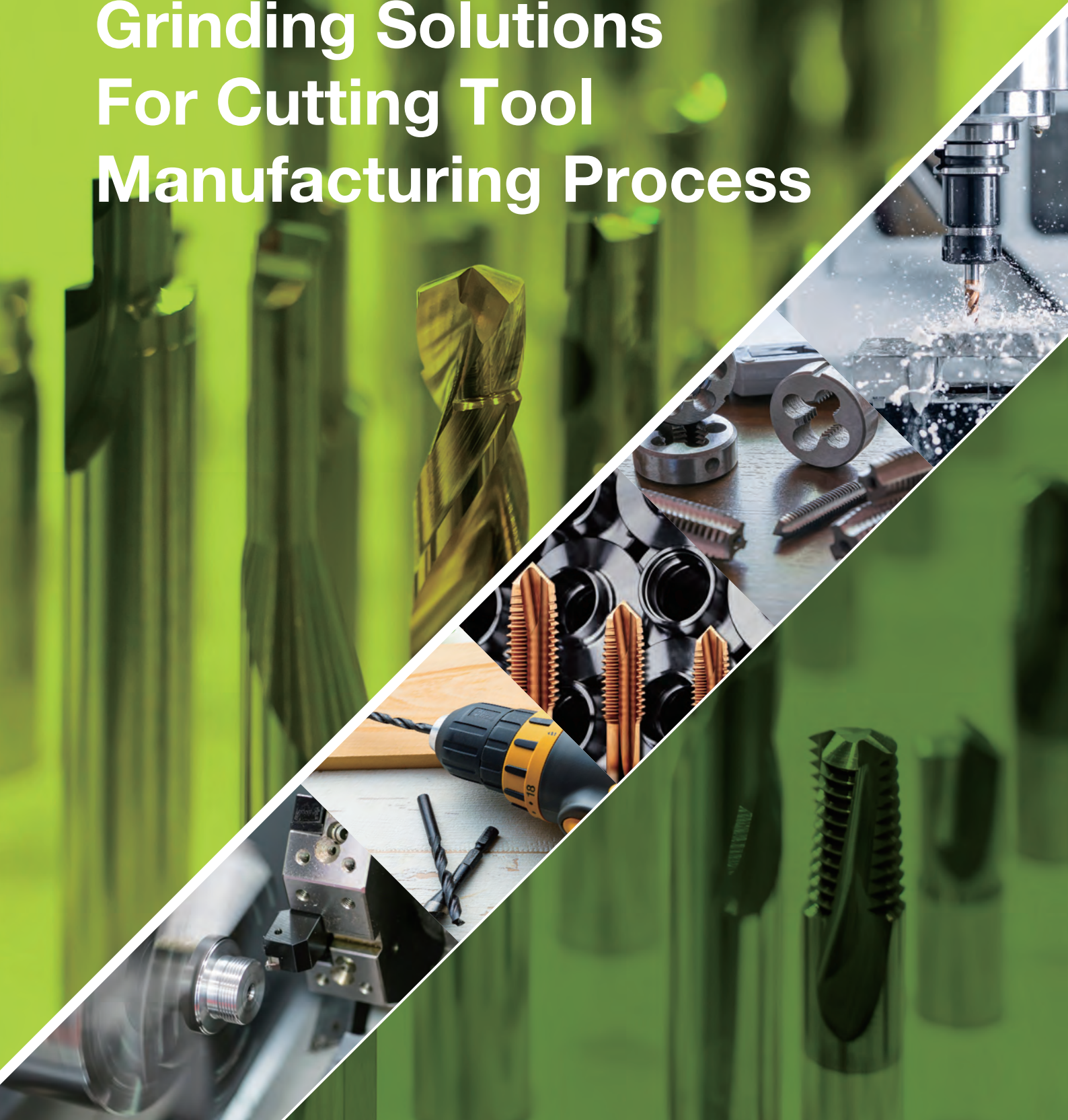

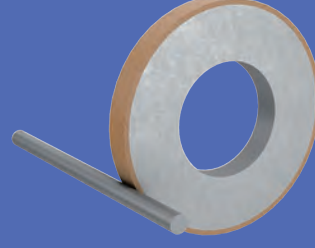
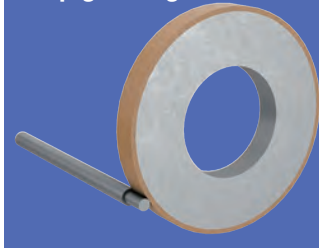
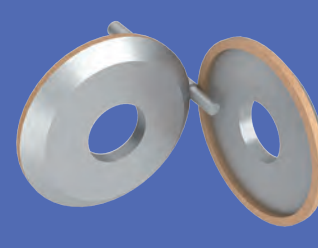
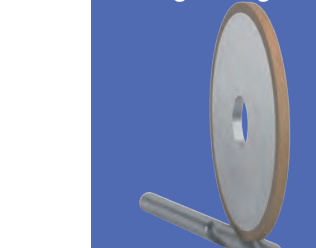
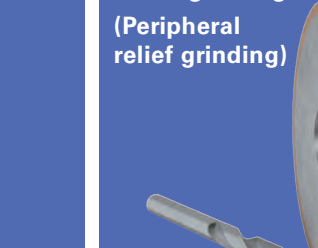
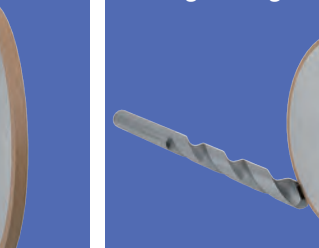


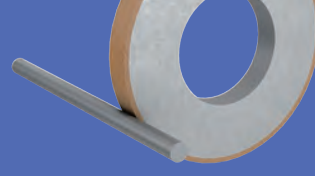
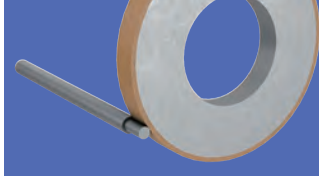

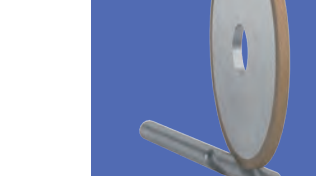
