Dicing Blade Technical Seminar

Dicing Blade Seminar

Headquarters, Factories & Global Offices
Regional Support Structure
Field Support Structure

Dicing Blade Seminar

- **History:**
  - 4” versus 2” technology
  - Separating techniques
- **Marketing profile & Market segmentation**
- **Manufacturing techniques:**
  - Nickel Bond
  - Steel core - Nickel
  - Resin Bond
  - Metal Sintered
  - Diamond selection
- **Blade characteristics:**
  - Advantages & disadvantages of the different blade binders & blade geometry's
- **Dressing:**
  - Principles
  - Dressing techniques

Cont.

Process techniques & Parameters:

- Application Characteristics
- Cutting mode
- Clamping methods
- Cooling
- High cooling flange
- Cutting through heavy substrates
- Cutting through into tapes
- Recommended exposure left

Major applications - Material dicing guide:

- Recommended Spindle speed
- Dicing green ceramic

Special applications:

Optimizing the cutting process:

Trouble shooting:

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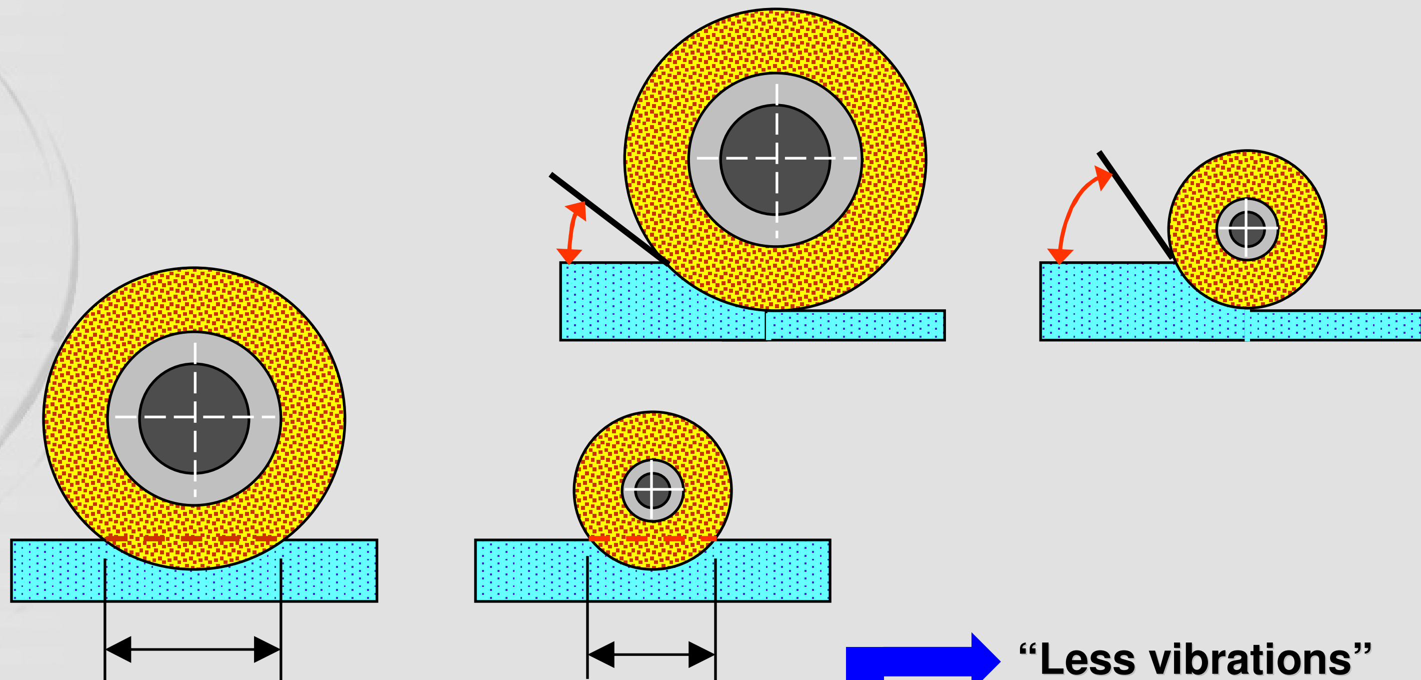
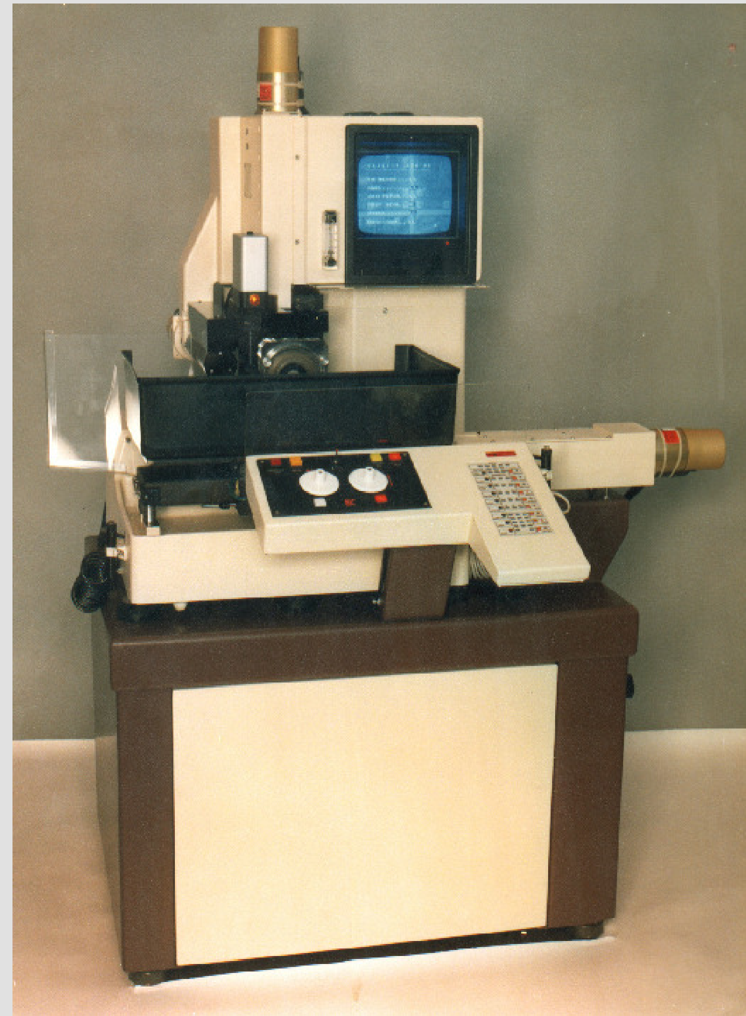
4" Diameter Versus 2" Diameter

- More edge surface → Longer life { Less blade wear }
- { More diamonds }
- Shallower angle of attack → Less material damage



Dicing Blade Seminar

K&S - 775



Dicing Blade Seminar

K&S - 780

K&S - 980

Dicing Blade Seminar

ADT - 7100

Dicing Blade Seminar

ADT 7500 & 7300

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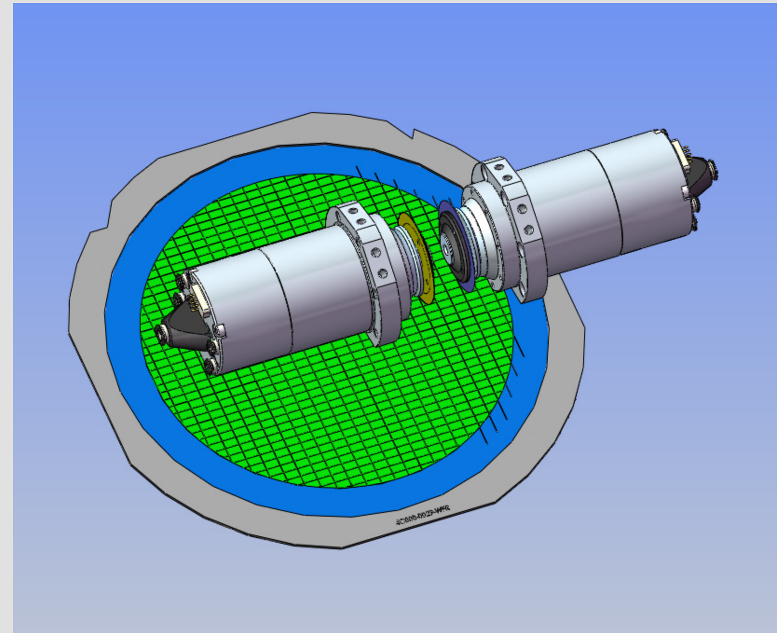
Dicing Blade Seminar

ADT - 7200

Dicing Blade Seminar

ADT - 7900



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Peripheral Products

- 966 - Wafer Mounting Stations
- 955 - UV Curing Systems
- 977 - Wafer Cleaning Stations
- 937 - Re Circulating Spindle Water Chiller
- 921 - Closed Loop Filtration System
- 947 - C02 In-Line injector
- Film Frames and Film Frame Cassettes

