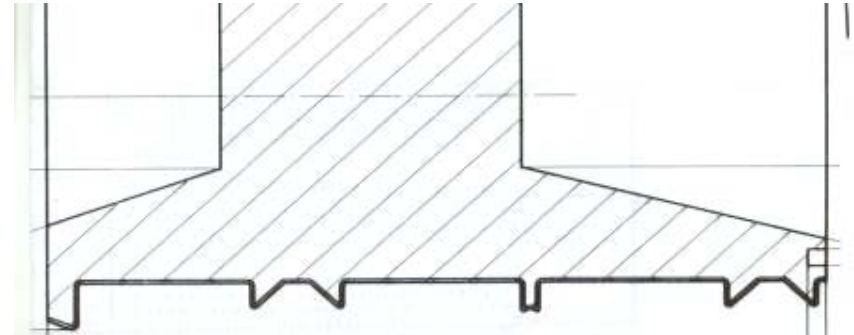
Step 2: One-piece grinding wheel body

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)

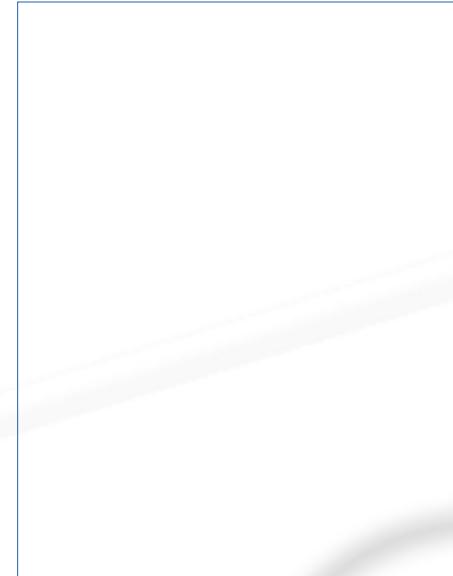


bonded
wheel(s)