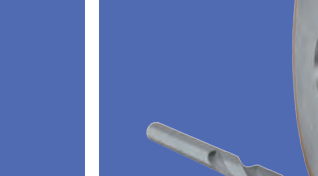
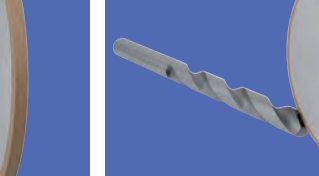
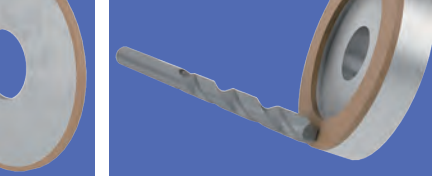






















Noritake


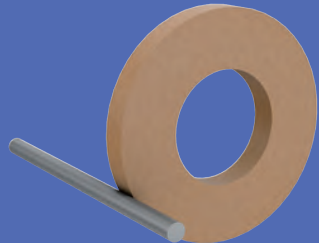
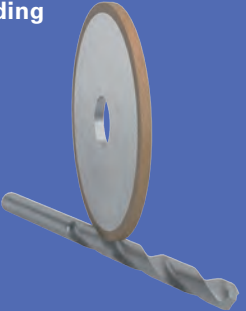
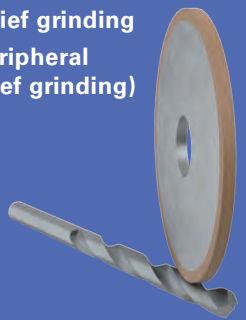
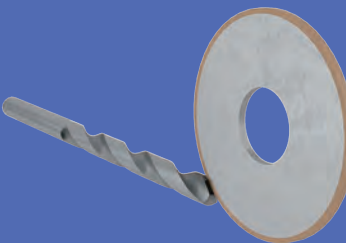
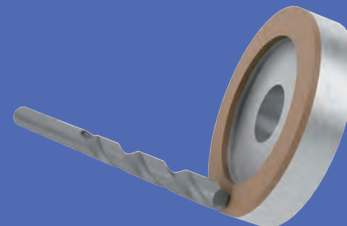
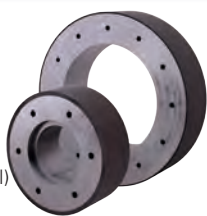

