

REVOLUTIONARY BOND TECHNOLOGY

# RESHAPING THE WORLD OF PRECISION GRINDING



— COOL CUTTING

— PRECISE PROFILE

— HIGH SPEED

**NORTON**

SAINT-GOBAIN®

**VITRIUM** 

TM



REVOLUTIONARY BOND TECHNOLOGY

A REVOLUTIONARY  
NEW GENERATION  
BOND THAT WILL  
RESHAPE THE  
WORLD OF PRECISION  
GRINDING.

Through Saint-Gobain Abrasives' extensive research and development program in grinding wheel technology, comes Vitrium<sup>3</sup> a new generation, patent-pending bond technology.

This revolutionary bond platform features an **exclusive chemistry** that delivers an entirely new grain adhesion science, resulting in improved product versatility across a wide range of precision grinding applications.

## FEATURES & BENEFITS

### COOL CUTTING: IMPROVE PART QUALITY

- SIGNIFICANTLY REDUCED BURN
- LOWER RESIDUAL STRESS
- INCREASED CUTTING EFFICIENCY AND CUT RATE
- IMPROVED COOLANT FLOW, REDUCING HEAT BUILD-UP AND WHEEL LOADING
- IMPROVED CHIP CLEARANCE

### PRECISE PROFILE: REDUCE COST

- ULTRA RADIUS ACCURACY
- EXTENDED WHEEL LIFE
- IMPROVED PRODUCTIVITY
- REDUCED DRESSING FREQUENCY AND COST
- IMPROVED CYCLE AND PROCESS TIME

### HIGH SPEED: INCREASE THROUGHPUT & PRODUCTIVITY

- WORK AT HIGHER MACHINE SPEED/PRESSURE
- LEVERAGE EXISTING EQUIPMENT
- OPTIMIZED MACHINE EFFICIENCY

**= IMPROVED COST/PERFORMANCE RATIO**

## GRAIN AVAILABILITY

Performance improvements with Vitrium<sup>3</sup> span abrasive grains from proprietary Quantum ceramic alumina to conventional aluminium oxide, to optimise grinding processes.

**BEST**



### NORTON QUANTUM & CERAMIC GRAINS

Patented ceramic alumina provides the high performance for precision grinding.

**BETTER**



### CONVENTIONAL ALUMINIUM OXIDE GRAINS

High performance aluminium oxide blends adapted to the most common applications and materials.

# A REVOLUTIONARY BOND THAT LOWERS YOUR PROCESS COST IN 3 WAYS

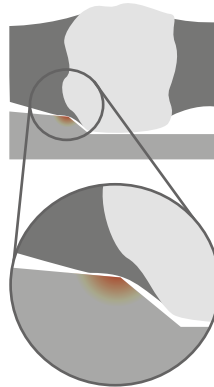
1

## COOL CUTTING

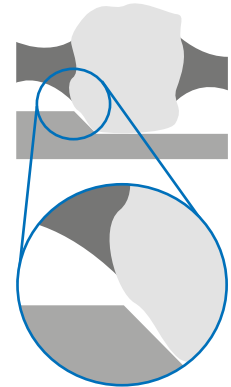
An improved holding power utilising less bond-to-abrasive ratio exposes a larger grain surface area. This enables the wheel to cut freely, improving cut rate. The reduced bond-part interaction also minimizes heat build-up, reducing burn and power consumption and grinding forces on the part. Thinner bond posts enable better coolant flow and chip clearance for a cooler cut and improved part quality.

**Use Vitrium<sup>3</sup> to improve part quality and ensure part integrity.**

STANDARD BOND  
BOND-PART INTERACTION



VITRIUM<sup>3</sup> BOND  
BOND-PART INTERACTION



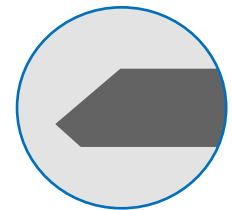
2

## PRECISE PROFILE

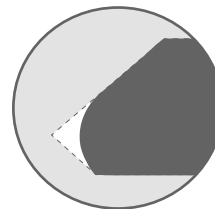
Vitrium<sup>3</sup> provides superior grain holding properties than that of any other bond, significantly improving wheel form and corner holding. This reduces dressing time, dresser wear and dresser replacement requirements.