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Peripheral Products

Water Control Circulation
Model 921

UV Tape Curing
Model 955

Mounting- Model 966

Spindle Chiller
Model 935

4.789m

6.613m

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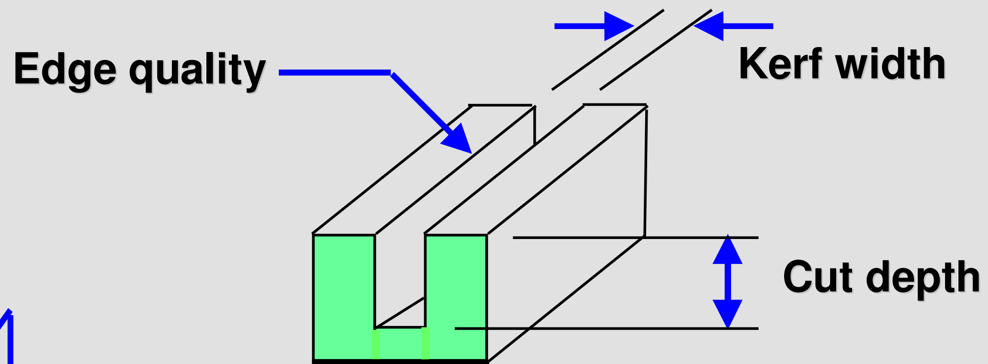
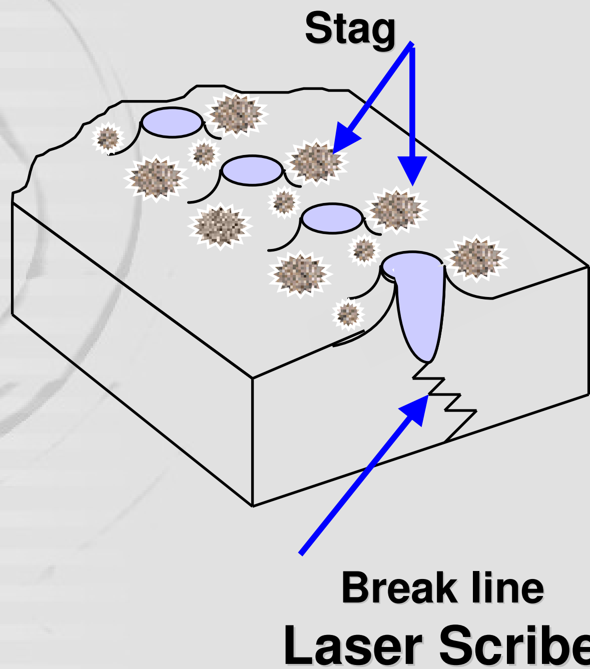
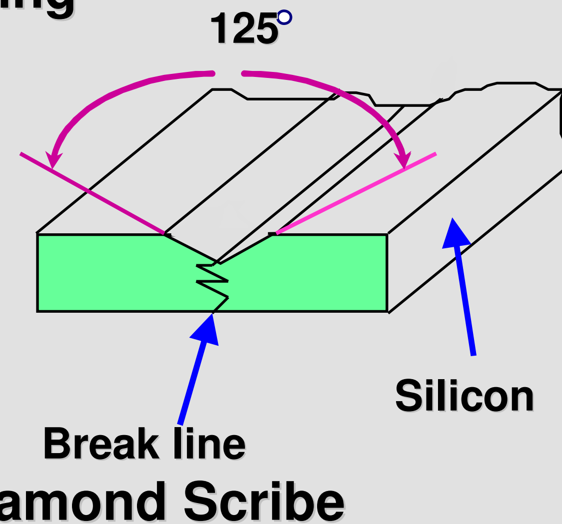
Separating Techniques







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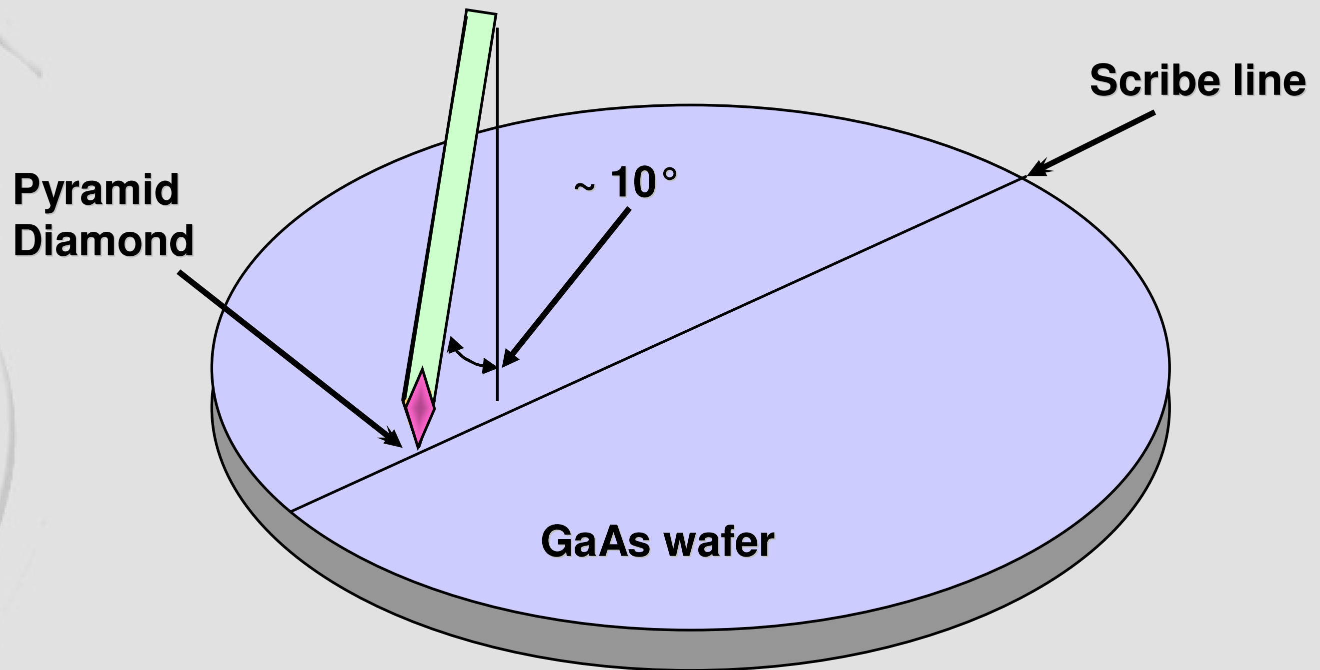
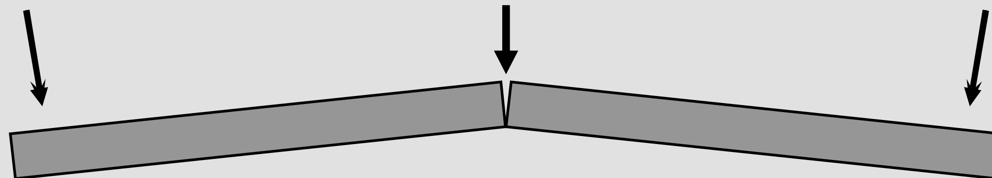
Diamond Scribing process





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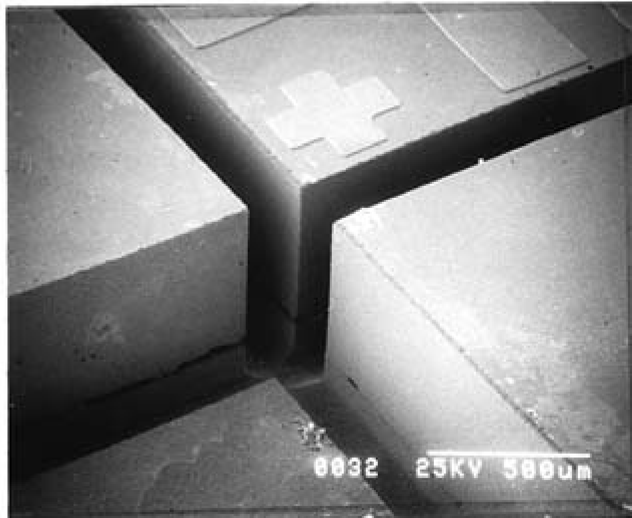
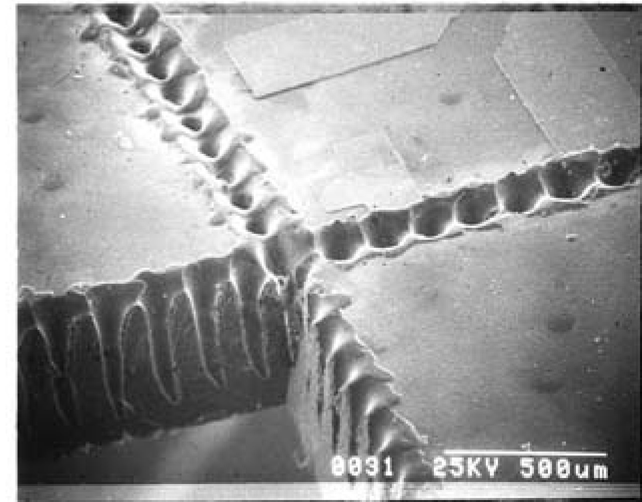
Separating Techniques



HARD AL. SUBSTRATE DICED
WITH A DIAMOND RESINOID BLADE
ON THE K+S 784 SAW.



HARD AL. SUBSTRATE SCRIBED
WITH A LASER BEAM.

Marketing Profile & Market Segmentation

Market Profile

Instrumentation
Optoelectronics & Optics
Sensors & Transducers

Data Processing
Magnetic Heads

Precision Dicing Systems

Electronics
Active Devices
Passive devices
Packaging

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Market Segmentation

Market	Instrumentation		Electronics			Data Processing
Market Segmentation	*Sensors & Transducers*	*Optoelectronics & Optics*	*Passive Devices*	*Packaging*	*Active Devices*	*Magnetic Heads*
Devices & Applications	• Ultrasound • Electro medicine • Measurement Instruments • Aerospace • Automotive • Solar Cells	• Photo Detectors • Lasers • LED / VLED • Fiber Optic Couplers & Transceivers • Display Panels (LCD, Flat Panels) • Facsimile Scan / Print Heads • Optical Components	• Resistors • Capacitors • Oscillators • Signal Fillers • Communication & Microwave • Thin Film Print Heads	• PCB • PPGA • Chip Carriers • IC Packaging • Hybrid Substrate	• IC's • Transistors • Diodes • Discrete Devices • Power Devices	• Thin Film (disk) •Thick Film (disk) • Tape R/W Heads
Materials	• Piezoelectric • Silicon on sapphire (SOS) • Calcium Tungsten	• Quartz • Germanium • GaAs, Silicon • Sapphire • Glass • Beryllium • Fiber Optic	• Green & Fired Ceramic • Alumina • Quartz • Lithium Niobate • Plastic • Glass	• Green & Fired Ceramic • Alumina • Glass • Fiberglass • Plastic	• Silicon • Gallium Arsenide • Gallium Phosphate • Germanium	• Titanium Carbide (TIC) • Ferrite • Alumina (TIC)
Market & Process Highlights	• Medium Volume • High Quality • High Accuracy • Broad Range of Thickness • Small to Medium Area (<6"X6") • Thin Walls (minimum vibration) • Costly Materials	• Medium/High Volume • High Quality • High Yield • High Accuracy • Broad Range of Thickness & Hardness • Costly Materials	• Medium / High Volume • High Quality • High Yield • Medium / High Accuracy • Broad Range of Thickness & Hardness	• Medium / High Volume • High Quality • High Yield • Large Substrate Area (14"X14") • Range of Thick. & Hardness	• Medium Volume Die separation • Semi-auto Operation • Pilot Line, R&D • High Quality • High Yield	• Medium / High Volume • High Quality • High Yield • High Accuracy • Thin Walls (Minimum Vibration) • Land Definition & Separation