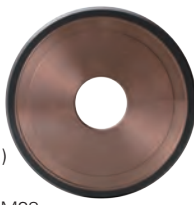



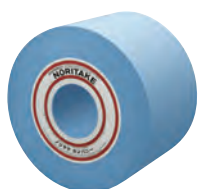


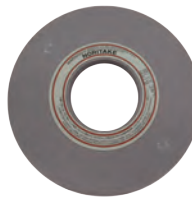






Grinding Solutions For Cutting Tool Manufacturing Process



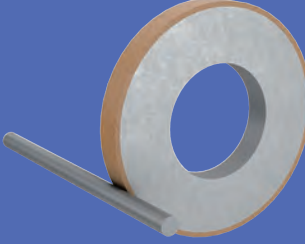

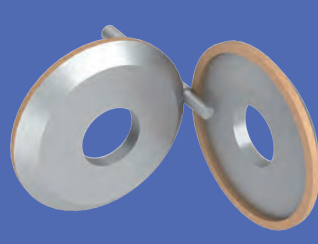


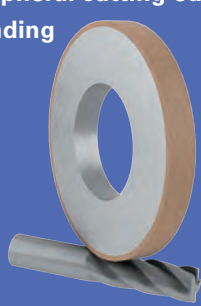

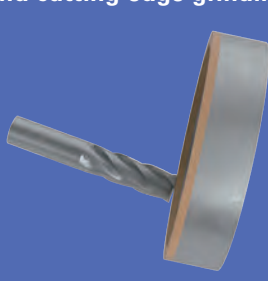




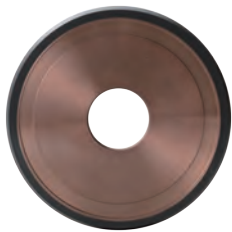









» Issues and Proposal for Improvement of Cutting Tool Manufacturing Process

Drill (Carbide)															
Sintering		Peripheral grinding		Step grinding		Flute grinding		Relief grinding (Peripheral relief grinding)		Point grinding		Cutting edge grinding		Complete	
															
Peripheral grinding		Step grinding		Flute grinding		Relief grinding (Peripheral relief grinding)		Point grinding		Cutting edge grinding					
															
Centerless grinding		Cylindrical grinding		Cylindrical grinding (Plunge grinding)		Cylindrical grinding (Traverse grinding)		Flute grinding		Relief grinding (Peripheral relief grinding)		Point grinding		Cutting edge grinding	
Due to the difference in stock removal at the entrance and exit, the wheel wears unevenly		The workpiece can bend easily due to the supports at either end		The wheel tends to lose shape		Large depth of cut		Large depth of cut and high grinding force		The wheel tends to lose shape		Requires a smoother surface finish		Requires a smoother surface finish	
Variation in workpiece accuracy		Difficult to ensure workpiece straightness		Finding a balance between holding wheel shape and maintaining easy dressability		Traversal marks, grinding burn and loss of wheel shape		Loss of wheel shape and grinding burn		Decrease in grinding efficiency		Achieving both the desired cutting ability and workpiece quality		Achieving both the desired cutting ability and workpiece quality	
Proposal		Proposal		Proposal		Proposal		Proposal		Proposal		Proposal		Proposal	
															