**Vitrium<sup>3</sup> considerably reduces unit process cost.**

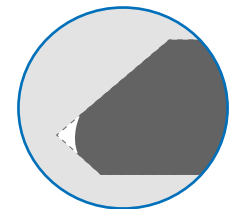
PROFILED WHEEL  
BEFORE GRINDING



AFTER 5 GRINDING CYCLES



STANDARD WHEEL



VITRIUM<sup>3</sup> WHEEL

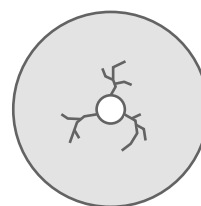
3

## HIGH SPEED

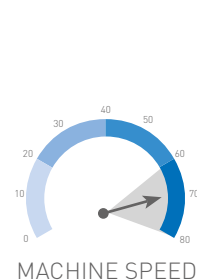
The Norton Vitrium<sup>3</sup> bond provides the ultimate wheel strength. This allows lighter construction and high speed operation. Machines can work at higher feed rates, speed and pressure, significantly increasing production with existing equipment.

**Vitrium<sup>3</sup> maximizes equipment utility to improve your process and throughput.**

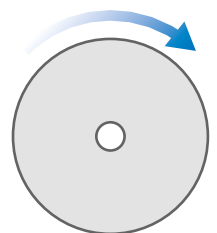
STANDARD WHEEL



STOP THE MACHINE



VITRIUM<sup>3</sup>



CONTINUE GRINDING



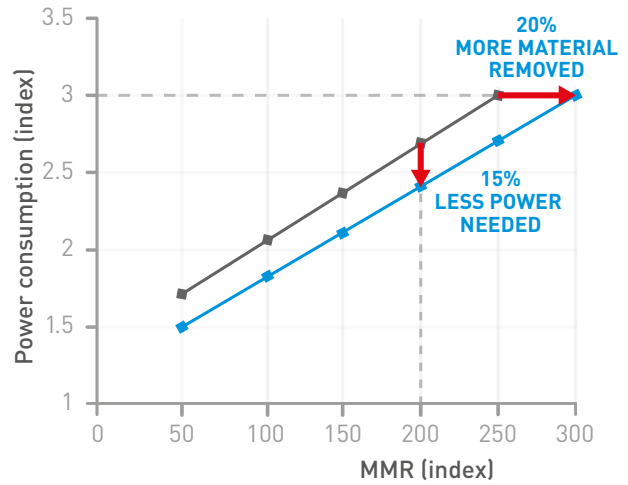
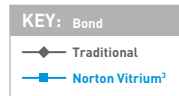
Scan this QR code to see the science in animation or visit:  
[www.saint-gobain-abrasives.com/norton-vitrium3.aspx](http://www.saint-gobain-abrasives.com/norton-vitrium3.aspx)

## TEST 1: REDUCED BURN AND POWER CONSUMPTION

The graph shows the increase in power consumption as Material Removal Rate (MRR) goes up.

At an MRR index of 200, Vitrium<sup>3</sup> requires **15% less power** to remove the same amount of material. This means less heat is generated on the work piece, resulting in **less burn**.

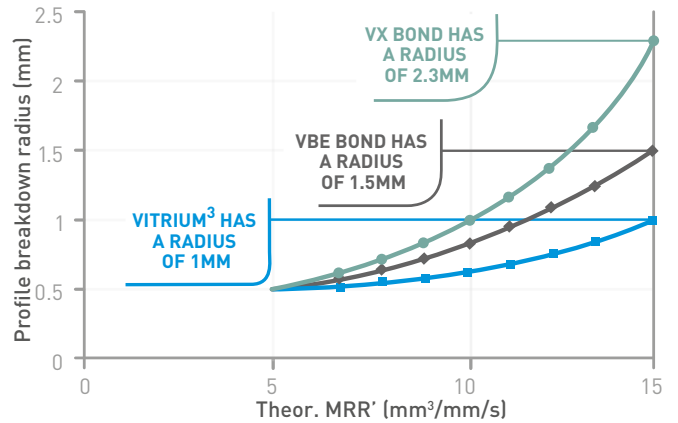
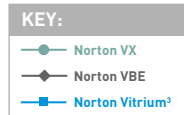
At a power consumption index of 3, Vitrium<sup>3</sup> removes **20% more** material than the standard bond, at the same power consumption, **reducing heat generated** on the work piece.