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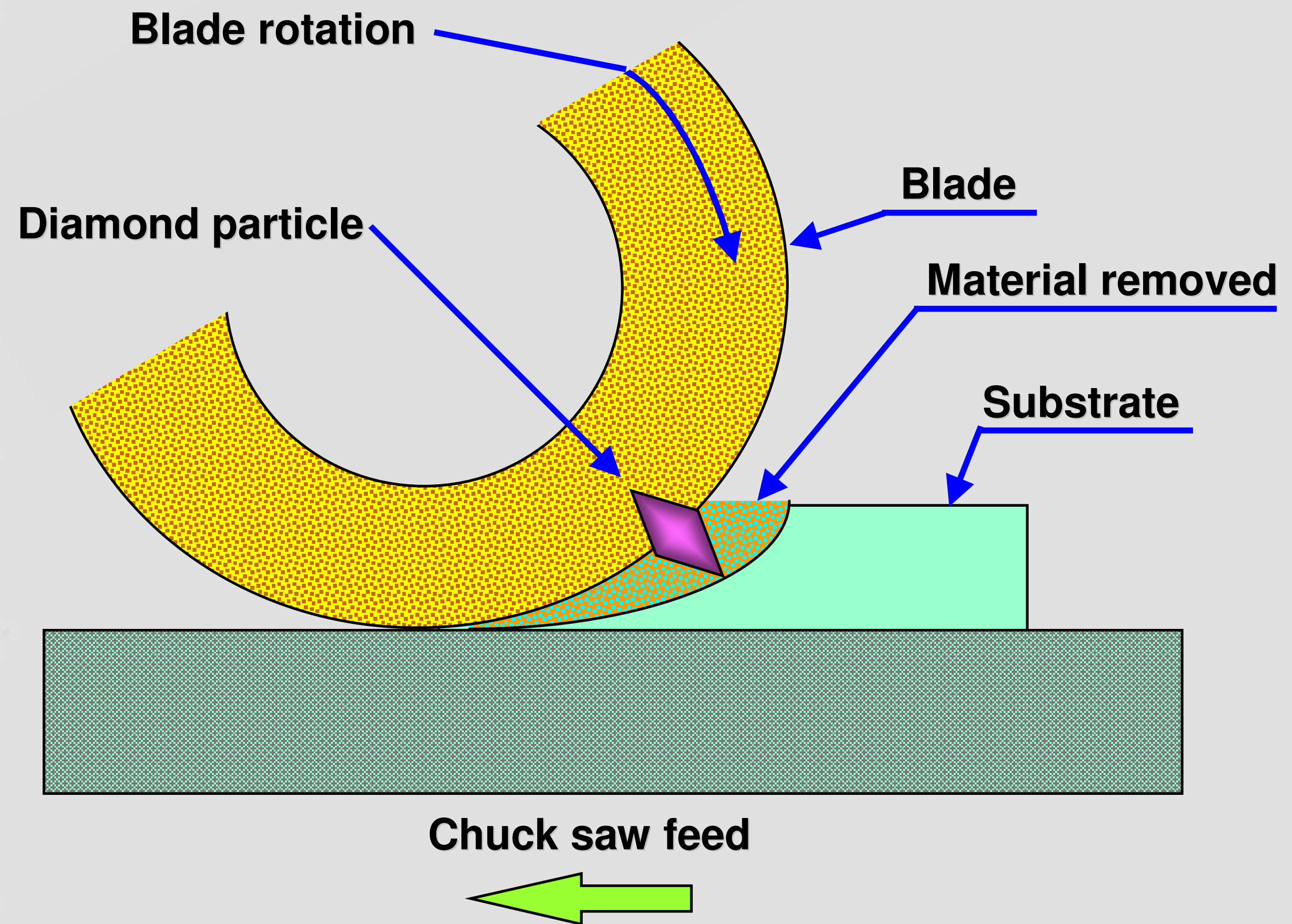
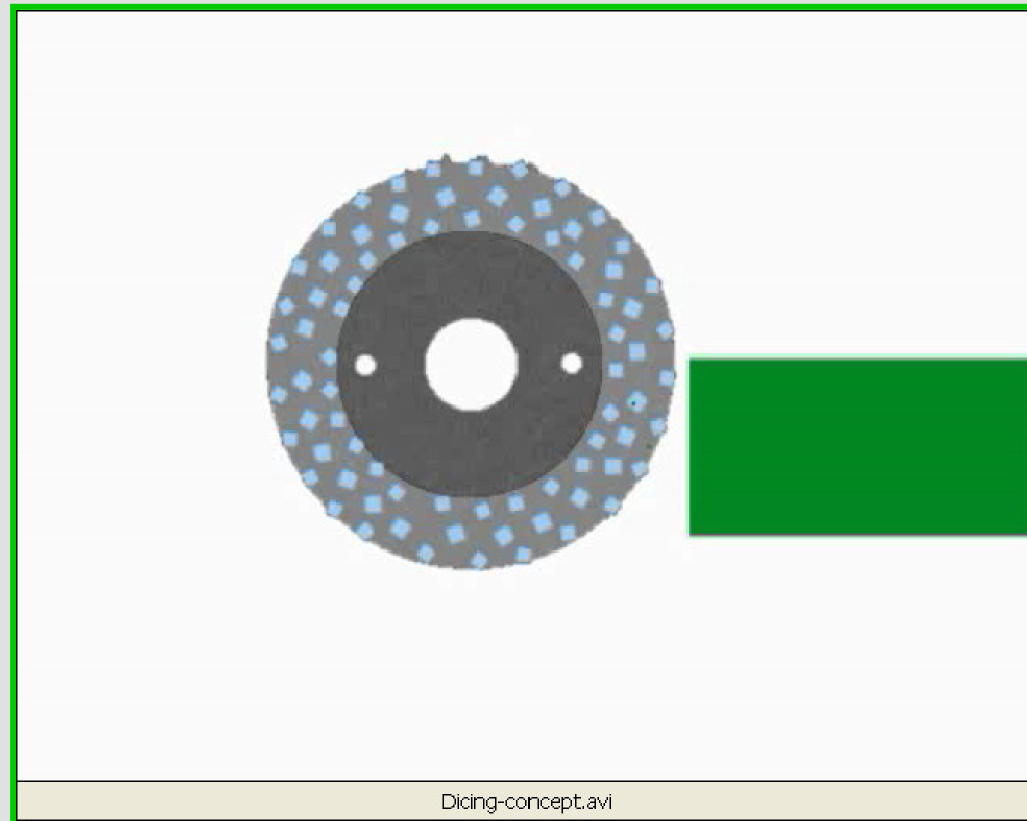
Single Diamond Machining Mechanism



Single Diamond Machining Mechanism



Blade Seminar

Manufacturing Techniques

Blade Characteristics

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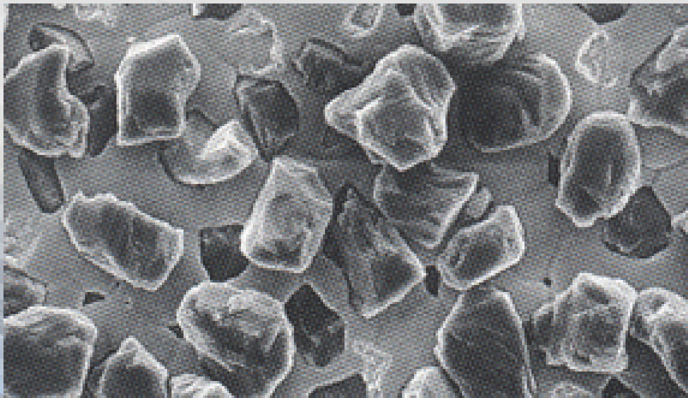
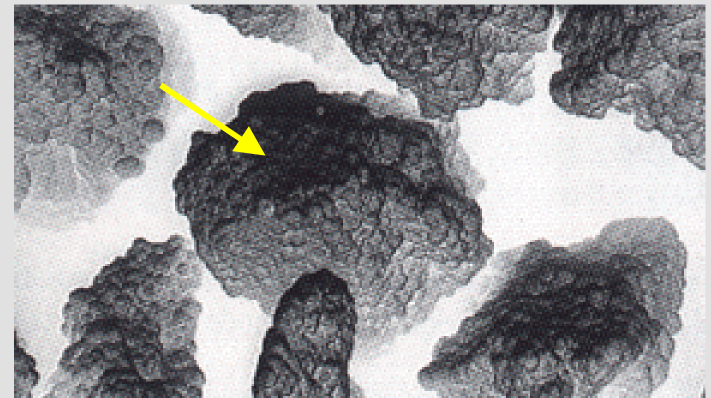
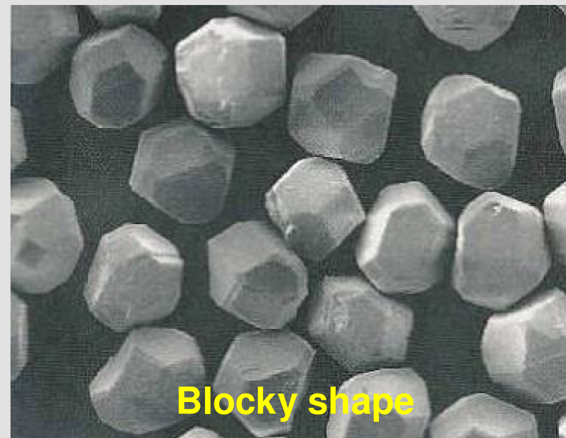
Diamond Selection in blade Manufacturing



