Norton Quantum X Case Studies.

**CASE STUDY 1**

- **Application**: Creepfeed grinding
- **Part**: Engine component: root and platform blade
- **Material**: Rene Ni alloy
- **Coolant**: 8% emulsion
- **Dresser**: Roller dresser

**WHEEL LIFE**: +40%
**DRESS COMPENSATION**: -20%
**TOTAL COST PER PART**: -20%

**RESULTS vs. COMPETITOR**

**CASE STUDY 2**

- **Application**: Creepfeed grinding
- **Part**: Engine component: blade
- **Material**: Rene Ni alloy
- **Coolant**: 8% emulsion
- **Dresser**: Roller dresser

**CYCLE TIME**: -50%
**WHEEL LIFE**: +40%
**TOTAL COST PER PART**: -25%

**RESULTS vs. COMPETITOR**

**CASE STUDY 3**

- **Application**: Surface grinding (segments)
- **Part**: Circular blade
- **Material**: Tool steel (non treated)
- **Coolant**: 4% emulsion

**Segments dimensions**: 38X127X152

**Wheel specification**: 5NQX30F20VS3X vs. 50% sintered alumina (ceramic grain) competition wheel

**POWER CONSUMPTION**: -20%
**WHEEL LIFE**: +50%
**TOTAL COST PER PART**: -20%

**RESULTS vs. COMPETITOR**

Minimal Environmental Impact & Guaranteed Compliance.

**NO MORE CHEMICAL PORE INDUCERS**
- Norton Quantum X wheels require no artificial pore inducers such as naphthalene to achieve a high level of permeability, unlike other porous vitrified wheel technologies.

**REDUCED CARBON FOOTPRINT**
- Norton Quantum X products are manufactured using a lower firing temperature, reducing energy consumption.

**SUSTAINABLE SOLUTION**
- Norton Quantum X eliminates costly revalidation of processes associated with using harmful artificial pore inducers.

Our Commitment: Safety, Quality and Environment Preservation

**SAFETY**
The personal safety of workers using abrasive cutting and grinding wheels is our primary concern. All Norton abrasive wheels are developed, manufactured and safety tested in accordance with the European standard EN12413, safety requirements for bonded abrasive products. In addition, all Norton products meet all stringent requirements of the Organization for the Safety of Abrasives (oSa). Saint-Gobain Abrasives is a founding member of the oSa organisation.

**QUALITY**
Saint-Gobain Abrasives is fully ISO accredited:
- ISO 9001: certifies Quality Management System is in accordance with requirements of quality standards.
- ISO 14001: certifies Environmental Management System is in accordance with requirements of environmental standards.
- OHSAS 18001: Health and Safety at Work certification.

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Norton and Norton Quantum are registered trademarks and Vitrium3 and Vortex2 are trademarks of Saint-Gobain Abrasives.
By combining three of the very best Norton technologies we have created Norton Quantum X to bring you unrivalled value and performance, creating the ultimate grinding experience.

**NORTON QUANTUM X IS A REVOLUTIONARY WHEEL – BEYOND THE RECOGNISED LIMITS OF PERFORMANCE GRINDING.**

Norton Quantum ceramic grain was developed from Norton patented Seeded-Gel technology. The revolutionary ceramic grain multiplied the cutting efficiency by controlling the grain breakdown at micrometric level.

**GROUND BREAKING BENEFITS.**

- **FAST OPERATIONS –** Highly permeable ceramic spacing offers cutting efficiency and cycle time reduction.
- **LOW FORCE CUTTING –** Low threshold power of Norton Quantum in a homogenous Vortex structure reduces the cutting forces – resulting in lower chaff and friction for better part quality, consistent cut and less dresser wear.
- **COMPETITIVE PRICE –** Norton Quantum X is positioned at a competitive price compared to other products in the market, providing valuable cost savings.

**VITRUM3** is a new generation revolutionary bond featuring exclusive Norton chemistry that delivers an entirely new grain adhesion science.