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



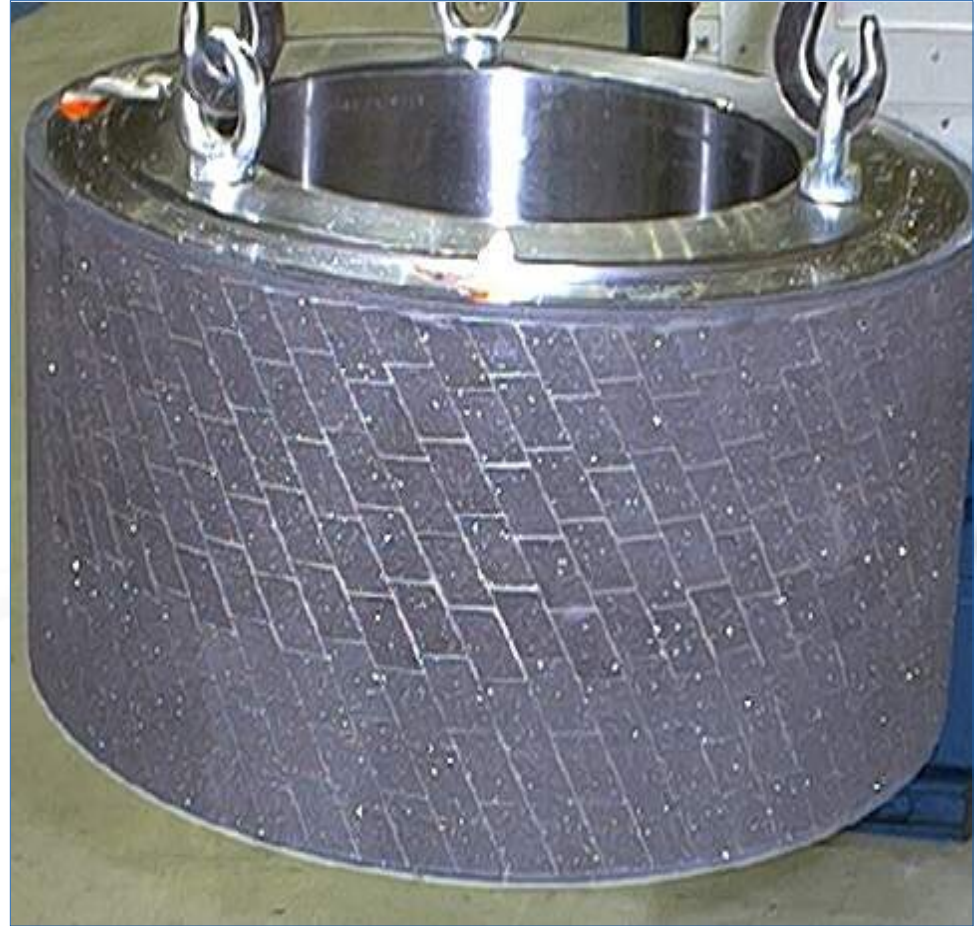
Centerless grinding with vitrified cBN

Wheel whilst setup



Centerless grinding with vitrified cBN

Centerless wheel

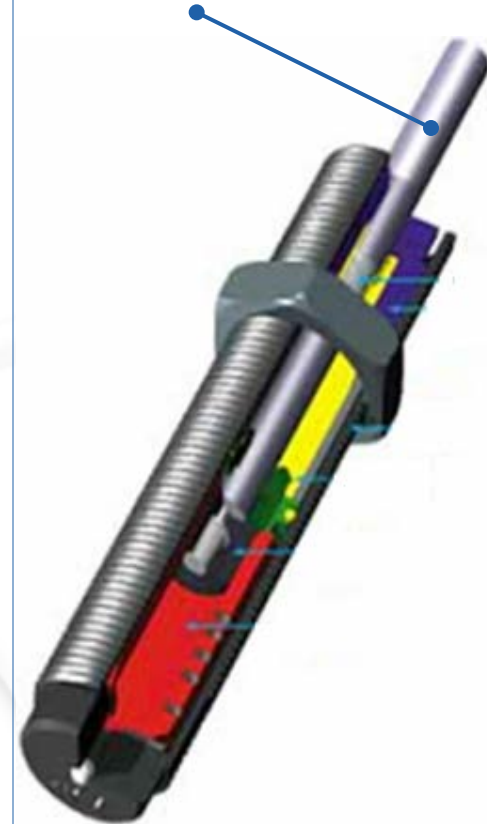


Centerless grinding with vitrified cBN

Circumferences of hydraulic bolts

■ machine	Mikrosa Kronos M
■ workpiece	hydraulic bolt 9SMn28K, soft
■ grinding wheel	500 – 250 – 5 multi layer specification
■ Parameter	$v_c \leq 125$ m/s $v_w = 18$ m/min
■ dressing tool	CNC dresser double sided plated
■ coolant	emulsion, 5 %
■ result	25.000 parts/dress $R_z \leq 1,2$ μ m

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 $\varnothing 52,8 * 13$
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 $R_{z \max}$ 2,5 μm Increase of tool life 30 %



Grinding of journals on camshaft

Plunge grinding with vitrified cBN

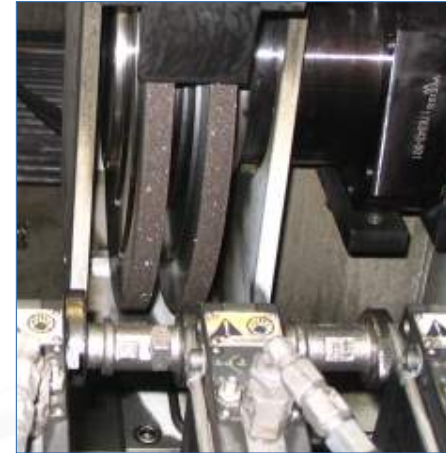
■ Machine	Schaudt
■ Workpiece	4 cylinder camshaft steel, hardened journal diameter 28 mm
■ Grinding wheel	190 – 17,5 – 5 vit. cBN B151 V30 W0E0VG2
■ Dressing tool	CNC dresser double sided plated
■ Coolant	oil
■ Parameter	$v_c = 100 \text{ m/s}$
■ Result	150 lobes / dress $R_z \leq 1,0 \mu\text{m}$