Strong, blocky single crystal used in nickel & m. sintered matrices



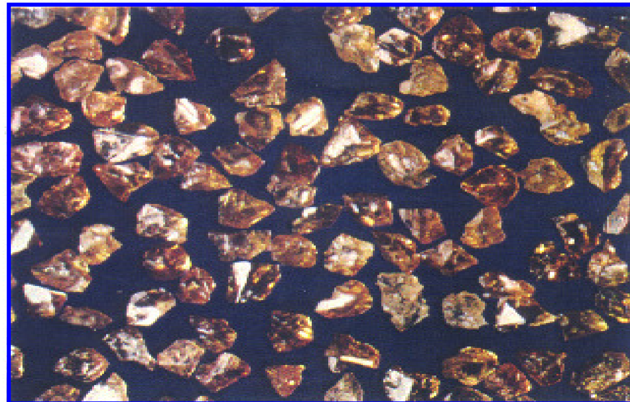
Friable, irregular shape coated with nickel alloy used in resin matrices

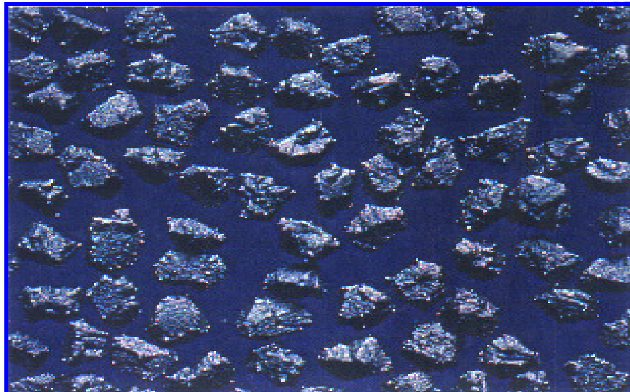


Diamond Selection in blade Manufacturing

CBN - Cubic Boron Nitride (Borozon)

For Grinding and Cutting Ferrous Materials





Standard available Diamonds

Nickel type blades:

2 - 4mic. , 3 - 6mic., 4 - 8mic., 10mic., 17mic., 30mic., 50mic.

Resin type blades:

3mic., 6mic. (3000 mesh), 9mic. (1800 mesh), 15mic. (1200 mesh), 20mic. (1000 mesh), 25mic. (800 mesh), 30mic.(600 mesh), 35mic.(400 mesh), 45mic. (325 mesh), 53mic. (270 mesh) 63mic. (230 mesh), 88mic. (170 mesh), 105mic. (140 mesh)

- For special application going up to 200mic.
- Any new diamond grit can be made

Metal sintered blades:

2- 4mic., 3- 6mic., 4- 8mic., 10mic., 17mic., 20mic., 25mic., 30mic., 45mic., 50mic., 63mic., 70mic., 80mic.,105mic.,

- Any new diamond grit can be made

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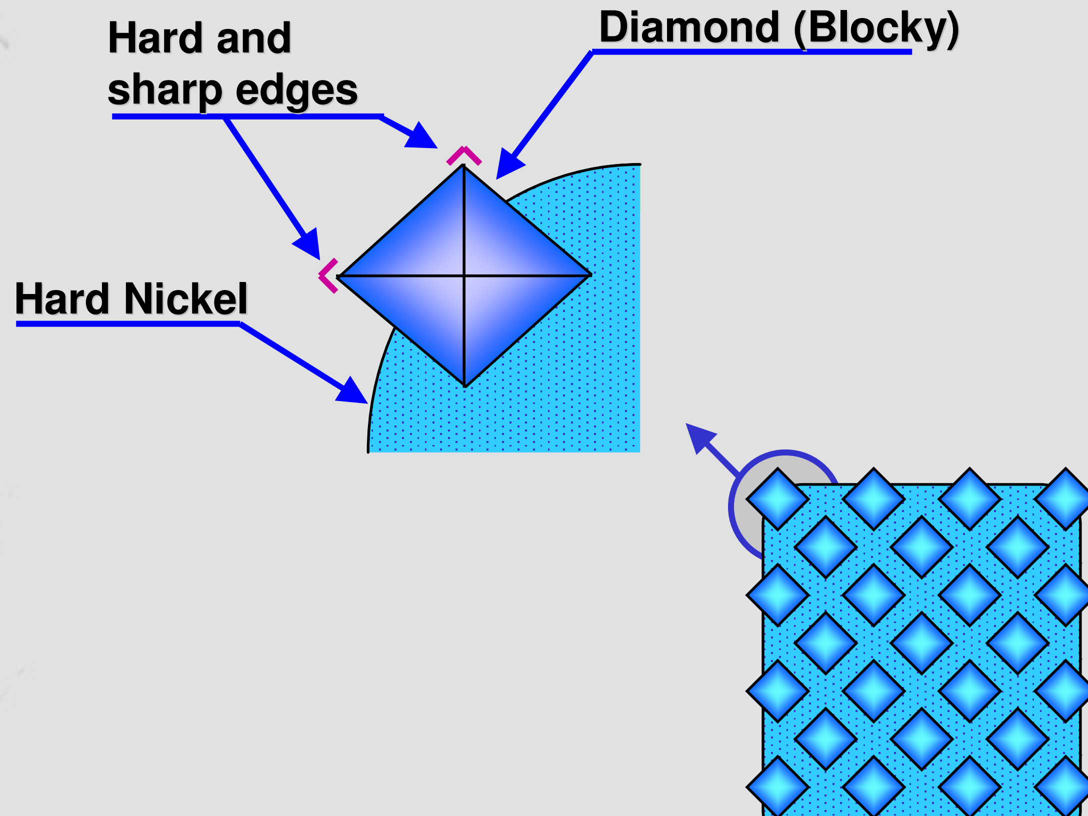
Nickel Bond - Low Wear blade



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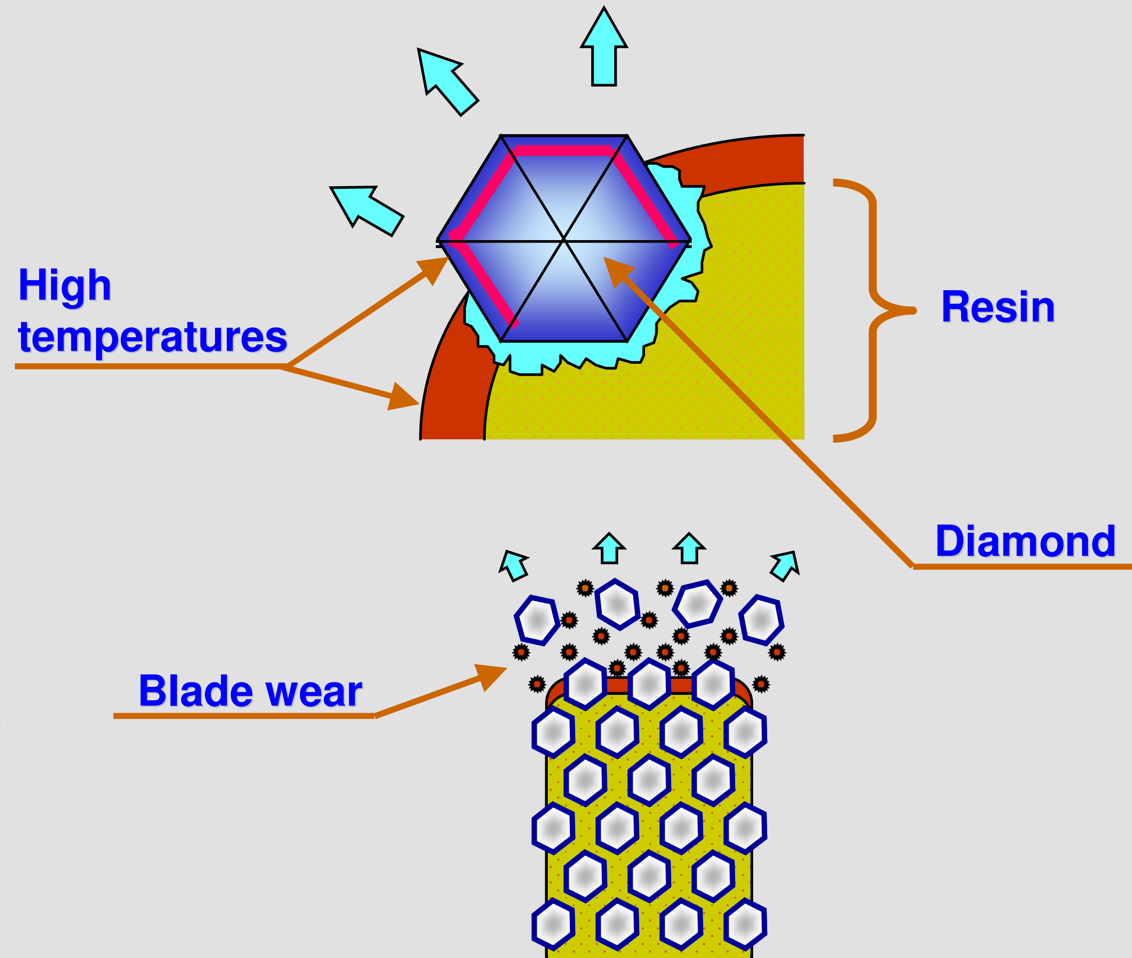
Resin Bond-self re-sharpening and free cutting blade