**HIGH PRECISION AND VERSATILITY ACROSS MANY APPLICATIONS.**

**HIGHLY POROUS WHEEL WITH HIGHER MATERIAL REMOVAL, EXCEPTIONAL COOL GRINDING AND REDUCED CYCLE TIMES IN HEAT AND STRESS SENSITIVE PROCESSES.**

**MULTIPLE INDUSTRIES.**
- Gear
- Aerospace and land turbine components
- Tools
- General engineering

**SPECIALISED APPLICATIONS.**
- Areas of high material removal
- Heat sensitive and difficult to grind alloys
- Thin wall parts sensitive to deformation

**NORTON QUANTUM X PRODUCT AVAILABILITY.**

<table>
<thead>
<tr>
<th>DESIGNATION</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>ABRASIVE TYPE</td>
<td>3NQX / 5NQX 30 or 50% Norton Quantum ceramic grain</td>
</tr>
<tr>
<td>GRAIN SIZE, FEPA</td>
<td>30/38 / 46 / 60 / 80 / 100 / 120</td>
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<tr>
<td>BOND TYPE</td>
<td>VS3X Latest generation Vitrium3 bond</td>
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<td>COLOUR</td>
<td>White</td>
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</table>

**COMPETITIVE PRICE – LOW FORCE CUTTING – FAST OPERATIONS –**

Vortex2 is a 3D engineered grain spacing, highly porous and permeable structure that maximises coolant access to the grinding zone.

**PROVIDING A COOL AND LOW STRESS CUT.**

Norton Quantum ceramic grain was developed from Norton patented Seeded-Gel technology. The revolutionary ceramic grain multiplied the cutting efficiency by controlling the grain breakdown at micrometric level.

**PROVIDING A PERFECT BLEND OF SHARPNESS AND TOUGHNESS.**

**NEXT GENERATION INNOVATION**

**HIGH STRESS scenarios resulted in lower stress and friction for better part quality, consistent cut and less dresser wear.**

**VI”HIBIT” is a highly porous wheel with higher material removal, exceptional cool grinding and reduced cycle times in heat and stress sensitive processes.**

**GROUND BREAKING BENEFITS.**

- Highly permeable ceramic spacing offers cutting efficiency and cycle time reduction.
- Low threshold power of Norton Quantum in a homogenous Vortex structure reduces the cutting forces – resulting in lower chaff and friction for better part quality, consistent cut and less dresser wear.
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**COMPETITIVE PRICE – LOW FORCE CUTTING – FAST OPERATIONS –**
NORTON QUANTUM X CASE STUDIES.

CASE STUDY 1
Application: Creepfeed grinding
Parts: Engine component root and platform blade
Material: Rene Ni alloy
Coolant: 8% emulsion
Dresser: Roller dresser
Wheel dimensions: 508x115x263.2
Wheel specification: 3NQX060D28VS3X vs. 30% sintered alumina (ceramic grain) competition wheel

RESULTS vs. COMPETITOR
WHEEL LIFE: +40%
DRESS COMPENSATION: -20%
TOTAL COST PER PART: -20%

CASE STUDY 2
Application: Creepfeed grinding
Parts: Engine component blade
Material: Rene Ni alloy
Coolant: 8% emulsion
Dresser: Roller dresser
Wheel dimensions: 400x60x127
Wheel specification: 5QX80E28VS3X vs. 50% sintered alumina (ceramic grain) competition wheel

RESULTS vs. COMPETITOR
CYCLE TIME: -50%
WHEEL LIFE: +40%
TOTAL COST PER PART: -25%

CASE STUDY 3
Application: Surface grinding (segments)
Parts: Circular blade
Material: Tool steel (non treated)
Coolant: 4% emulsion
Segments dimensions: 383X127X152
Wheel specification: 5NQX30F20VS3X vs. 50% sintered alumina (ceramic grain) competition wheel

RESULTS vs. COMPETITOR
POWER CONSUMPTION: -20%
WHEEL LIFE: +30%
TOTAL COST PER PART: -20%

MINIMAL ENVIRONMENTAL IMPACT & GUARANTEED COMPLIANCE.

