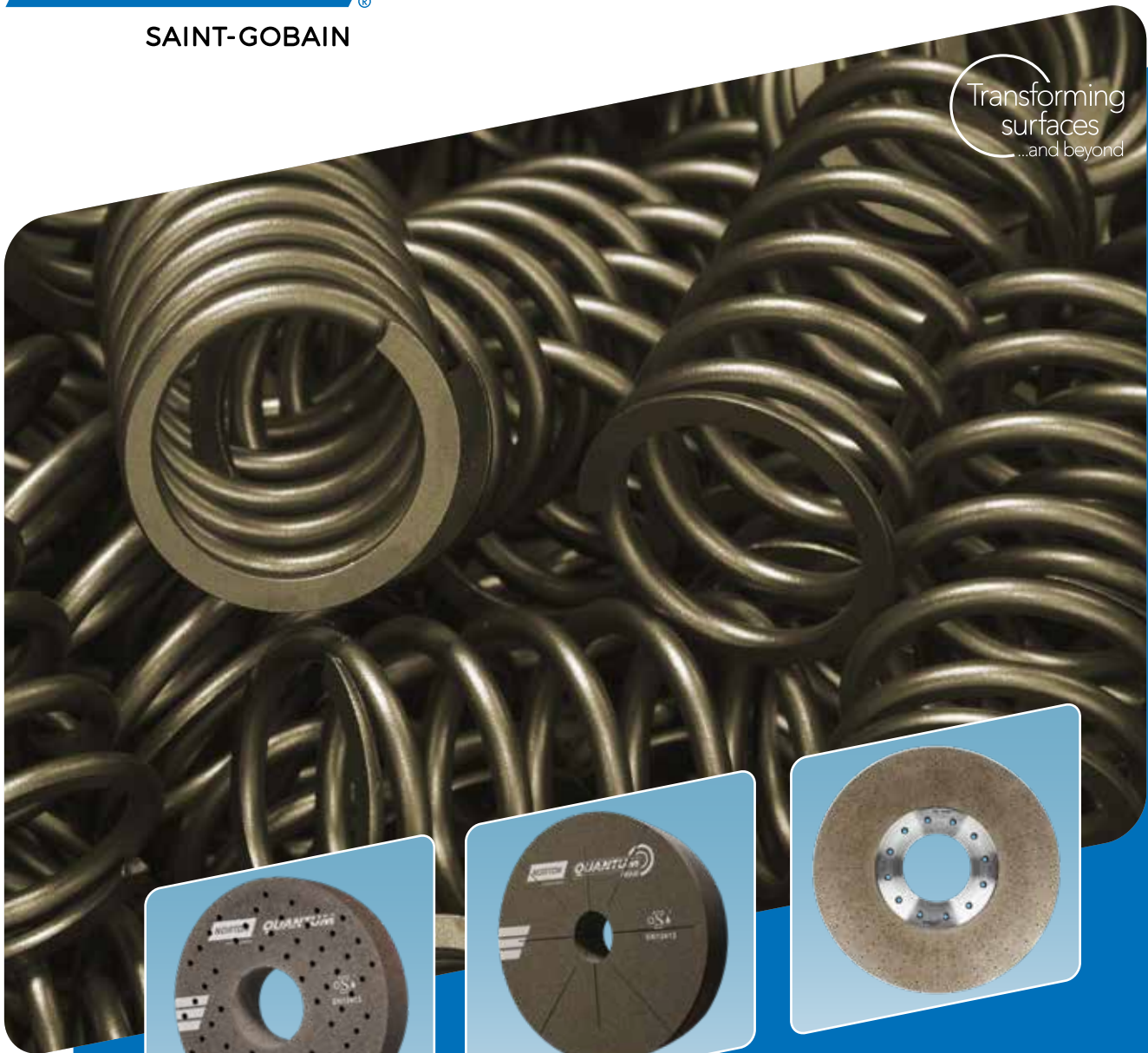


NORTON

SAINT-GOBAIN

Transforming
surfaces
...and beyond



SURFACE SOLUTIONS

SPRING-END GRINDING

SPRING-END GRINDING SOLUTIONS

Spring-end grinding plays a crucial role in the overall cost of producing compression springs. To optimise cost efficiency and meet your budgetary goals, the use of high-performance grinding tools is essential. Saint-Gobain Abrasives offers an extensive portfolio of abrasive solutions specifically engineered for spring-end grinding. Our team of expert engineers is available to provide tailored support, guiding you in selecting the optimal combination of abrasive grains and bonding systems to enhance performance and maximise productivity.