## TEST 2: PROFILE HOLDING AFTER FIVE CYCLES

After five continuous cycles (without dressing) the profile radius or 'edge corner' of wheels with standard bonds has a considerably higher wear than that of Vitrium<sup>3</sup>

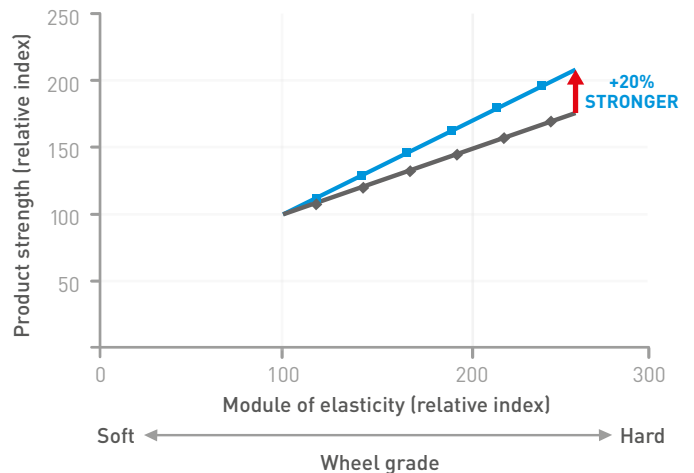
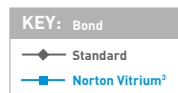
For a given Material Removal Rate (MRR), Vitrium<sup>3</sup> holds the wheel profile better than the existing ceramic VX bond and even the traditionally high profile holding VBE bond.



## TEST 3: WHEEL STRENGTH

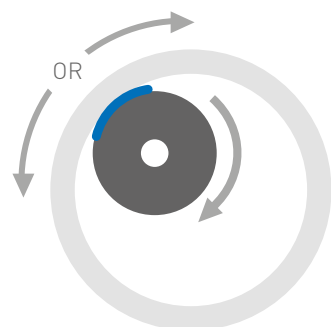
Product strength and module of elasticity are linked to the amount of bond used in grinding wheels. Wheel strength increases as the module of elasticity goes up. Norton Vitrium<sup>3</sup> always provides higher product strength than any other bond. At the same grade, a Norton Vitrium<sup>3</sup> product is more resistant than any other comparable product.

**This allows higher pressure grinding at higher working speeds.**





# INTERNAL DIAMETER GRINDING



**KEY**

- Contact surface between wheel and part
- Wheel
- Work piece
- ↑ Rotation options

**MARKETS**

- Bearing (cylindrical)
  - Internal track, bore
- Gears
  - Bore
- Hydraulic components
  - Fluid diffusion
  - Pipe connections

**APPLICATION CHARACTERISTICS**

- Large contact area
- Low grinding force per grain and bond post
- Difficult access for coolant
- Risk of part deformation when cut quality is not high enough

**BENEFITS OF VITRIUM<sup>3</sup> IN ID GRINDING**

- Decreased risk of part deformation (ovality) on thin rings
- Excellent coolant diffusion throughout the wheel for cooler cutting and reduced burn on the work piece
- Free cutting capabilities, and improved cut rate
- Faster cycle with limited grinding force on part
- Longer wheel life

# CASE STUDY

## LARGE TAPERED RING

**Wheel with Vitrium<sup>3</sup> bond:**

Size: 200x200x93  
 Shape: Shape 01  
 Grain: Norton Quantum  
 Specification: 3NQ70G10VS3P

**Competitor wheel:**

Specification: xx80H6Vxx

**Part:**

Material: Steel 60 HRc  
 Part diameter: 432mm, width 180mm

**Cycle:**

Over thickness: 1.5mm  
 Wheel speed: 50m/s

**RESULTS**

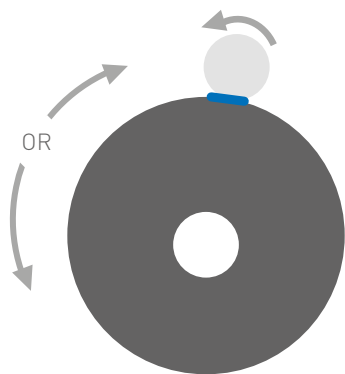
Feed rate increased by: **+30%**

Cycle time reduced by: **-20%**

Total cost per part reduced by: **-15%**

With a softer wheel grade, a higher G ratio is achieved, reducing stress on the work piece.