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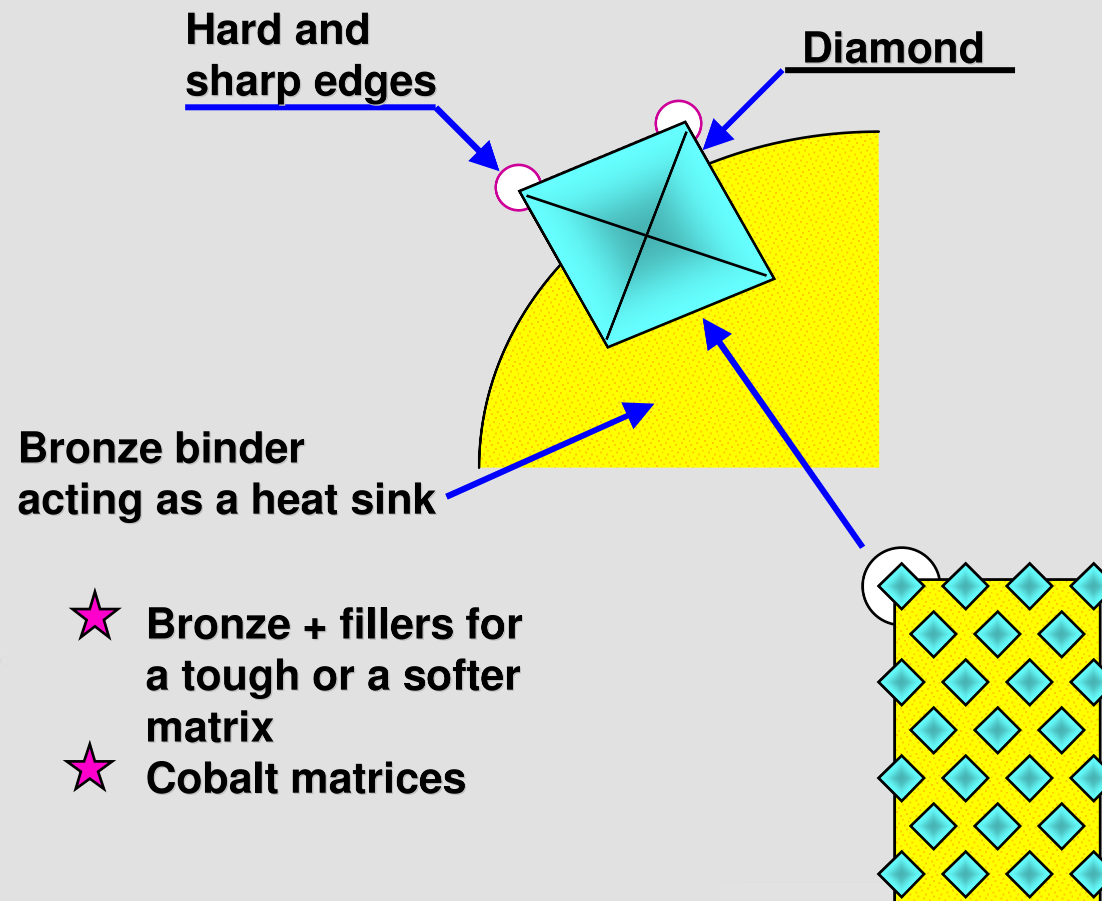
Metal Sintered blades



- Bronze + fillers for a tough or a softer matrix
- Cobalt matrices

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Advantages & Disadvantages of blade Binders

Resin

Advantages:

- Cuts almost any material
- Clean and chip free cuts on hard and brittle materials
- Thick blades up to .100” are available
- No need for long dressing
- A variety of different resin matrixes is available
- Any new diamond grit can be made at low cost

Disadvantages:

- Higher blade wear
- The edge geometry is lost sooner
- Relatively lower R.P.M.
- Minimum thickness is .003” depending on diamond grit

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Advantages & Disadvantages of blade binders

Nickel

Advantages:

- Very low blade wear (Some time it is a disadvantage)
- Maintaining the edge geometry
- Very good on accurate applications (Magnetic heads)
- Very thin blades can be made - .0006” (0.0152mm)

Disadvantages:

- Max thickness .018” - .020” (0.45 - 0.50mm)
  (Can go thicker with Steel Core blades)
- Long dressing procedure
- High cost of new diamond grits (New plating set-up)
- Can not cut very hard and brittle materials (Overloading)
- Side wear on singulation type application due to min. radial wear. (BGA & similar applications)

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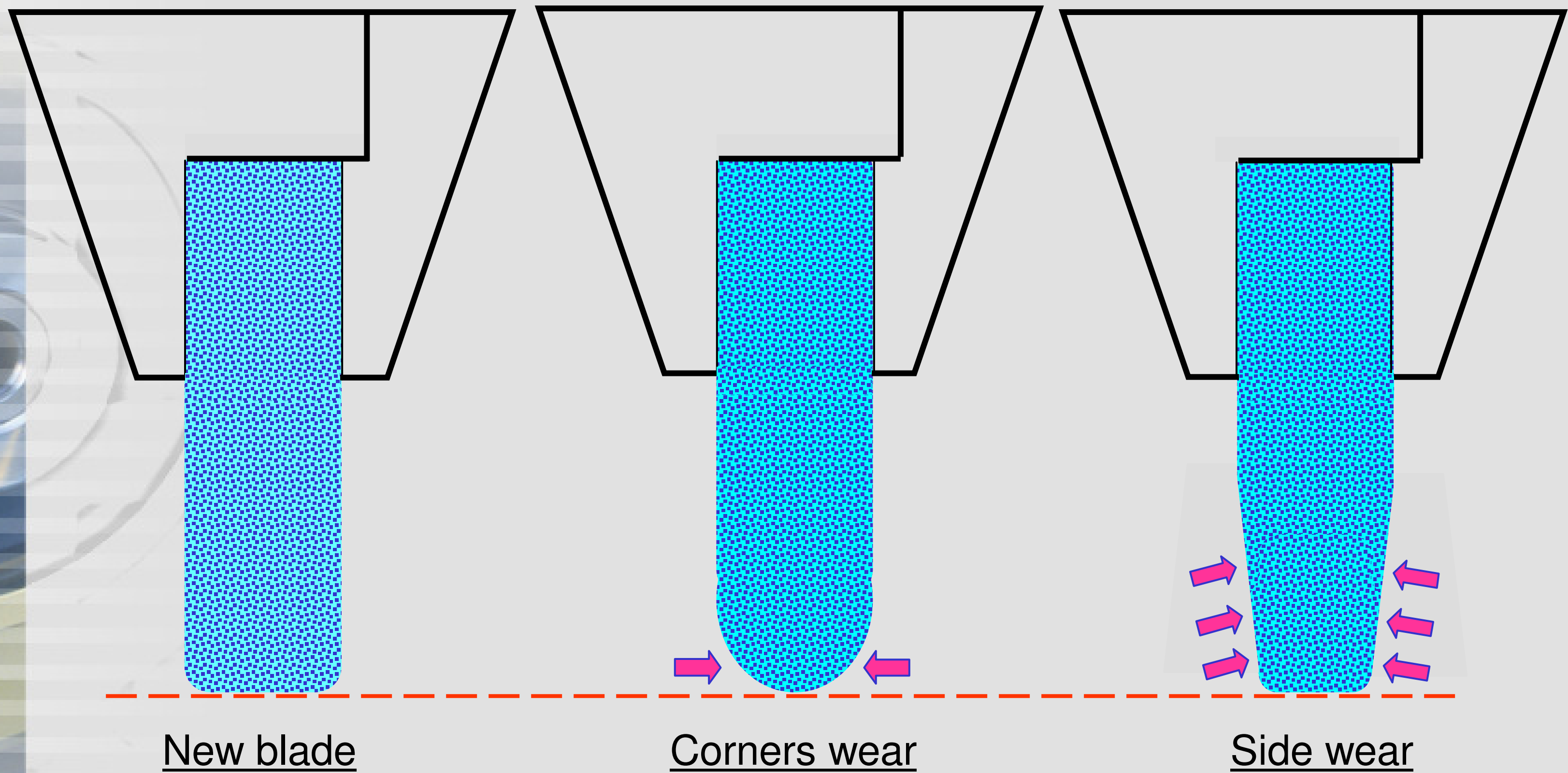
Advantages & Disadvantages of blade binders

Nickel



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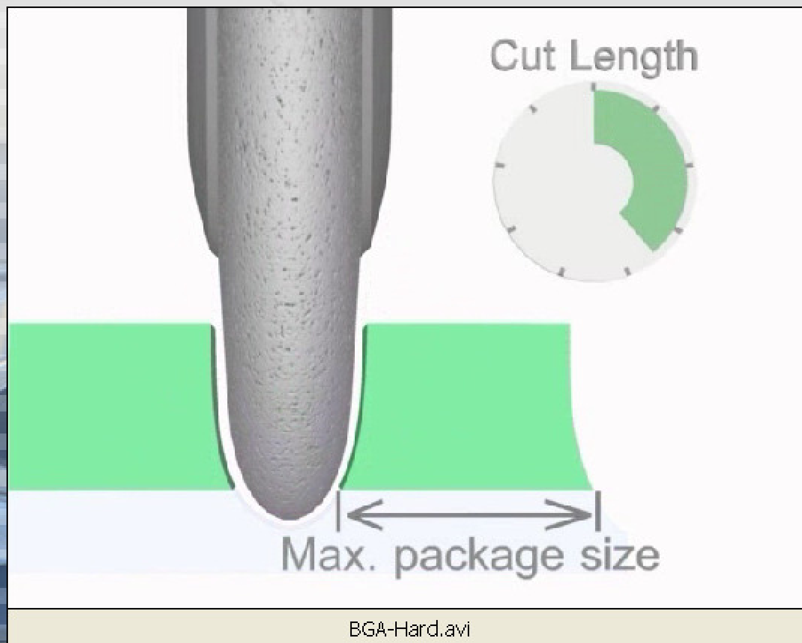
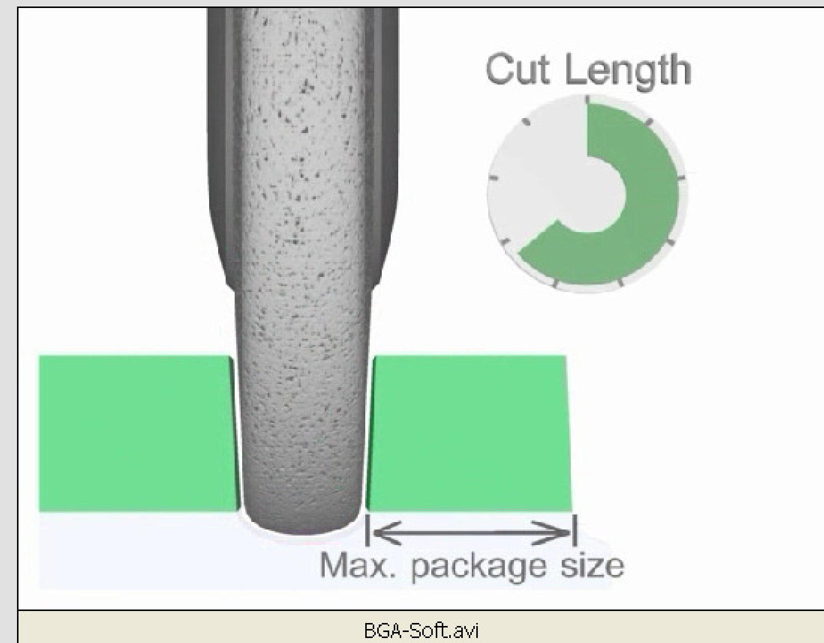
Advantages & Disadvantages of blade binders