NORTON WINTER TECHNOLOGY



Ultimate Solution for Spring Diameters < 1.5mm



SPRING X by **Norton Winter** is the latest innovation for grinding springs with diameters under 1.5mm. Harnessing cutting-edge direct plating technology combined with premium cBN grains, **SPRING X** delivers unmatched precision and performance.

- Ideal for springs with diameters ranging from 0.5mm to 1.5mm
- Available in diameters up to 900mm
- Operates at speeds up to 60 m/s (and up to 100 m/s in specific cases)
- Infeed up to 1.2mm
- Suitable for grinding both steel and stainless steel



Norton Resinoid Bonded Wheels for Spring Diameters > 1.5mm

For springs with diameters exceeding 1.5mm, Norton offers three specialised ranges of resinoid bonded wheels designed to meet diverse requirements, from cost-effective solutions to high-performance options. These ranges include the **Standard Organic Bond**, **B98 Porous Bond**, and **B494 VORTEX Tech Bond**, and are produced in our European facilities to ensure extensive product availability and various levels of performance. Our wheels feature resinoid bonding with Aluminium Oxide and Silicon Carbide grains, including both conventional and ceramic types, and utilize the advanced **QUANTUM PRIME** technology for optimal efficiency.



RANKING BY TECHNOLOGY

Norton Spring Grinding Wheel Performance Comparison



WHY CHOOSE CERAMIC ALUMINA?

Ceramic grains consist of thousands of microcrystals. This microstructure allows for controlled fracturing during grinding, providing continual exposure of new cutting edges. As a result, the wheel remains sharp and more durable than conventional grains, which lose macro grains during resharping.

Wheels made with Norton ceramic grains are the most effective solution for spring-end grinding, allowing for lower pressures while maintaining high metal removal rates and reduced wheel consumption.

Among ceramic grains, Norton Quantum Prime represents the latest innovation in grinding technology. Designed for maximum performance and unmatched precision, it offers the fastest and finest grinding solution available.

MAIN CHARACTERISTICS OF NORTON QUANTUM PRIME:

- **New Ceramic Grains:** Chemistry and shape developed from Saint-Gobain's patented Seeded-Gel Technology.
- **Enhanced Efficiency:** Revolutionary ceramic grains multiply cutting efficiency by controlling grain breakdown at the micro-metric level.
- **Balanced Performance:** A perfect blend of sharpness (free cutting) and toughness (durability).
- **Optimised Bonds:** Newly developed bonds improve grain-to-bond adhesion and enhance grain retention.