NO MORE CHEMICAL PORE INDUCERS
• Norton Quantum X wheels require no artificial pore inducers such as naphthalene to achieve a high level of permeability, unlike other porous vitrified wheel technologies.

REDUCED CARBON FOOTPRINT
• Norton Quantum X products are manufactured using a low firing temperature, reducing energy consumption.

SUSTAINABLE SOLUTION
• Norton Quantum X eliminates costly revalidation of processes associated with using harmful artificial pore inducers.

OUR COMMITMENT: SAFETY, QUALITY AND ENVIRONMENT PRESERVATION

SAFETY
The personal safety of workers using abrasive cutting and grinding wheels is our primary concern. All Norton abrasive wheels are developed, manufactured and safety tested in accordance with the European standard EN12413, safety requirements for bonded abrasive products. In addition, all Norton products meet stringent requirements of the Organization for the Safety of Abrasives (oSa). Saint-Gobain Abrasives is a founding member of the oSa organisation.

QUALITY
Saint-Gobain Abrasives is fully ISO accredited:
ISO 9001: certifies Quality Management System is in accordance with requirements of quality standards.
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OHSAS 18001: health and safety at work certification.

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No more chemical pore inducers and Norton Quantum X products are manufactured using a low firing temperature, reducing energy consumption. Norton Quantum X eliminates costly revalidation of processes associated with using harmful artificial pore inducers.
NORTON QUANTUM X CASE STUDIES.

CASE STUDY 1
Application: Creepfeed grinding
Part: Engine component root and platform blade
Material: Rene Ni alloy
Coolant: 8% emulsion
Dresser: Roller dresser
Wheel dimensions: 508x115x203.2
Wheel specification: 3NQX60D28VS3X vs. 50% sintered alumina (ceramic grain) competitor wheel

RESULTS VS. COMPETITOR
WHEEL LIFE: +40%
DRESS COMPENSATION: -20%
TOTAL COST PER PART: -20%

CASE STUDY 2
Application: Creepfeed grinding
Part: Engine component blade
Material: Rene Ni alloy
Coolant: 8% emulsion
Dresser: Roller dresser
Wheel dimensions: 400x60x127
Wheel specification: 5NQX80E28VS3X vs. 50% sintered alumina (ceramic grain) competitor wheel

RESULTS VS. COMPETITOR
CYCLE TIME: -50%
WHEEL LIFE: +40%
TOTAL COST PER PART: -25%

CASE STUDY 3
Application: Surface grinding (segments)
Part: Circular blade
Material: Tool steel (non-treated)
Coolant: 4% emulsion
Segments dimensions: 3.8X127X152
Wheel specification: 5NQX30F20VS3X vs. 50% sintered alumina (ceramic grain) competitor wheel

RESULTS VS. COMPETITOR
POWER CONSUMPTION: -20%
WHEEL LIFE: +30%
TOTAL COST PER PART: -20%

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NORTON QUANTUM X is a REVOLUTIONARY WHEEL – BEYOND THE RECOGNISED LIMITS OF PERFORMANCE GRINDING.

By combining three of the very best Norton technologies we have created Norton Quantum X to bring you unrivalled value and performance, creating the ultimate grinding experience.

Norton Quantum X is created with patented Norton Quantum and Vortex2 3D engineered grain spacing, combined with the revolutionary Vitrium3 bond innovation; resulting in a grinding wheel that provides maximum performance, raised productivity and reduced process costs.

**GROUND BREAKING BENEFITS.**

- **FAST OPERATIONS** – Highly permeable ceramic spacing offers cutting efficiency and cycle time reduction.
- **LOW FORCE CUTTING** – Low threshold power of Norton Quantum in a homogenous Vortex structure reduces the cutting forces – resulting in lower stress and friction for better part quality, consistent cut and less dresser wear.
- **COMPETITIVE PRICE** – Norton Quantum X is positioned at a competitive price compared to other products in the market, providing valuable cost savings.