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

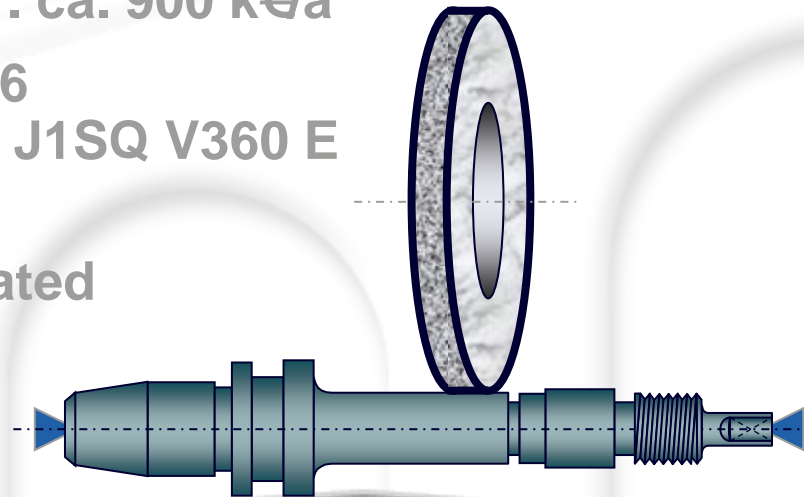
Machine	Landis Lund
Workpiece	camshaft chilled cast iron
Grinding wheel	400 – 22 – 5 vit. cBN V-B100 J208 V660
Dressing tool	CNC dresser single sided plated
Coolant	emulsion
Parameters	$v_c = 125 \text{ m/s}$, $a_e = 3,4 \text{ mm}$ $R_a \leq 0,6 \mu\text{m}$
Result	increase of ppd by factor 5



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





SAINT-GOBAIN

ABRASIVES

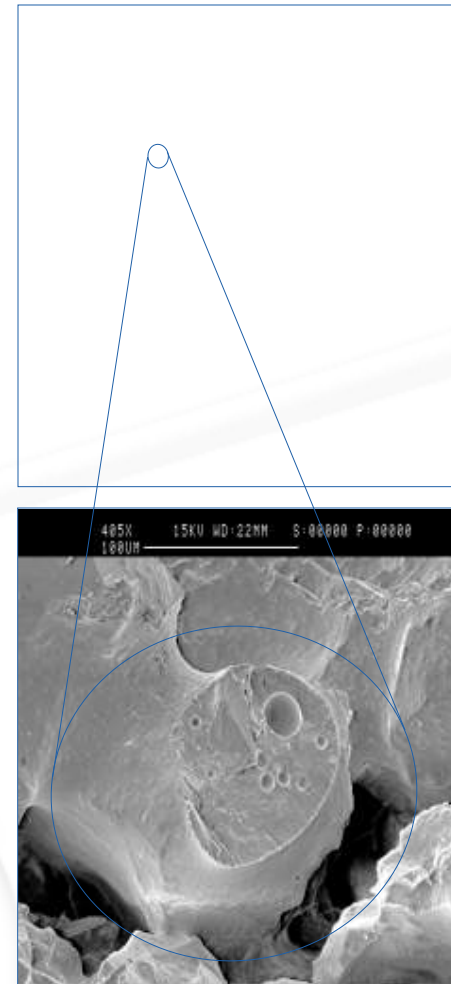
Grinding of camshafts with vitrified cBN - journals

customer:	Automotive Industry
machine:	Schautd
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 $R_z \leq 1,0$ μm



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: $v_c = 125$ m/s, $a_e = 3,4$ mm
 $R_a \leq 0,6$ μ 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