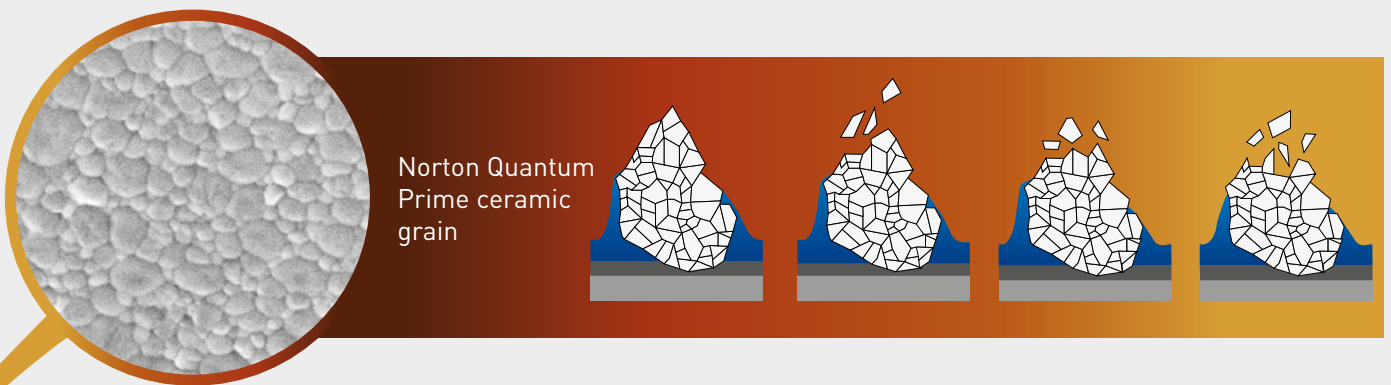
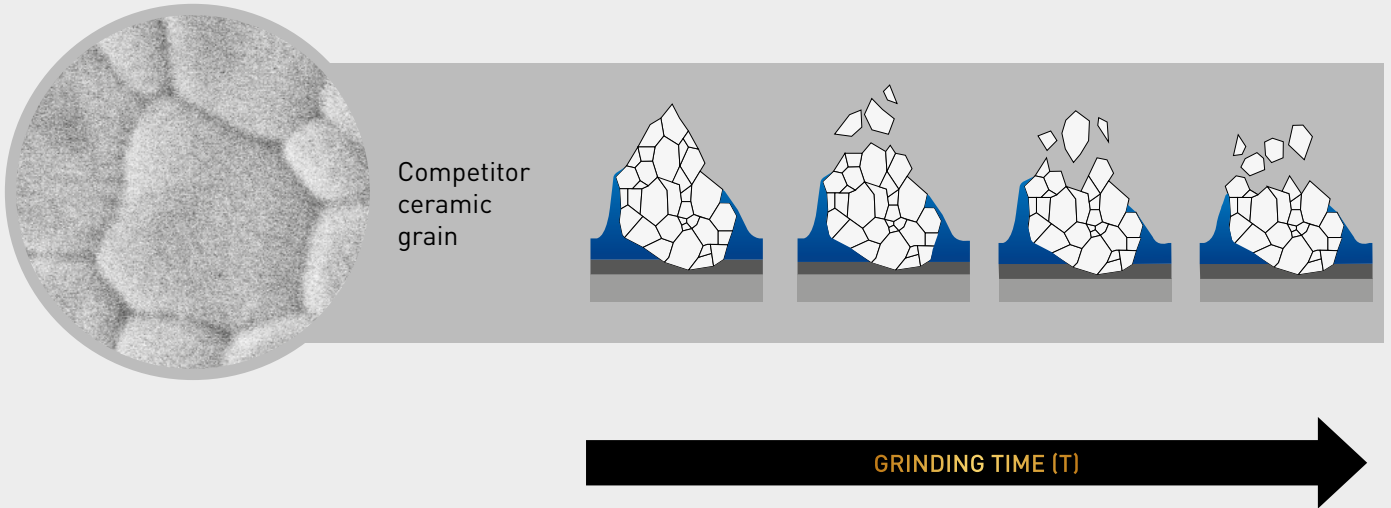
Norton Quantum Prime wheels guarantee improved wheel life, reduced dressing frequency, higher production rates, and cooler cutting compared to standard ceramic grains.

THE SCIENCE BEHIND THE GRAIN

The new micro-structure of the Norton Quantum Prime grain features a significant crystal size reduction compared to previous generation ceramic grains. The unique formulation and reduced crystal size allow the grain to micro-fracture and self-sharpen more efficiently. This keeps the wheel sharper for longer, reducing heat, wear flats, and minimising the need for dressing.