# OUTER DIAMETER GRINDING



**KEY**

- Contact surface between wheel and part
- Wheel
- Work piece
- ↑ Rotation options

**MARKETS**

- Bearing (cylindrical)
  - Centerless, external track
- Automotive components
  - Cam/crank/gear box shafts
- General engineering
  - Bars/tubes (centerless)

**APPLICATION CHARACTERISTICS**

- Small contact area
- High force per grain and bond post
- In general, no problem with coolant access

**BENEFITS OF VITRIUM<sup>3</sup> IN OD GRINDING**

- Improved profile holding
- High wheel speed capability for increased throughput
- Increased free cutting without wheel speed reduction
- Shorter cycle time with limited risk of burn, improving part quality
- Lower stress on work piece, especially on long components (bars, tubes)

# CASE STUDY

## CENTRELESS PLUNGE GRINDING, SHAFT

**Machine:** Cincinnati Viking

**Wheel with Vitrium<sup>3</sup> bond:**

Size: 406x75x203.2  
 Shape: Shape 01  
 Grain: Norton Quantum  
 Specification: 5NQP80NVS3

**Wheel with standard bond:**

Grain: Norton Quantum  
 Specification: 5NQP80NVQN

**Part:**

Material: Mild steel 35HRc

**Rough cycle 1:**

Infeed: 20mm/min Removal: 0.12mm

**Rough cycle 2:**

Infeed: 12mm/min Removal: 0.25mm

**Finish cycle:**

Infeed: 5mm/min Removal: 0.15mm

**RESULTS**

Infeed increased by: **+50%**

Cycle time reduced by: **-15%**

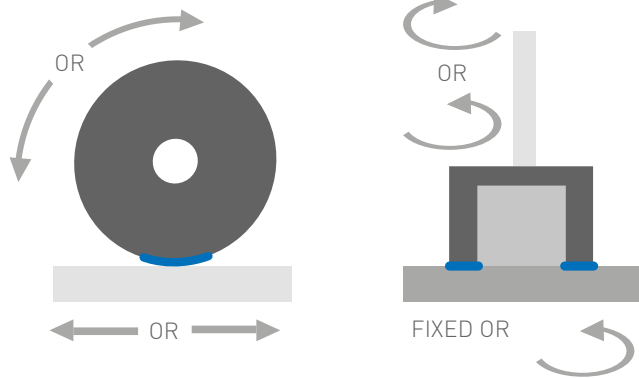
Total cost per part reduced by: **-15%**

At the same wheel grade and bond volume, the Vitrium<sup>3</sup> bond allows faster process time, with limited risk of burn on the work piece.

# SURFACE GRINDING

## KEY

- Contact surface between wheel and part
- Wheel
- Work piece
- ↑ Rotation options



## MARKETS

- Aerospace (creep-feed or regular surface grinding)
  - Blades, NGV
- Gear
  - All modules, including bevel
- Bearing (linear)
  - Track, base, top
- General engineering
  - Flat surfaces with profiles
- Toolroom
- MRO

## APPLICATION CHARACTERISTICS

- Average size contact area
- Medium grinding force per grain and bond post
- Wide variety of applications: horizontal spindle (wheels) and vertical spindle (cylinders, segments, cups, disc)

## BENEFITS OF VITRIUM<sup>3</sup> SURFACE GRINDING

- Improved form holding
- Reduced dressing
- Longer wheel life
- Higher working speed, for improved productivity
- Faster and deeper cutting capabilities
- Cool grinding (significantly reduced burn risk)

