RESHAPING THE WORLD OF PRECISION GRINDING

REVOLUTIONARY BOND TECHNOLOGY

COOL CUTTING
PRECISE PROFILE
HIGH SPEED
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, 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 \(^3\) 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\(^3\) to improve part quality and ensure part integrity.

2. PRECISE PROFILE
Vitrium\(^3\) 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\(^3\) considerably reduces unit process cost.

3. HIGH SPEED
The Norton Vitrium\(^3\) 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\(^3\) maximizes equipment utility to improve your process and throughput.
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 Vitrium³.

For a given Material Removal Rate (MRR), Vitrium³ holds the wheel profile better than the existing ceramic VX bond and even the traditionally high profile holding VBE bond.

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 Vitrium³ always provides higher product strength than any other bond. At the same grade, a Norton Vitrium³ product is more resistant than any other comparable product.

This allows higher pressure grinding at higher working speeds.

Test 2:
Profile holding after five cycles

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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 Vitrium³ always provides higher product strength than any other bond. At the same grade, a Norton Vitrium³ product is more resistant than any other comparable product.

This allows higher pressure grinding at higher working speeds.
**INTERNAL DIAMETER GRINDING**

**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 VITRIUM³ 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

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

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**EXTERNAL DIAMETER GRINDING**

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

**BENEFITS OF VITRIUM³ 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)

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

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**CASE STUDY**

**LARGE TAPERED RING**

Wheel with Vitrium³ bond:
- Size: 200x200x93
- Shape: Shape 01
- Grain: Norton Quantum
- Specification: 3NQ76G10V53P
- Competitor wheel:
  - Specification: xx80H6Vxx

Part:
- Material: Steel 40 HRc
- 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.

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**CENTRELESS PLUNGE GRINDING, SHAFT**

**Machine:** Cincinnati Viking

Wheel with Vitrium³ bond:
- Size: 456x75x203.2
- Shape: Shape 01
- Grain: Norton Quantum
- Specification: 5NQP80NV53

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 Vitrium³ bond allows faster process time, with limited risk of burn on the work piece.
At one grade softer, Vitrium³ maintains the same MRR than the wheel with a standard bond, reducing the risk of burn and maintaining consistent performance.

Case Study - Worm Gear Grinding

Machine: Kapp KX300P
Wheel with Vitrium³ bond:
- Size: 320x125x115 63m/s
- Shape: Shape 01
- Grain: Norton Quantum
- Specification: NQ80HVQ3
Wheel with standard bond:
- Grain: Norton Quantum
- Specification: NQ80HVQN
Part:
- Material: Steel 58-62 HRc
- 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 Vitrium³ showed a vital reduction in dressing frequency and shorter cycle time.

Case Study - Profile Gear Grinding

Machine: Gleason-Pfauter P1200G
Wheel with Vitrium³ bond:
- Size: 400x45x127 32m/s
- Shape: Shape 01
- Grain: Norton TG
- Specification: 3TGP60G10VS3P
Wheel with standard bond:
- Grain: Norton TG
- Specification: 3TGP60G10VXP
Part:
- 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

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 VITRIUM³ 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)

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

BENEFITS OF VITRIUM³ SURFACE GRINDING

Improved form holding properties of Vitrium³ showed a vital reduction in dressing frequency and shorter cycle time.

APPLICATION CHARACTERISTICS

BENEFITS OF VITRIUM³ SURFACE GRINDING
ENVIRONMENTAL BENEFITS

NO CHEMICAL PORE INDUCERS
Pore inducers used in the manufacture of many high porosity products are harmful to the environment. Vitrium® wheels require no artificial pore inducers (chemicals) to achieve a high level of permeability, unlike other porous vitrified wheel technologies.

By choosing Vitrium® technology for your grinding operation, you help to preserve the environment. In addition, Vitrium® 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® is manufactured using a low firing temperature, reducing energy consumption and lowering carbon footprint.