SELF-SHARPENING PROCESS



CONTROLLED GRAIN
MICRO-FRACTURE

ENHANCED
SELF-SHARPENING

REDUCED CYCLE
TIME, IMPROVED PART
QUALITY & IMPROVED
WHEEL LIFE

PRODUCT SELECTION

ABRASIVE SELECTION GUIDE		SILICA CARBON STEEL SPRINGS (HEAT SENSITIVE)	SILICA CARBON STEEL SPRINGS (GENERAL PURPOSE)	STAINLESS STEEL SPRINGS
PRICE/PERFORMANCE RANKING		ABRASIVE TYPE		
INNOVATION	Norton Spring X & Quantum Prime Organic	Spring X + NQN - ORG, nNQNJ, nNQNR-QNxA - Vortex	Spring X + NQN Org nNQNA - QNxA - Vortex	Spring X + NQN Org nNQNJG, nNQNRG, nNQNDG, QNxA Vortex
BEST +++++	Norton Quantum	nNQJ, nNQR Q2A - Q3A -Q4A Vortex	nNQA Q2A - Q3A -Q4A Vortex	nNQJC, nNQRC, nNQAC, nNQDG
BETTER ++++	Standard Ceramic Grain	nXGJ, nXGR 38AA,X1A,Q1A Vortex	nXGA 38AA,X1A,Q1A Vortex	nXGJC, nXGRC, nXGAC, X2A-Q2A - G3A Vortex
GOOD +++	Conventional Grain	88A, 40A , 38AA-X1A Vortex	57A 38AA-Vortex	88AC, 40AC, 57AC, G3A Vortex

G/C: G: Green Silicon Carbide
C: Black Silicon Carbide

88A (J)*: Very friable pure white aluminium oxide

40A (R)*: Pure friable pink aluminium oxide, more durable than 88A

57A (A)*: Semi-friable aluminium oxide

nXGJ, nXGR, nXGA, nNQJ, nNQR, nNQA (n= 1,2,3,4 and refers to premium grain %)

nXGJC, nXGRC, nXGAC, nNQJC, nNQRC, nNQAC (n= 1,2,3,4 and refers to premium grain %)

* When used as diluent abrasive.

GRIT AND GRADE SELECTION GUIDE		RIGID SPRINGS		ELASTIC SPRINGS	
WIRE DIAMETER	TYPICAL MACHINE TYPES ⁽¹⁾	GRIT SIZE	GRADE ⁽²⁾	GRIT SIZE	GRADE ⁽²⁾
∅ ≥ 10 mm	pendular machines continuous downfeed	16 - 20	N - Q - L - M Vortex Tech	16 - 20 - 36 Vortex Tech	M - P - K - L Vortex Tech
∅ > 10 mm	single pass or continuous downfeed	16 - 20 - 36 Vortex Tech	N - Q - L - M Vortex Tech	16 - 20 - 36 Vortex Tech	M - P - K - L Vortex Tech
4 mm < ∅ < 9 mm	single pass or continuous downfeed	20 - 24 - 30	P - S - M - N Vortex Tech	20 - 24 - 30	O - R - L - M Vortex Tech
1.5 mm < ∅ < 3 mm	single pass or continuous downfeed	30 - 36 - 46	Q - S - M - N Vortex Tech	30 - 36 - 46	P - R - L - M Vortex Tech
∅ < 1,5 mm	single pass or continuous downfeed	Spring X			

(1) For single pass machines, choose a hard grade, for downfeed grinding select a soft grade

(2) For wet applications, choose a softer grade

APPLICATION INFORMATION	
WHEEL	MACHINE
Wheel dimensions (diam x thickness x hole)	Name & Power (kW)
Working zone thickness	Machine type : continuous, downfeed or single pass
Dimensional tolerances (if any)	Coolant type (if any)
Nut layout (if any)	SPRING
Nut type	Wire and spring diameter (mm)
Working zone pattern (perforated, plain..)	Wire composition and EU classification
Maximum Operating Speed (m/s)	Spring hardness
MAIN CUSTOMER REQUIREMENT	
Please specify any other parameter(s) to be improved.	

WHEN CONTACTING YOUR LOCAL SALES REPRESENTATIVE, PLEASE PROVIDE THE FOLLOWING INFORMATION TO HELP US RECOMMEND THE BEST PRODUCT FOR YOUR APPLICATION.