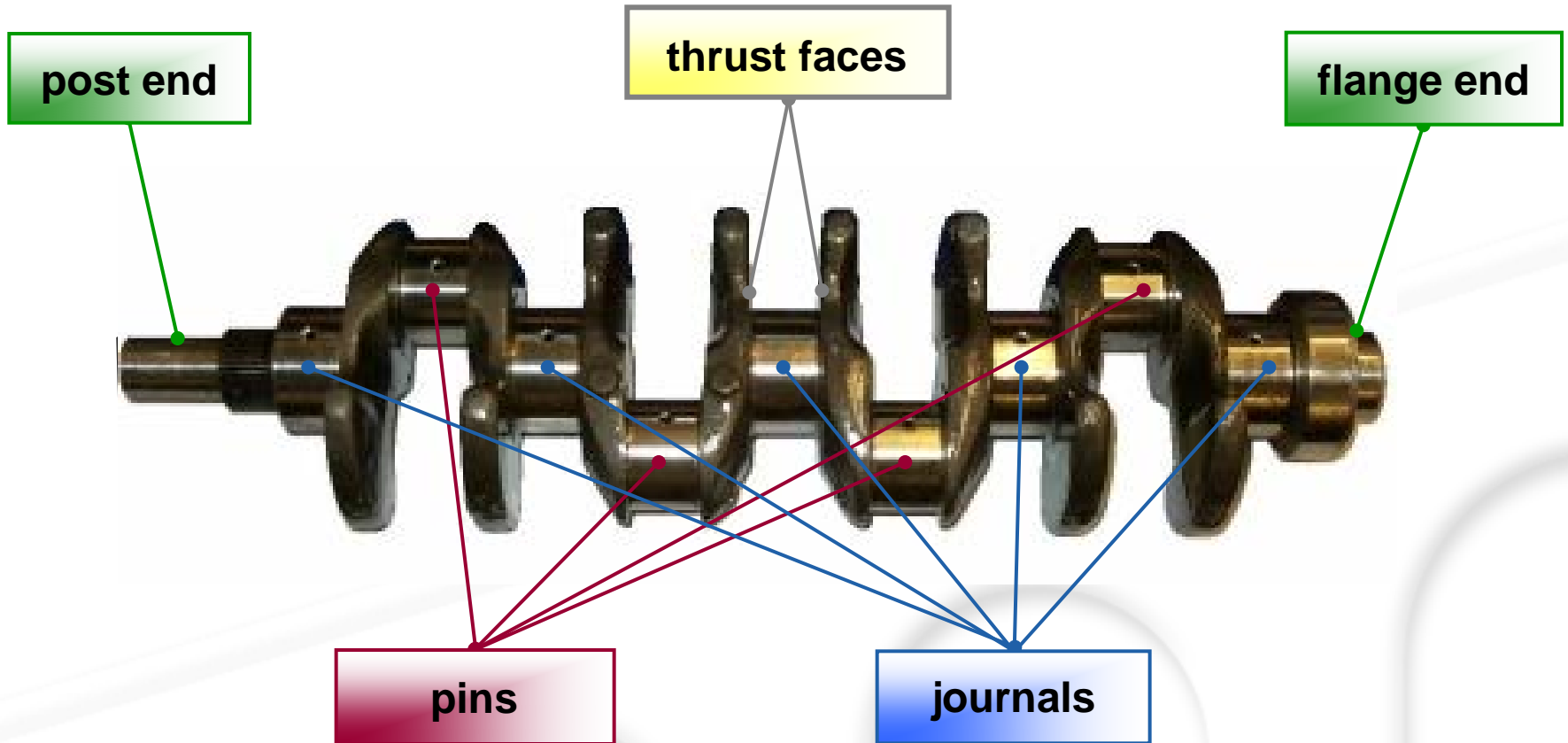
Plunge grinding of balance shafts with vitrified cBN Wheels