BEL Series (Diamond/CBN wheel for electrical discharge dressing) Standard specification: Rough :SDC 125 ~ 325 S-BEL5 Finish :SDC 400 ~ 1000 S-BEL5		BWC Wheel (Diamond/CBN wheel) Standard specification: Rough :SDC 140 ~ 700 N 75 BWC Finish: SDC 800 ~ 1000 P-BWCF		Besler Wheel (Diamond/CBN wheel) Standard specification: SDC 230 P 100 BX341		Rough : M60 Series (Diamond/CBN wheel) Standard specification: SD 200 N 120 M60 Finish: BT Series (Diamond/CBN wheel) Standard specification: SDC 600 ~ 800 J 100 BT50		MDL Wheel (Diamond/CBN wheel) Standard specification: SD 140 ~ 400 L 60 MDL36		Besler Wheel (Diamond/CBN wheel) Standard specification: SDC 230 P 100 BX341		Besler Wheel (Diamond/CBN wheel) Standard specification: SDC 200 ~ 600 P 100 BX331		Besler Wheel (Diamond/CBN wheel) Standard specification: SDC 400 ~ 600 P 100 BX341	
															
Noritake Cool N-60TCS (Water base coolant)		Noritake Cool N-60TCS (Water base coolant)		Noritake Cool N-60TCS (Water base coolant)		Noritake Cool N-60TCS (Water base coolant)		Noritake Cool N-60TCS (Water base coolant)		Noritake Cool N-60TCS (Water base coolant)		Noritake Cool N-60TCS (Water base coolant)		Noritake Cool N-60TCS (Water base coolant)	
															
Centrifugal NCX type		Centrifugal NCX type		Centrifugal NCX type		Centrifugal NCX type		Centrifugal NCX type		Centrifugal NCX type		Centrifugal NCX type		Centrifugal NCX type	


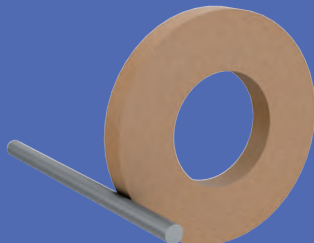

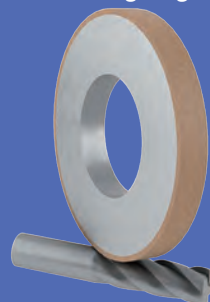

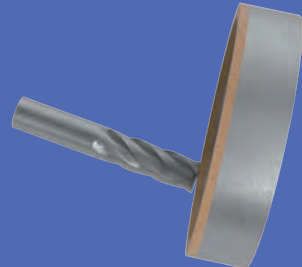























» Issues and Proposal for Improvement of Cutting Tool Manufacturing Process

Drill (High speed steel)												
Heat treatment		Peripheral grinding		Flute grinding		Relief grinding (Peripheral relief grinding)		Point grinding		Cutting edge grinding		Complete
												
Centerless grinding		Cylindrical grinding				Relief grinding (Peripheral relief grinding)		Point grinding		Cutting edge grinding		
Due to the difference in stock removal at the entrance and exit, the wheel wears unevenly		The workpiece can bend easily due to the supports at either end		Large depth of cut and high grinding force		The wheel tends to lose shape		Requires a smoother surface finish		Requires a smoother surface finish		
Variation in workpiece accuracy		Difficult to ensure workpiece straightness		Loss of wheel shape and grinding burn		Decrease in grinding efficiency		Achieving both the desired cutting ability and workpiece quality		Achieving both the desired cutting ability and workpiece quality		
Proposal		Proposal		Proposal		Proposal		Proposal		Proposal		
 BW6 Series (Diamond/CBN wheel) Standard specification: Rough :CBC 270 ~ 325 P 75 BW6 Finish: CBC400 ~ 1000 P 75 BW6		 CX Wheel (Conventional grinding wheel) Standard specification: CXY 80 M 8 V104		 Steel Meister (Diamond/CBN wheel) Standard specification: CB 200 ~ 400 N 80 MSM38		 Besler Wheel (Diamond/CBN wheel) Standard specification: CBC 230 P 100 BX341		 Besler Wheel (Diamond/CBN wheel) Standard specification: CBC 200 ~ 600 P 100 BX331		 Besler Wheel (Diamond/CBN wheel) Standard specification: CBC 400 ~ 600 P 100 BX341		
 CX Wheel (Conventional grinding wheel) Standard specification: CXY 80 M 8 V104				 CX Wheel (Conventional grinding wheel) Standard specification: CXY 100 R 10 B1699				 SA Wheel (Conventional grinding wheel) Standard specification: SA 60 ~ 100 K 7 V35		 SA Wheel (Conventional grinding wheel) Standard specification: SA 60 J 8 V35		
Noritake Cool SEC-X(K) (Water base coolant)		Noritake Cool SEC-Z (Water base coolant)		Noritake Cool SEC-Z (Water base coolant)		Noritake Cool SEC-X(K) (Water base coolant)		Noritake Cool SEC-X(K) (Water base coolant)		Noritake Cool SEC-X(K) (Water base coolant)		
												