**NEXT GENERATION INNOVATION**

**NORTON QUANTUM X PRODUCT AVAILABILITY.**

**DESIGNATION**

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<tr>
<th>ABRASIVE TYPE</th>
<th>3NQX / 5NQX</th>
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</thead>
<tbody>
<tr>
<td>GRAIN SIZE</td>
<td>36B / 46B / 60B / 80B / 120B</td>
</tr>
<tr>
<td>STRUCTURE</td>
<td>16 / 20 / 24 / 28</td>
</tr>
<tr>
<td>BOND TYPE</td>
<td>VS3X</td>
</tr>
<tr>
<td>COLOR</td>
<td>White</td>
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</table>

**DESCRIPTION**

- 3NQX / 5NQX: 30 or 50% Norton Quantum ceramic grain
- Less open structure for improved form holding and wheel wear
- More open structure for higher MRR and heat sensitive parts
- Lasted generation Vitrium3 bond

**MULTIPLE INDUSTRIES.**

- Gear
- Aerospace and land turbine components
- Bearing
- Tools
- General engineering

**SPECIALISED APPLICATIONS.**

- Areas of high material removal
- Heat sensitive and difficult to grind alloys
- Thin wall parts sensitive to deformation

**HIGHLY POROUS WHEEL WITH HIGHER MATERIAL REMOVAL, EXCEPTIONAL COOL GRINDING AND REDUCED CYCLE TIMES IN HEAT AND STRESS SENSITIVE PROCESSES.**

**HIGH PRECISION AND VERSATILITY ACROSS MANY APPLICATIONS.**

**VITRIUM3**

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**Norton Quantum X Case Studies.**

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<tr>
<td>Parts: Engine component</td>
<td><strong>DRESS COMPENSATION:</strong> -20%</td>
</tr>
<tr>
<td>Material: Rene 80 alloy</td>
<td><strong>TOTAL COST PER PART:</strong> -20%</td>
</tr>
<tr>
<td>Coolant: 8% emulsion</td>
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<tr>
<td>Dresser: Roller dresser</td>
<td></td>
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<td>Wheel dimensions: 508x115x203.2</td>
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<td>Wheel specification: 3NQX60D28VS3X vs. 50% sintered alumina (ceramic grain) competition wheel</td>
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<tr>
<th>CASE STUDY 2</th>
<th>RESULTS vs. COMPETITOR</th>
</tr>
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<tbody>
<tr>
<td>Application: Surface grinding (segmented)</td>
<td><strong>WHEEL LIFE:</strong> +40%</td>
</tr>
<tr>
<td>Parts: Circular blade</td>
<td><strong>DRESS COMPENSATION:</strong> -20%</td>
</tr>
<tr>
<td>Material: Tool steel (non-treated)</td>
<td><strong>TOTAL COST PER PART:</strong> -20%</td>
</tr>
<tr>
<td>Coolant: 5% emulsion</td>
<td></td>
</tr>
<tr>
<td>Segments dimensions: 385X72X152</td>
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</tr>
<tr>
<td>Wheel specification: 5NQX30F20VS3X vs. 50% sintered alumina (ceramic grain) competition wheel</td>
<td></td>
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<tr>
<th>CASE STUDY 3</th>
<th>RESULTS vs. COMPETITOR</th>
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<tr>
<td>Application: Surface grinding (segmented)</td>
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**Minimal Environmental Impact & Guaranteed Compliance.**

**No More Chemical Pore Inducers**
- Norton Quantum X wheels require no artificial pore inducers such as naphthalene to achieve a high level of permeability, unlike other porous vitrified wheel technologies.

**Reduced Carbon Footprint**
- Norton Quantum X products are manufactured using a low firing temperature, reducing energy consumption.

**Sustainable Solution**
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---

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**Fast Operations**

**Competitive Price**

**Beyond the Limits of Performance Grinding**