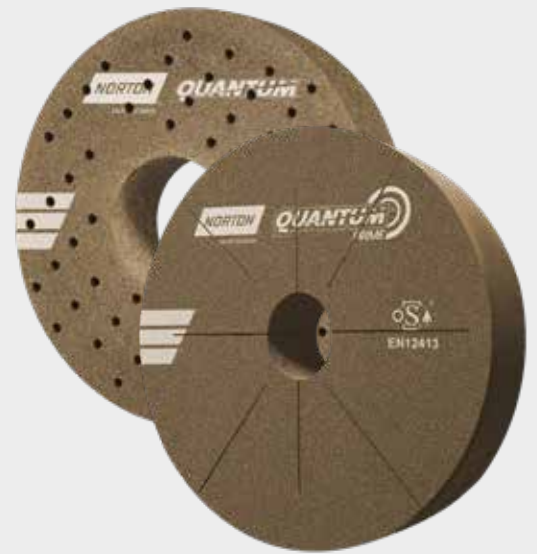
Norton Organic Bonded Wheels

Norton offers a comprehensive range of organic bonded wheels, suitable for both “single pass” and “downfeed” machines across wet or dry applications. Our wheels are available in all standard dimensions and shapes.

Resinoid wheels can be supplied with nuts (ISO shape 36) or without any fixtures for mounting on metallic plates (ISO shape 35).

Grinding zones can be designed as compact, compact with porosity inducer, or with perforations—either partial or throughout. For optimal cooling efficiency, throughout perforations are recommended and are available in diameters of 450mm, 660mm, and 915mm.

The table below showcases the most popular wheel dimensions for spring-end grinding. While this list highlights commonly used sizes, we can also provide custom dimensions to meet a wide range of applications.



DIMENSIONAL AVAILABILITY			
355 x 50 x 150	450 x 90 x 0	600 x 90 x 215	660 x 90 x 305
355 x 60 x 140	450 x 90 x 40	610 x 65 x 0	660 x 93 x 200
355 x 60 x 152.4	450 x 90 x 50	610 x 74 x 140	762 x 85 x 152.4
400 x 60 x 80	450 x 90 x 90	610 x 89 x 139	800 x 90 x 220
450 x 60 x 0	508 x 63 x 152.4	650 x 80 x 350	800 x 120 x 300
450 x 65 x 0	557 x 74 x 89	660 x 100 x 150	900 x 90 x 305
450 x 70 x 200	600 x 40 x 215	660 x 100 x 300	915 x 120 x 200
455 x 50 x 250	600 x 50 x 304.8	660 x 105 x 200	1000x150x200 / 300
457 x 83 x 150	660 x 90 x 300		

NORTON WINTER SPRING X WHEELS

- Diameter (standard diameter 350,450, 660)
- Max diameter 900 mm, max weight 100 kg
- MOS until 100M/S (standard use 60M/S)
- Unique grain quality
- Customised design depending on the spring material
- Standard grit sizes: B181 B251 B301 B602- depending on the spring wire size

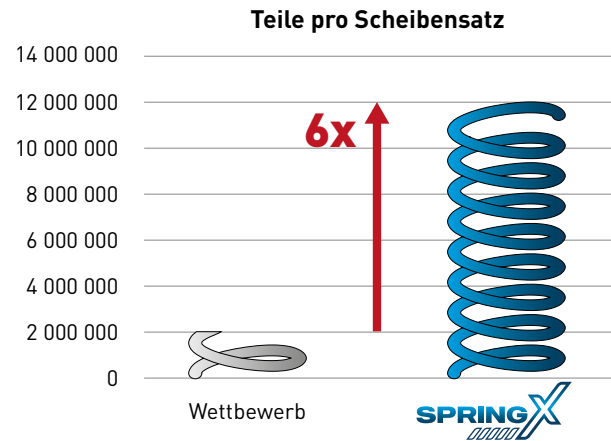


SPRING GRINDING



Market: General Engineering	
WORKPIECE	
Material:	Spring Carbon Steel & Stainless Steel
Workpiece:	Spring
Wire Diameter:	0,8 mm
Required Roughness:	No burn
TESTED PRODUCT	
Shape and dimensions:	222 shape 450 x 150 mm
Specification:	B301
MOS:	60 m/s
MACHINE	
OEM:	OMD
Coolant:	Airflow
Dresser:	No dressing
COMPETITOR	
Specification:	B602

RESULTS	
DRESSING:	No dressing
PART QUALITY:	Constant in geometry, no burn
REJECT:	Down to 0%