Magnetic Separator MDKZ type		Drum-type paper filter NDPF type		Magnetic Separator MDKZ type		Centrifugal NCX type		Magnetic Separator MDKZ type		Drum-type paper filter NDPF type		

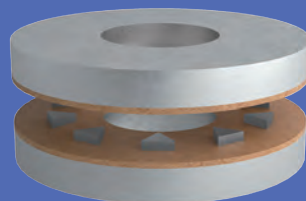
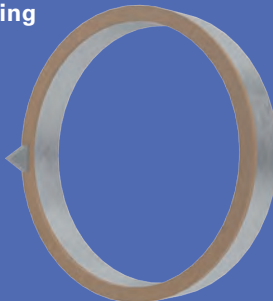
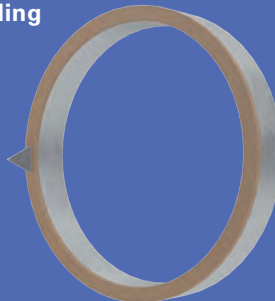
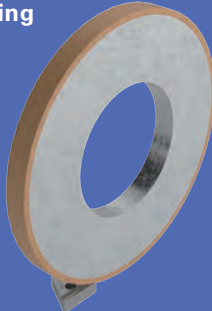
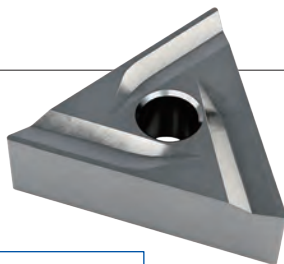

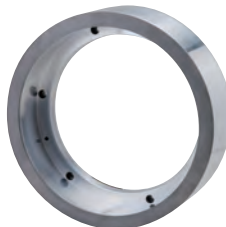
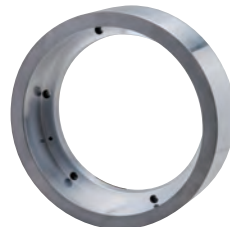