Hard bond – shorter life



Soft bond – longer life

Advantages & Disadvantages of blade binders

M. Sintered

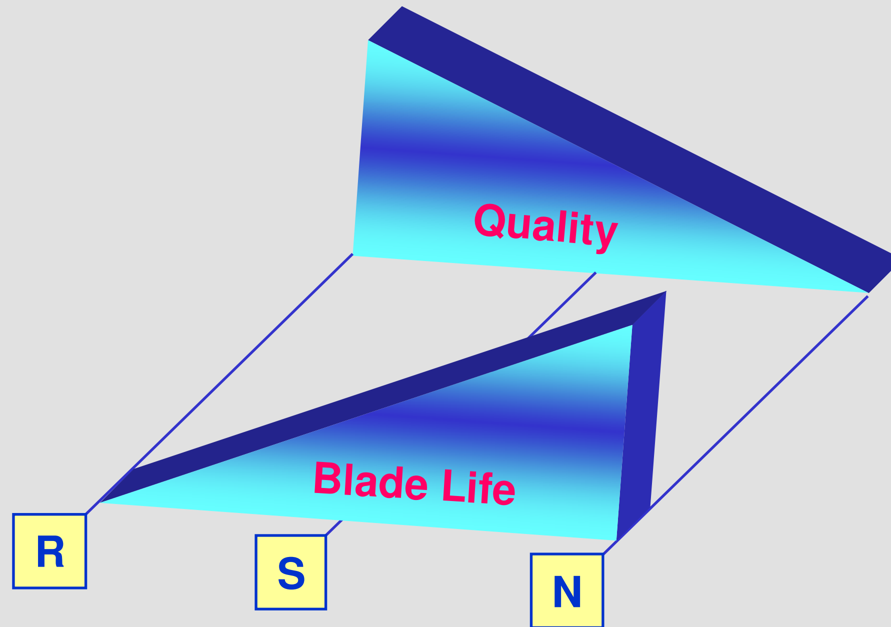
Advantages:

- Lower wear than Resinoid
- Maintaining the edge geometry much longer compare to resin
- Can be lapped to very precise thicknesses
- Very thick blades can be made (Way over .020")
- Stable matrix (Stress free)
- Many different matrices can be made (Softer or harder)
- Any new diamond grit can be made at low cost

Disadvantages:

- Longer dressing compare to Resinoid
- Minimum thickness limitations (New thin product is developed down to 0.030mm)
- Relatively lower R.P.M.

Blade Matrix Characteristics

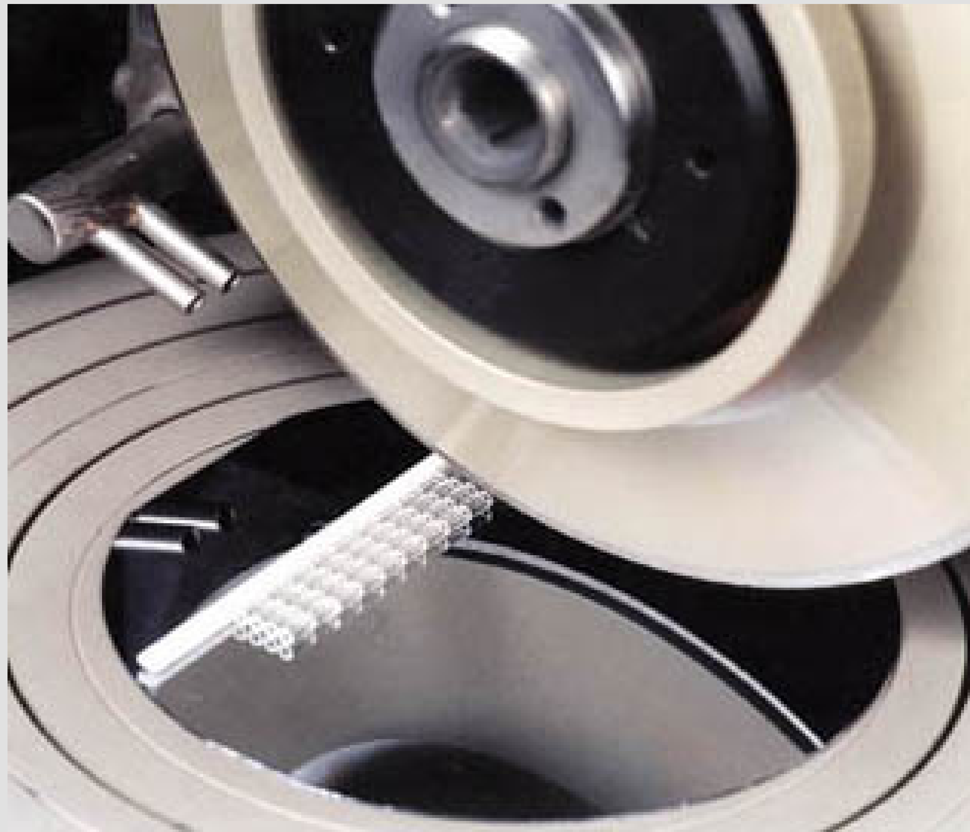


Blade Characteristics

.025" thick Glass Plate diced with Resinoid blade

Blade Characteristics

Glass Tubes diced with resinoid Blade



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Blade Characteristics

.025" thick Hard Al. (99.6%) diced with Resinoid Blade

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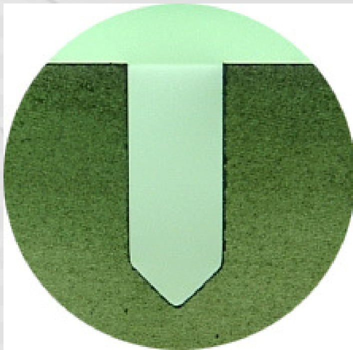
Blade Geometry

Angled cut



Special edge geometry's (By grinding)

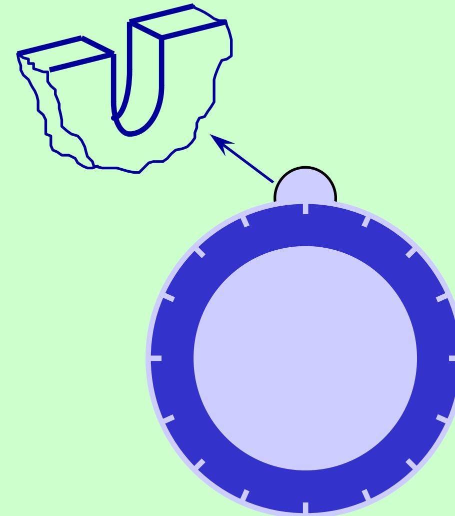
Blade Geometry

Nickel & Metal Sintered

Examples:

4.256" O.D. x 54 Slots
4.600" O.D. x 60 Slots
4.600" O.D. x 16 Slots
4.600" O.D. x 8 Slots

2.188" & 2.250"O.D. x 72 Slots
2.188" & 2.250"O.D. x 16 Slots
2.188" & 2.250"O.D. x 8 Slots
Other O.D. blades x different Slot geometry's are available



Resinoid blades can also be made with Slots

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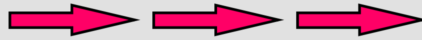
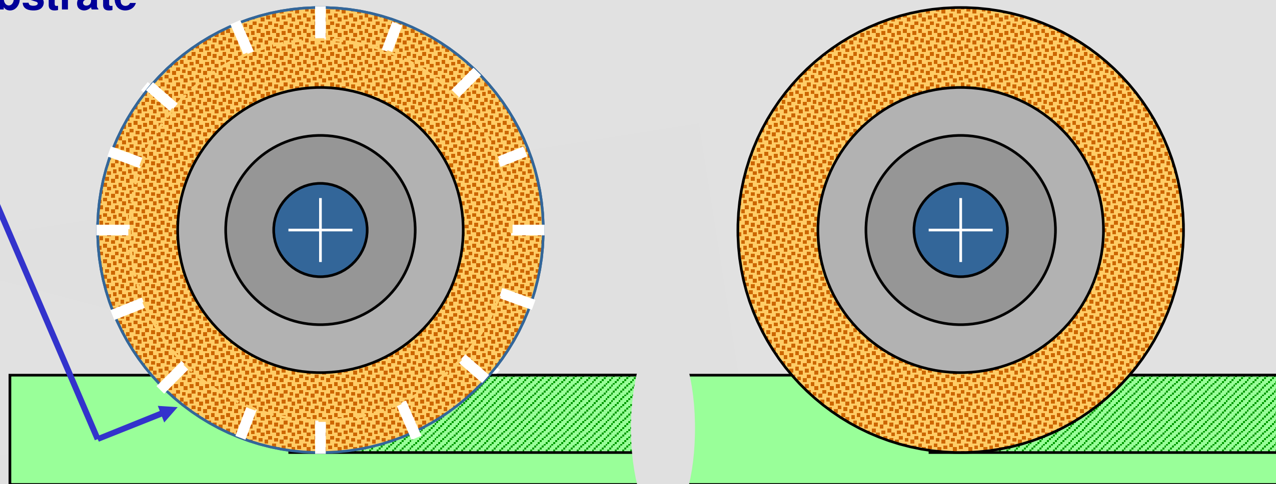
Serrated Blades