SPRING GRINDING



Market: General Engineering	
WORKPIECE	
Material:	Carbon Steel
Dimension:	Wire diameter from 1 mm to 1,5 mm
Workpiece:	Spring – various dimensions
Hardness:	Various from 30 to 55 Hrc
TESTED PRODUCT	
Shape and dimensions:	36_450 x 90 x 100 mm
Specification:	Q2A366L12B494
SAP:	69210497608
WHEEL SPEED:	50 m/s
MACHINE	
OEM:	Kamatech G45T
Coolant:	Cool Air Flow
COMPETITOR	
Specification:	CCL303V13B5P2

RESULTS	
<ul style="list-style-type: none"> • Positive test result: • Higher MRR • Very good wheel wear rate • Good cutting performance on various materials, dimensions, and hardness levels 	



SPRING GRINDING

QUANTUM

Market: General Engineering

WORKPIECE

Material:	Alloy steel
Dimension:	19 mm < Ø spring < 40 mm / 4 mm < Ø wire < 8,35 mm
Workpiece:	Spring

TESTED PRODUCT

Shape and dimensions:	36_660 x 100 x 150 mm
Specification:	5NQJG20020BQN98
SAP:	69083128296
MOS:	45 m/s

MACHINE

OEM:	OMD MA10
------	----------

RESULTS

- A total of 32905 springs were processed over 150 hours of uninterrupted machine operation, excluding time for tooling adjustments and other pauses
- +25% wheel life vs competitor
- Cool cut
- No burns
- Good surface finish



SPRING GRINDING

QUANTUM

Market: General Engineering

WORKPIECE

Material:	52SiCrNi5 hardened – 50CrV4 hardened
Workpiece:	Spring
Hardness:	52±2 Hrc

TESTED PRODUCT

Shape and dimensions:	36_915 x 120 x 200 mm
Specification:	5NQJG20MBQN98 (up) - 5NQJG20OBQN98 (down)
SAP:	69210467074 - 69210467079
MOS:	32 m/s

MACHINE

OEM:	Kamatech
Coolant:	Cooled air flow

COMPETITOR

Dimensions:	915 x 120 x 200 mm
Specification:	225A 20-9 N13B31

RESULTS

- Performance comparable to competitors
- Good MRR
- Good surface quality
- Norton grinding wheels do not heat the piece during processing



EFFECTIVE COST REDUCTION CASE STUDIES

STANDARD CERAMIC GRAIN XG

WHEEL

- **Norton Specification:**
Rough grinding: **3XGJ24S20b98** - 30% Ceramic
Finish grinding: **3XGJ24M20B98** - 30% Ceramic
- Competitor Spec: 30% ceramic
- Dimensions: 660 x 80 x 150 mm
- Shape 36 with perforation
- MOS: 45m/s

MATERIAL

- Material composition: CrSi Steel
- Hardness of material ground: Hard Spring
- Diameter: 25 mm
- Wire diameter: 4 mm

MACHINE

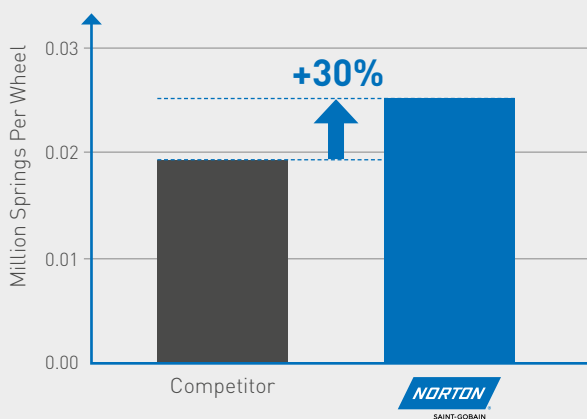
- Name: Self made machine
- Cooling system: dry
- Infeed system: continuous downfeed
- Number of springs/charger (pcs): 240 - 280
- Cycle time: 3 min

CUSTOMER REQUIREMENT

- Decrease overall abrasive cost per spring

RESULTS

Despite similar amounts of ceramic grain, Norton specifications outperform competitor specifications without changing operating parameters and while maintaining burn-free quality



NORTON QUANTUM

WHEEL

- **Norton Specification:**
3NQJ24MBQN - 30% Ceramic - Quantum
- Competitor Spec: - 35% ceramic grain
- Dimensions: 915 x 120 x 200 mm
- Shape 36 with perforations
- MOS: 35m/s