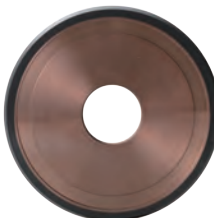








» Issues and Proposal for Improvement of Cutting Tool Manufacturing Process

Endmill(Carbide)																
<div>SinteringPeripheral grindingStep grindingFlute grindingPeripheral cutting edge grindingGash grindingEnd cutting edge grindingComplete</div>																
Process	<div>Peripheral grinding</div> <div></div> <div>Centerless grindingCylindrical grinding</div>		<div>Step grinding</div> <div></div> <div>Cylindrical grinding (Plunge grinding)Cylindrical grinding (Traverse grinding)</div>		<div>Flute grinding</div> <div></div> <div>Flute grinding</div>		<div>Peripheral cutting edge grinding</div> <div></div> <div>Peripheral cutting edge grinding</div>		<div>Gash grinding</div> <div></div> <div>Gash grinding</div>		<div>End cutting edge grinding</div> <div></div> <div>End cutting edge grinding</div>		Process			
	Due to the difference in stock removal at the entrance and exit, the wheel wears unevenly		The workpiece can bend easily due to the supports at either end		The wheel tends to lose its shape		Large depth of cut		Large depth of cut and high grinding force		The wheel tends to lose shape		The wheel tends to lose shape		Requires a smoother surface finish	
Variation in workpiece accuracy		Difficult to ensure workpiece straightness		Finding a balance between holding wheel shape and maintaining easy dressability		Traverse marks, grinding burn and loss of wheel shape		Loss of wheel shape and grinding burn		Decrease in grinding efficiency		Decrease in grinding efficiency		Achieving both the desired cutting ability and workpiece quality		Issues
Proposal		Proposal		Proposal		Proposal		Proposal		Proposal		Proposal		Proposal		
Grinding wheel	<div></div> <div>BEL Series (Diamond/CBN wheel for electrical discharge dressing) Standard specification: Rough :SDC 125 ~ 325 S-BEL5 Finish: SDC 400 ~ 1000 S-BEL5</div> <div></div> <div>BWC Wheel (Diamond/CBN wheel) Standard specification: Rough :SDC 140 ~ 700 N 75 BWC Finish: SDC 800 ~ 1000 P-BWCF</div>		<div></div> <div>Besler Wheel (Diamond/CBN wheel) Standard specification: SDC 230 P 100 BX341</div> <div></div> <div>Rough : M60 Series (Diamond/CBN wheel) Standard specification: SD 200 N 120 M60</div> <div>Finish: BT Series (Diamond/CBN wheel) Standard specification: SDC 600 ~ 800 J 100 BT50</div>		<div></div> <div>MDL Wheel (Diamond/CBN wheel) Standard specification: SD 140 ~ 400 L 60 MDL36</div>		<div></div> <div>Besler Wheel (Diamond/CBN wheel) Standard specification: SDC 400 ~ 600 P 100 BX341</div>		<div></div> <div>MDL Wheel (Diamond/CBN wheel) Standard specification: SD 325 N 100 MDL32</div>		<div></div> <div>Besler Wheel (Diamond/CBN wheel) Standard specification: SDC 400 ~ 600 P 100 BX341</div>		Grinding wheel			
	Noritake Cool N-60TCS (Water base coolant)		Noritake Cool N-60TCS (Water base coolant)		Noritake Cool N-60TCS (Water base coolant)		Noritake Cool N-60TCS (Water base coolant)		Noritake Cool N-60TCS (Water base coolant)		Noritake Cool N-60TCS (Water base coolant)		Coolant			
												Filtration equipment				
Centrifugal NCX type		Centrifugal NCX type		Centrifugal NCX type		Centrifugal NCX type		Centrifugal NCX type		Centrifugal NCX type						



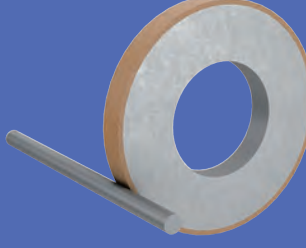
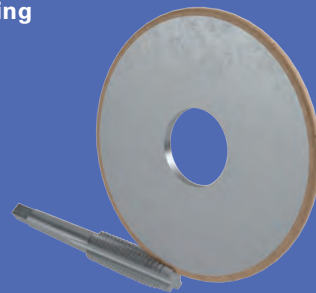
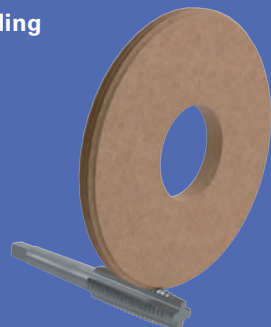
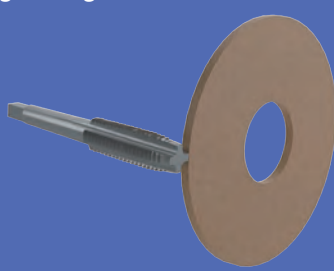
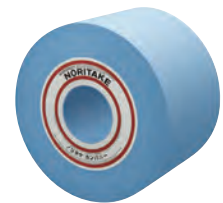
















» Issues and Proposal for Improvement of Cutting Tool Manufacturing Process

Endmill (High speed steel)												
Heat treatment		Peripheral grinding		Flute grinding		Peripheral cutting edge grinding		Gash grinding		End cutting edge grinding		Complete
												