Advantages:

★ Less contact between the edge and the substrate

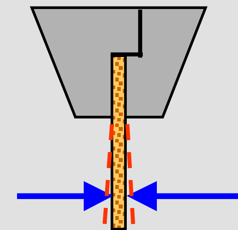


Less load during the dicing



★ Better Coolant

Longer life



★ **Disadvantages:**
Wider kerf

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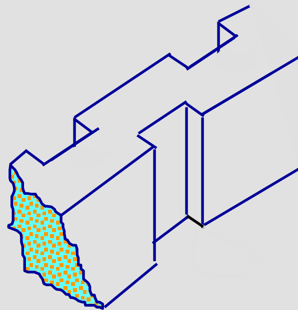
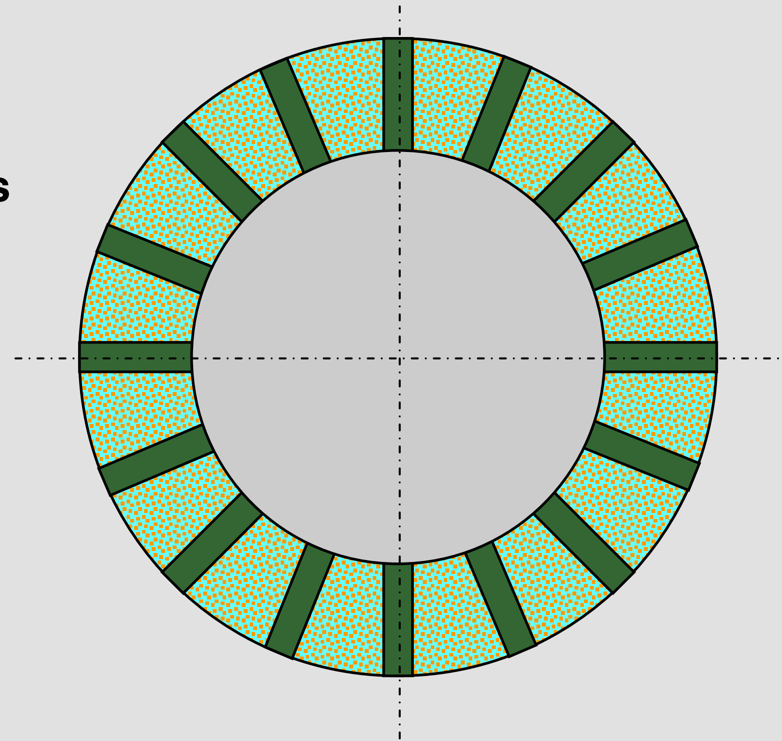
Blade Characteristics

.5” Thick Optical prism diced with a Resinoid Blade

Special Grooved Blade - SPG

- Minimizes load and blade wear during the dicing process
- Min. thickness .012”
- Can be used with a high cooling flange set or with standard flanges





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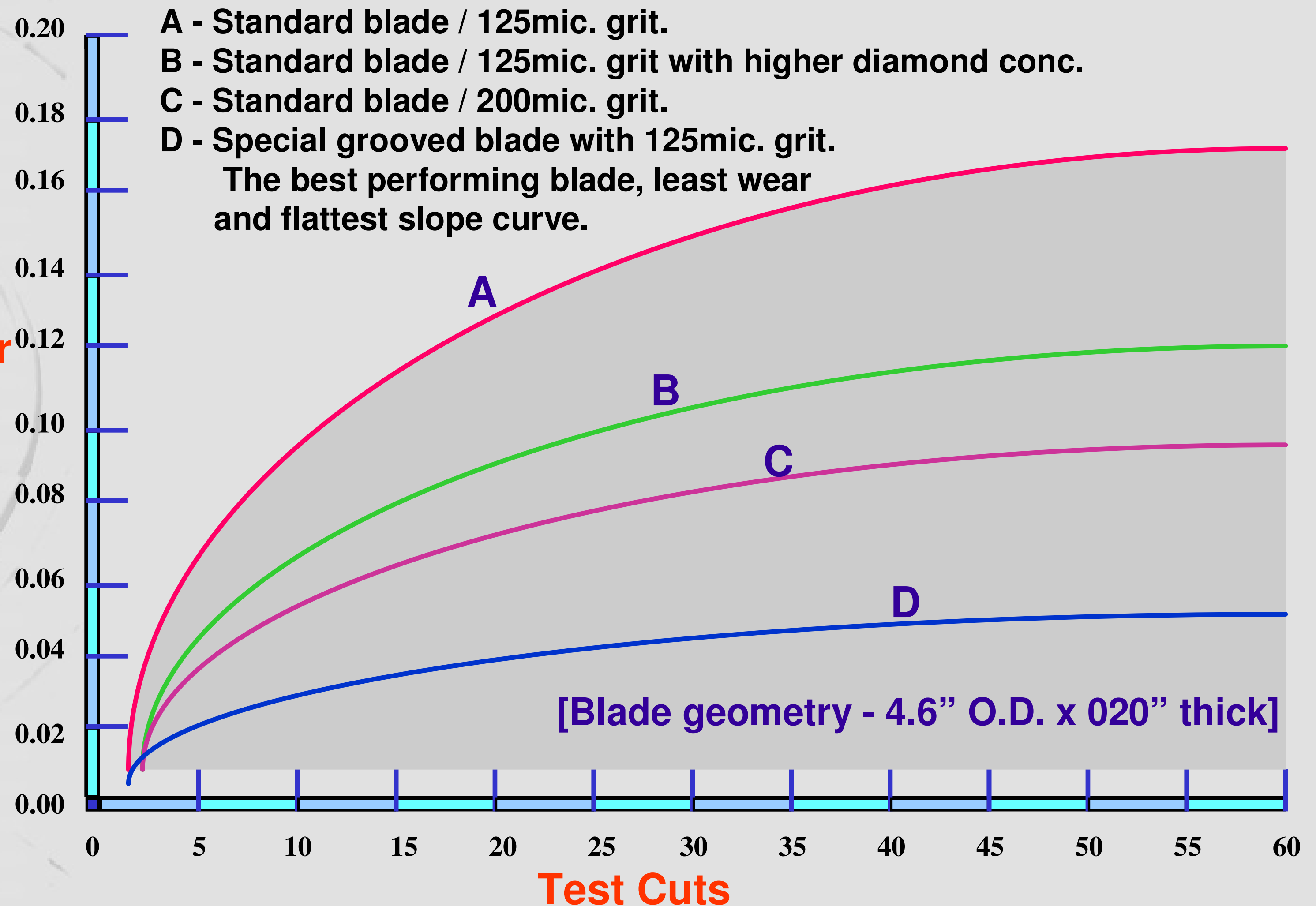
Wear Comparison Between Standard & SPG blades