- 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

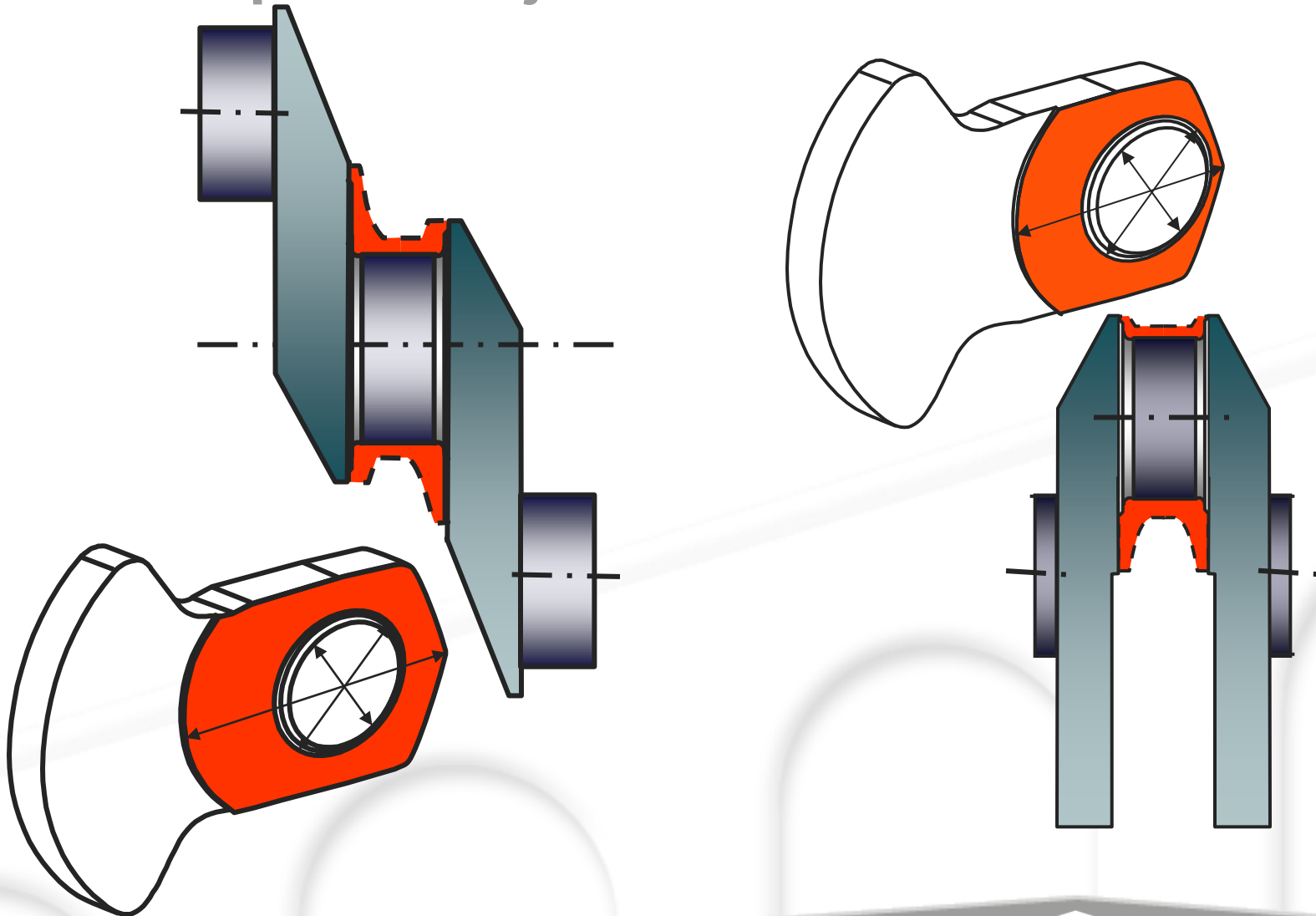
Results are impressive



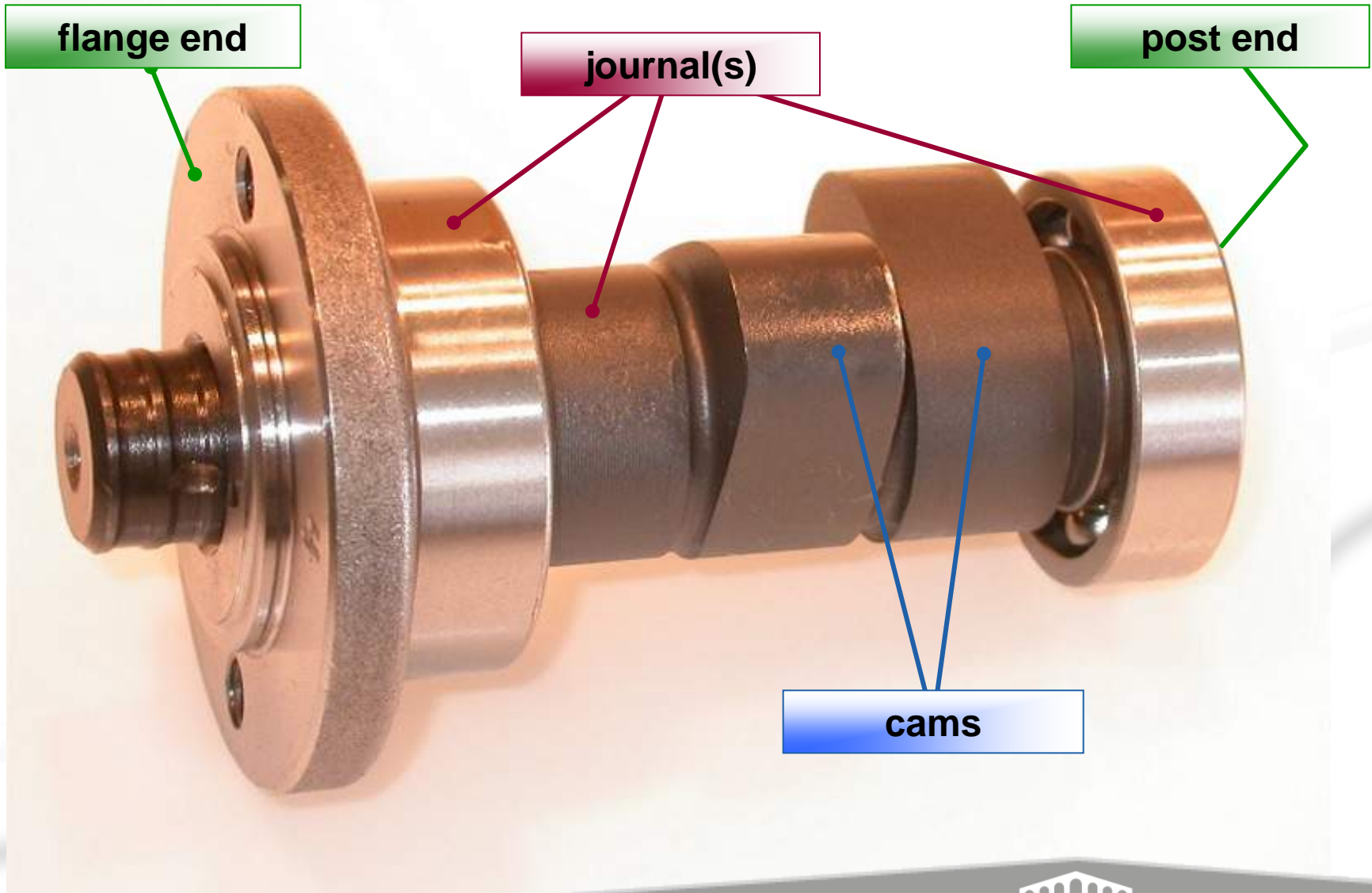
Grinding areas on crankshafts

Crankshaft

Stock on pins and journals



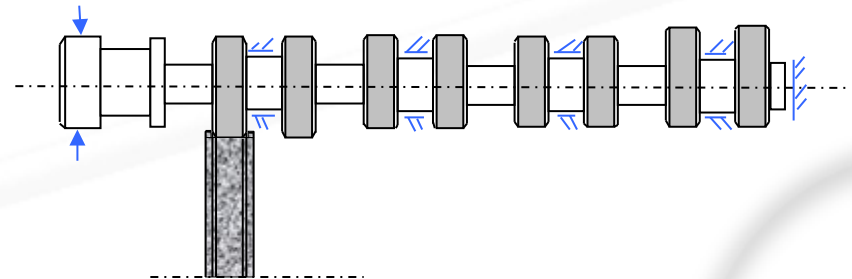
Grinding areas on camshafts



Roughing of cam lobes