Centerless grinding		Cylindrical grinding										
Due to the difference in stock removal at the entrance and exit, the wheel wears unevenly		The workpiece can bend easily due to the supports at either end		Large depth of cut and high grinding force		The wheel tends to lose shape		The wheel tends to lose shape		Requires a smoother surface finish		
Variation in workpiece accuracy		Difficult to ensure workpiece straightness		Loss of wheel shape and grinding burn		Decrease in grinding efficiency		Decrease in grinding efficiency		Achieving both the desired cutting ability and workpiece quality		
Proposal		Proposal		Proposal		Proposal		Proposal		Proposal		
				 								
BW6 Series (Diamond/CBN wheel) Standard specification: Rough :CBC 270 ~ 325 P 75 BW6 Finish: CBC400 ~ 1000 P 75 BW6		CX Wheel (Conventional grinding wheel) Standard specification: CXY 80 M 8 V104		Steel Meister (Diamond/CBN wheel) Standard specification: CB 200 ~ 400 N 80 MSM38 GA/SN Wheel (Conventional grinding wheel) Standard specification: GA/SN 100 S 10 BX09		Besler Wheel (Diamond/CBN wheel) Standard specification: CBC 400 ~ 600 P 100 BX341		Steel Meister (Diamond/CBN wheel) Standard specification: CB 200~600 P 100 MSM31		Besler Wheel (Diamond/CBN wheel) Standard specification: CBC 400 ~ 600 P 100 BX341		
Noritake Cool SEC-X(K) (Water base coolant)				Noritake Cool SEC-Z (Water base coolant) 		Noritake Cool SEC-X(K) (Water base coolant) 		Noritake Cool SEC-X(K) (Water base coolant) 		Noritake Cool SEC-X(K) (Water base coolant) 		
				 		 		 		 		
Magnetic Separator MDKZ type		Drum-type paper filter NDPF type		Magnetic Separator MDKZ type Centrifugal NCX type		Magnetic Separator MDKZ type Drum-type paper filter NDPF type		Magnetic Separator MDKZ type Drum-type paper filter NDPF type		Magnetic Separator MDKZ type Drum-type paper filter NDPF type		

» Issues and Proposal for Improvement of Cutting Tool Manufacturing Process

Insert (Carbide / Cermet)										
Sintering		Upper and lower surface grinding		Peripheral grinding		Chamfer surface grinding		Chip breaker grinding		Complete
										
Cutting ability affects processing time due to constant pressure grinding		Requires surface grinding and radius grinding		The wheel tends to lose shape		The wheel tends to lose shape				
Persistence of cutting ability		Finding a balance between cutting ability and wheel shape retention		Decrease in grinding efficiency		Decrease in grinding efficiency				
Proposal		Proposal		Proposal		Proposal				
										
Flat King (Diamond/CBN wheel) Standard specification: SDC 400 P 40 BFK1		MDL Wheel (Diamond/CBN wheel) Standard specification: SD 400 ~ 600 K 75 MDL32		BT Series (Diamond/CBN wheel) Standard specification: SDC 400 ~ 800 L 60 BT50		BT Series (Diamond/CBN wheel) Standard specification: SDC 400 ~ 600 N 100 BT50		MDL Wheel (Diamond/CBN wheel) Standard specification: SD 800 ~ 1000 L 80 MDL32		
										
										
Centrifugal NCX type		Centrifugal NCX type		Centrifugal NCX type		Centrifugal NCX type				

» Issues and Proposal for Improvement of Cutting Tool Manufacturing Process

Tap (High speed steel)										
Heat treatmentPeripheral grindingFlute grindingThread grindingChamfer grindingComplete										
Process	Peripheral grinding		Flute grinding		Thread grinding		Chamfer grinding			
	 									