MATERIAL

- 1. Type CrSi Din 17223-2 FDSiC
- 2. Type piano wire - Din 17223-1 Class C
- Hardness of material ground: high strength oil hardened valve spring steel.
- Spring Type 1: Wire diameter: range 12-14 mm
- Spring Type 2: Wire diameter: range 10-11.5 mm

MACHINE

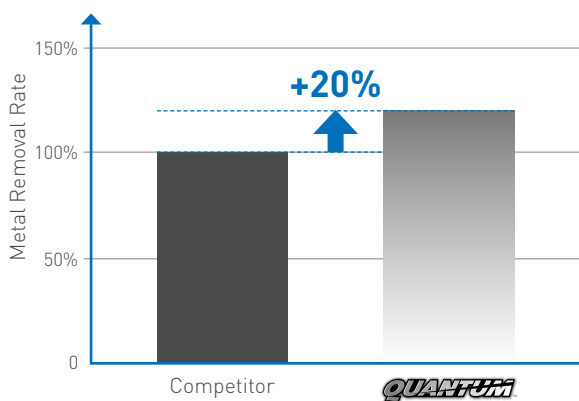
- Name: OMD
- Cooling system: dry
- Infeed system: continuous downfeed
- Number of springs/charger: 15 (CrSi), 24 (piano wire)

CUSTOMER REQUIREMENT

- Increase wheel life and productivity

RESULTS

Norton Quantum demonstrated a 20% faster grinding process



NORTON QUANTUM

WHEEL

- **Norton Specification: 3NQJ24PB98**
30% Ceramic - Quantum
- Competitor Spec: 30% ceramic
- Dimensions: 660 x 100 x 150 mm
- Shape 36 with perforations
- MOS: 50 m/s

MATERIAL

- Material type: CrSi Steel & Stainless Steel
- Hardness of material ground: Various Spring
- Diameter: 59 mm
- Wire diameter: 8 mm (range 2-8 mm)

MACHINE

- Name: Wafios
- Cooling system: dry
- Infeed system: continuous downfeed
- Number of springs/charger: 60 (CrSi)
- Cycle time: 3.5 min (CrSi) and 20 min (Stainless)

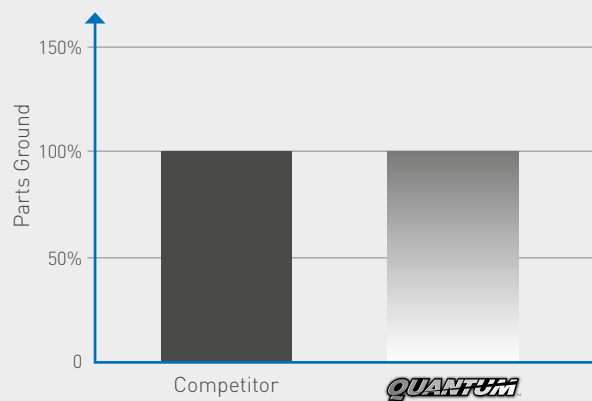
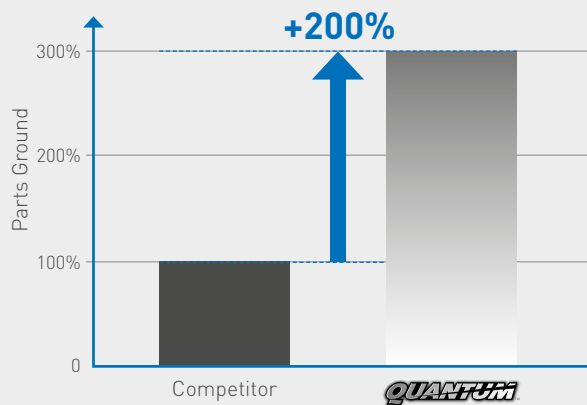
CUSTOMER REQUIREMENT

- Increase wheel life and productivity

RESULTS

CrSi steel: Norton Quantum grinds more than three times the number of parts before dressing compared to the leading competitor's specification

Stainless steel: Performance equal to the leading competitor's specification



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