Plunge grinding with vitrified cBN wheels

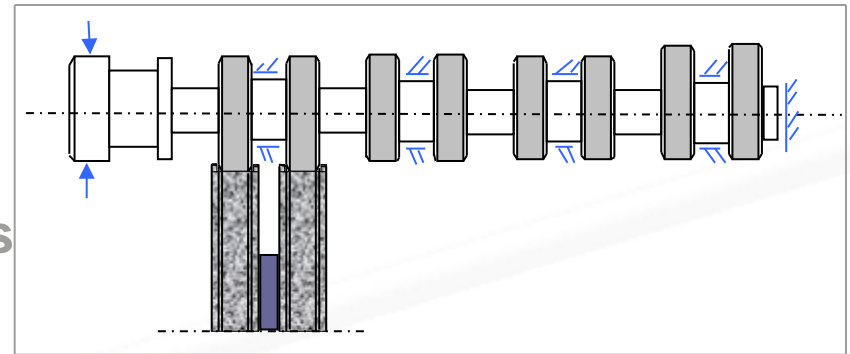
- Machine Schaudt CF41, 40KW
- Coolant
Oil
Fuchs Ecocut HD 15 LE
- Workpiece
3- and 4-cylinder camshaft,
chilled cast iron
- Grinding wheel
1VG1A1-400-18-5-100 WB
B213-T2L-160-G10E, $v_c = 110\text{m/s}$
- Dressing wheel
CNC dresser, $b_{\text{eff}} = 0,6$
- Result
Increase tool life 150%