	Centerless grindingCylindrical grinding									
	High grinding forceThe workpiece can bend easily due to the supports at either end		Large stock removal and high grinding efficiency		Uses a profiled wheel to shape the thread's root		Clogging or glazing occur easily on the grinding wheel surface			
Issues		Issues		Issues		Issues		Issues		
Finding a balance between cutting ability and wheel shape retention		Difficult to ensure workpiece straightness		Grinding burn and loss of wheel shape		Grinding burn and loss of wheel shape		Chatter		
Proposal		Proposal		Proposal		Proposal		Proposal		
Grinding wheel	 CX Wheel (Conventional grinding wheel) Standard specification: CXY 80 M 8 V104		 BW4 Series (Diamond/CBN wheel) Standard specification: CBC 120 N 75 BW4		 For large tap diameter Besler Wheel (Diamond/CBN wheel) Standard specification: CBC 120 R 100 BX341		 WA Wheel (Conventional grinding wheel) Standard specifications: WA 600 O 11 VT (Pitch ~ 0.5) WA 400 L 8 V33 (Pitch 0.5) WA 320 K 8 V33 (Pitch 0.75 to 1) WA 220 J 7 V35 (Pitch 1.25 to 2) WA 120 J 7 V35 (Pitch 2.5 to 6) WA 80 J 7 V35 (Pitch 6 ~)		 SN Wheel (Conventional grinding wheel) Standard specification: SN 120 M 7 V53	
					 For straight flute Standard specifications: SN 80 J 8 V55 CXZ 80 J 8 V104		 For spiral flute Standard specification: SN 100 S 10 BX09 Specifications for durability: SN 100 Z 10 BMK3			
Coolant		Noritake-cut EPS-6X (Oil base coolant) 		Noritake-cut EPS-6X (Oil base coolant) 		Noritake-cut EPS-6X (Oil base coolant) 		Noritake-cut EPS-6X (Oil base coolant) 		
Filtration equipment	 Magnetic Separator MDKZ type		 Centrifugal NCX type		 Magnetic Separator MDKZ type		 Centrifugal NCX type		 Magnetic Separator MDKZ type	
									 Centrifugal NCX type	



NORITAKE CO., LIMITED

Grinding wheel, Dresser, Coolant

☐ Domestic Sales Locations

■ INDUSTRIAL PRODUCTS GROUP SALES DIVISION

3-1-36 Noritake-Shinmachi, Nishi-Ku, Nagoya 451-8501 Japan
Tel +81-52-561-9833

■ EASTERN JAPAN BRANCH

Wellston 1 Building 6th floor, 87-1 Kawakamicho,
Totsuka-ku, Yokohama, Kanagawa 224-0805 Japan
Tel +81-45-330-3413

■ CENTRAL JAPAN BRANCH

3-1-36 Noritake-Shinmachi, Nishi-Ku, Nagoya 451-8501 Japan
Tel +81-52-561-7226

☐ Global Manufacturing and Sales Locations

■ NORITAKE U.S.A., INC.

Cincinnati Branch

4990 Alliance Dr., Mason, OH 45040, U.S.A.
Tel +1-513-234-0770

Atlanta Branch

490 Sun Valley Dr., Suite#102
Roswell, GA 30076, U.S.A.
Tel +1-770-518-8233

■ NORITAKE EUROPA GmbH.

Kurhessenstrasse 3, D-64546
Mörfelden-Walldorf, Germany
Tel +49-61-05-2092-44

■ NORITAKE SHANGHAI TRADING CO., LTD.

Shanghai Headquarter

Room 701 Aetna Tower No.107, Zun Yi Road,
Chang Ning District, Shanghai, 200051, China
Tel +86-21-6237-5667

Guangzhou Branch

2510 Goldlion Digital Network Center, 138
Tiyu Road East, Guangzhou 510620, China
Tel +86-20-3877-2253

Dalian Branch

22K, International Finance Building,
No.15 Renmin Road Zhongshan
Dist Dalian 116001, China
Tel +86-411-825-06065

■ NORITAKE SA (THAILAND) CO., LTD.

Bangkok Office

388 Amigo Tower, 17th Floor, Zone A/1, Siphaya Road,
Mahapruetaram, Bangrak, Bangkok, 10500, Thailand
Tel +66-2-235-1688

Filtration

■ NORITAKE CO., LIMITED Fluid Technology Dept.

Filtration System Section

3-1-36 Noritake-Shinmachi, Nishi-Ku, Nagoya 451-8501 Japan
Tel +81-52-561-4268

Website ►



Contact us ►



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