## CASE STUDY

### GEAR GRINDING - WORM

<b>Machine:</b>	Kapp KX300P
<b>Wheel with Vitrium<sup>3</sup> bond:</b>	
Size:	320x125x115 63m/s
Shape:	Shape 01
Grain:	Norton Quantum
Specification:	NQ80HVS3
<b>Wheel with standard bond:</b>	
Grain:	Norton Quantum
Specification:	NQ80HVQN
<b>Part:</b>	
Material:	Steel 58-62HRc
Diameter:	210mm, width 25mm 86 tooth, module 2.5

## RESULTS

Number of passes per cycle: **reduced from 3 to 2**

Parts between dress: **increased from 25 to 45**

Cycle time reduced by: **-16%**

Improved form holding properties of Vitrium<sup>3</sup> showed a vital reduction in dressing frequency and shorter cycle time.

## CASE STUDY

### GEAR GRINDING - PROFILE

<b>Machine:</b>	Gleason-Pfauter P1200G
<b>Wheel with Vitrium<sup>3</sup> bond:</b>	
Size:	400x45x127 32m/s
Shape:	Shape 01
Grain:	Norton TG
Specification:	3TGP60G10VS3P
<b>Wheel with standard bond:</b>	
Grain:	Norton TG
Specification:	3TGP60G10VXP
<b>Part:</b>	
Material:	Steel 60HRc
Diameter:	200mm, width 450mm 50 tooth, module 4

## RESULTS

Dress compensation per part: **-40%**

Cycle time reduced by: **-13%**

## CASE STUDY

### SURFACE GRINDING - SEGMENTS

<b>Machine:</b>	Blanchard
<b>Wheel with Vitrium<sup>3</sup> bond:</b>	
Size:	203x50x150
Shape:	Shape 31
Grain:	Norton Quantum
Specification:	3NQ30FVS3
<b>Wheel with standard bond:</b>	
Grain:	Norton Quantum
Specification:	3NQ30GVQN
<b>Part:</b>	
Material:	1020 Steel plate

## RESULTS

With the same parameters, and at one grade softer, Vitrium<sup>3</sup> grinds with no surface damage.

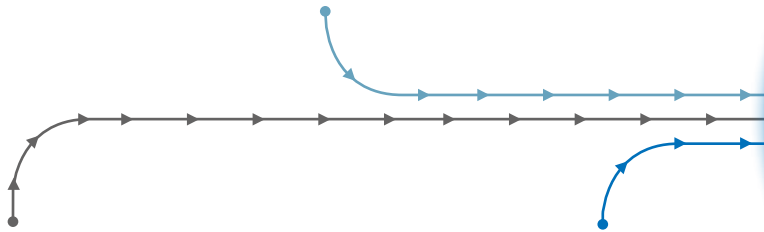
At one grade softer, Vitrium<sup>3</sup> maintains the same MRR than the wheel with a standard bond, reducing the risk of burn and maintaining consistent performance.

# RESHAPING THE WORLD OF PRECISION GRINDING



## VITRIUM<sup>3</sup>

Exclusive bond chemistry allows higher wheel speed, improved profile holding and reduced work piece burn.



Cutting edge, high performance ceramic grain technology. Multiplies cutting efficiency for maximum performance and unrivalled precision.



High precision, high performance diamond dressing tools.

## ENVIRONMENTAL BENEFITS

### NO CHEMICAL PORE INDUCERS

Pore inducers used in the manufacture of many high porosity products are harmful to the environment. Vitrium<sup>3</sup> wheels require no artificial pore inducers (chemicals) to achieve a high level of permeability, unlike other porous vitrified wheel technologies. **By choosing Vitrium<sup>3</sup> technology for your grinding operation, you help to preserve the environment.** In addition, Vitrium<sup>3</sup> eliminates costly revalidation of processes associated with using certain chemicals.

### REDUCED CARBON FOOT PRINT

Increase productivity with existing machine capacity. Work with higher feed rates, speed and pressure, significantly increasing production leveraging existing equipment. In addition, Norton Vitrium<sup>3</sup> is manufactured using a low firing temperature, reducing energy consumption and lowering carbon footprint.



[www.norton.eu](http://www.norton.eu)

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Form #2405