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 life of 25%



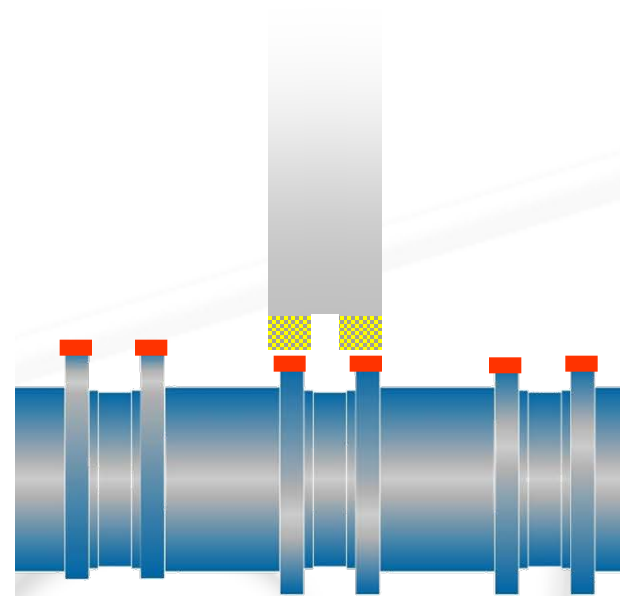
Finish grinding of cam lobes with vitrified bonded cBN

- Machine Schaudt Zeus Machine, 55KW
- Coolant
Emulsion
- Workpiece
8 cams, chilled cast iron
(GGG 70), \varnothing -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 life of 160%



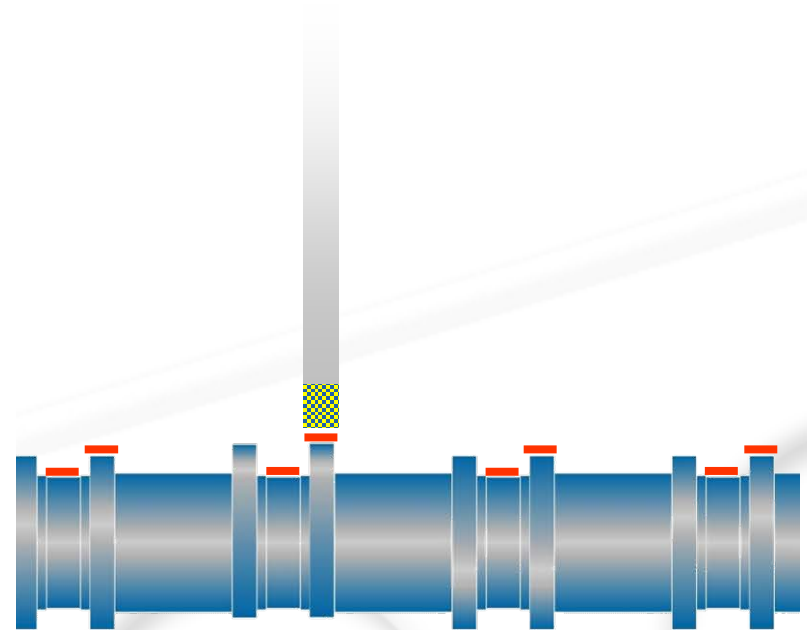
Finish grinding of cam lobes with vitrified bonded cBN

- 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
 - Woerkpiece
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
Coolant pressure
Cleaning pressure

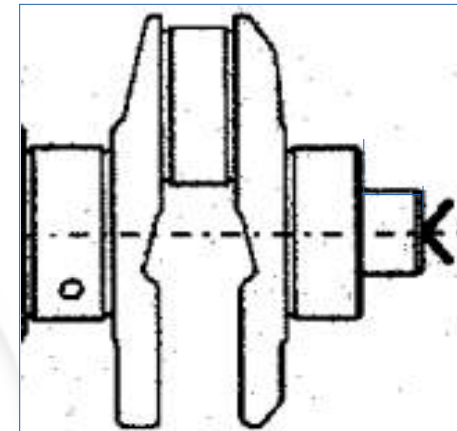
- Workpiece
VR6 Crankshaft, post end GGG70, Ø35x31,5
Angle approach grinding

- Grinding wheel
1VG 700-400-41,8-6 H127
B151 VSS 1425 L8SV V360E

- Results
Dressing cycle m_T
Dress amount a_{ed}
Surfacefinish $R_{z\ max}$
Increase of life time

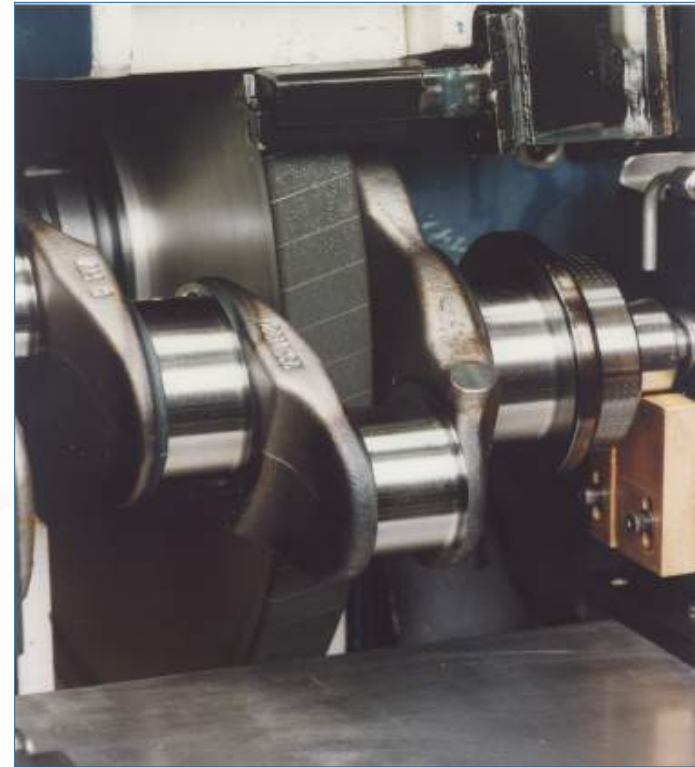
Customer

SH 10
8 bar
71 bar



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