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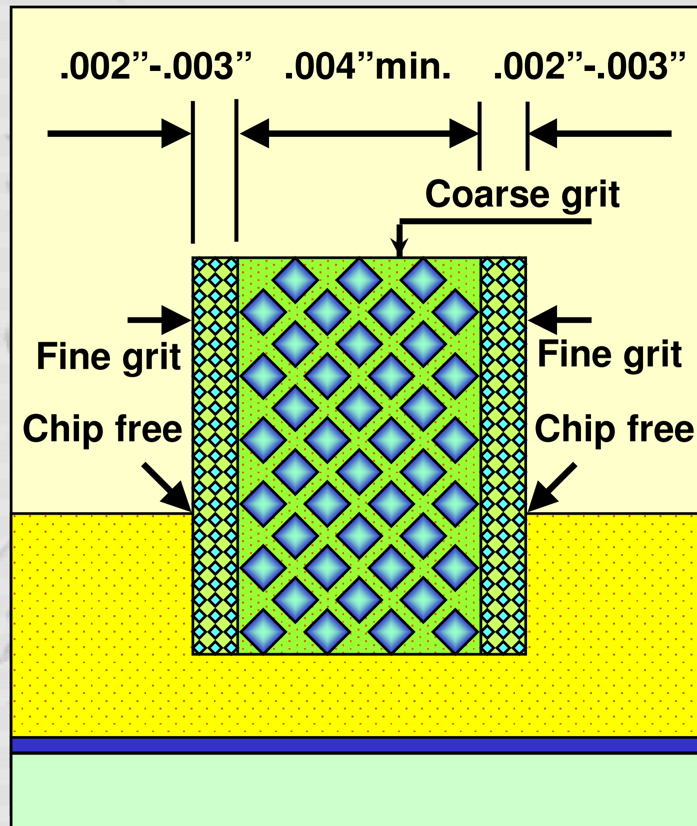
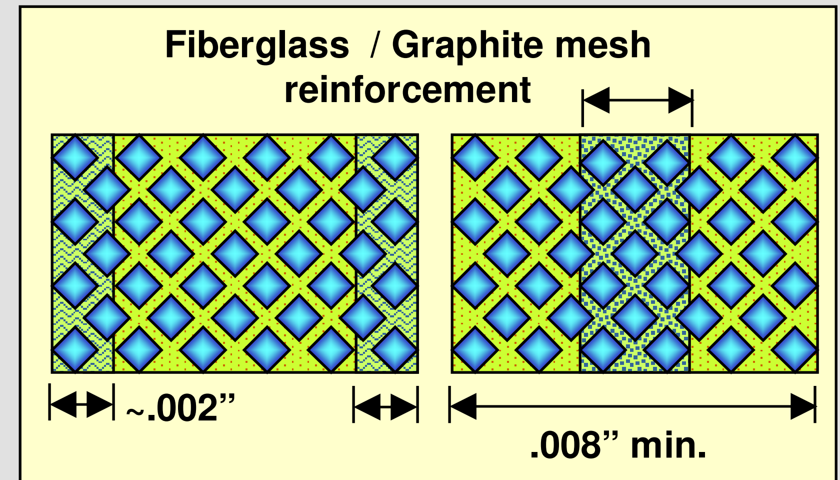
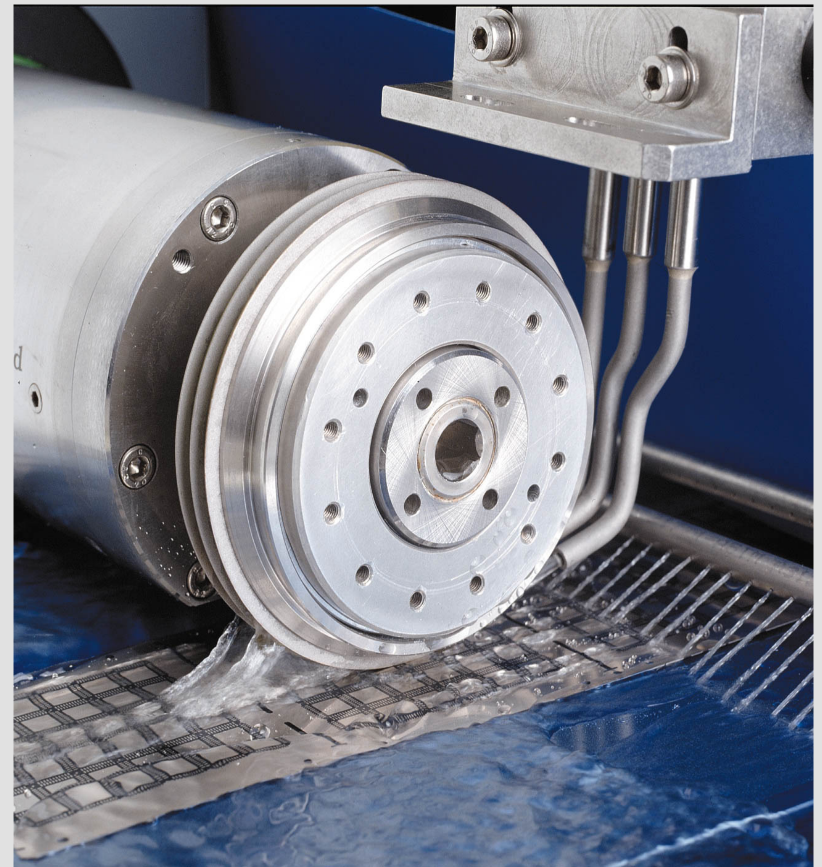
Diamond Combination & Reinforcement in Resin Blades





E Series
Extended Life Resin Blades for QFN

- **Low cost versus cut length ration**
- **Blade life up to ten times longer than standard resins**
- **Optimized to provide excellent cut quality for the most severe dicing challenges**



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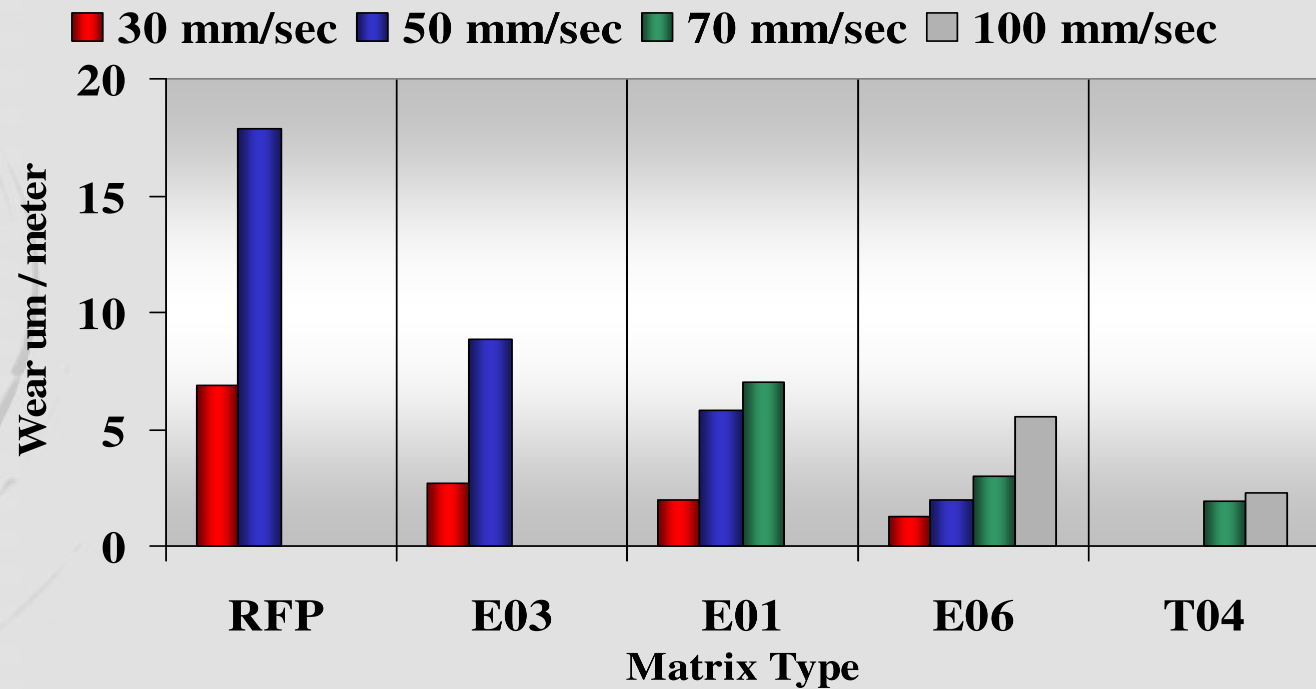
T - Series
Extended Life Resin Blades for QFN

More meters of dicing at 100mm/sec



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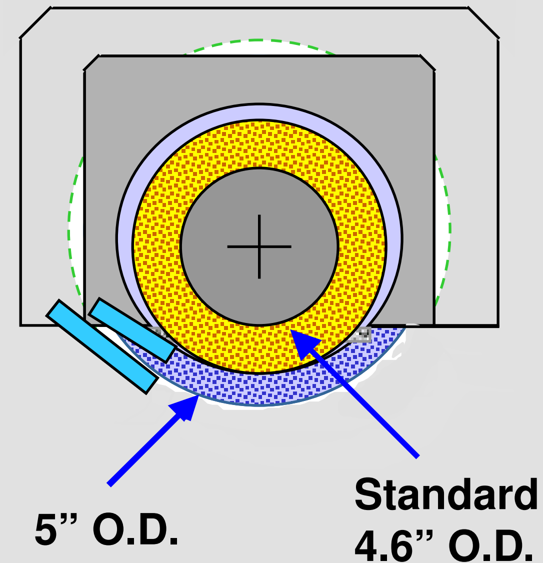
5" Technology

Designed for thick substrates where a large exposure is needed

Blades available:

- **Nickel serrated- 5.0"O.D. x 3.5" I.D.**
  5.0"O.D. x 3.0" I.D.
- **Resinoid - 5.0"O.D. x 3.5" I.D.**
  5.0"O.D. x 3.0" I.D.
- **M. Sintered - 5.0"O.D. x 3.5" I.D.**
  5.0"O.D. x 3.0" I.D.



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Blade Characteristics

Green Ceramic diced with Nickel Serrated blade

.6” thick substrate (M.L.C.) diced with a 5” Nickel serrated blade

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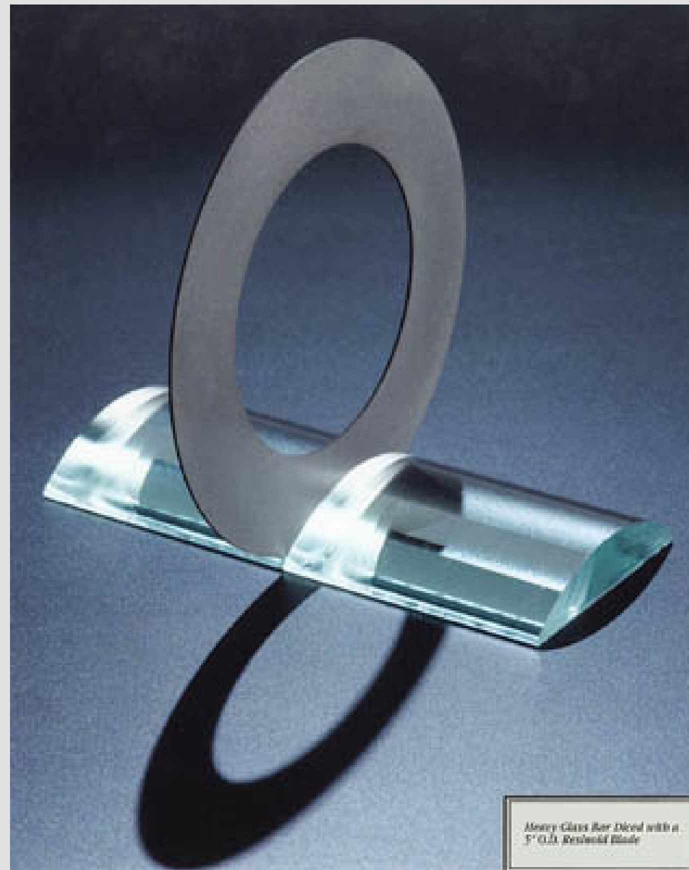
Blade Characteristics

Heavy Glass bar diced with 5" Resinoid blade



Blade Characteristics

1/2” Ceramic tube diced with 5” Resinoid blade

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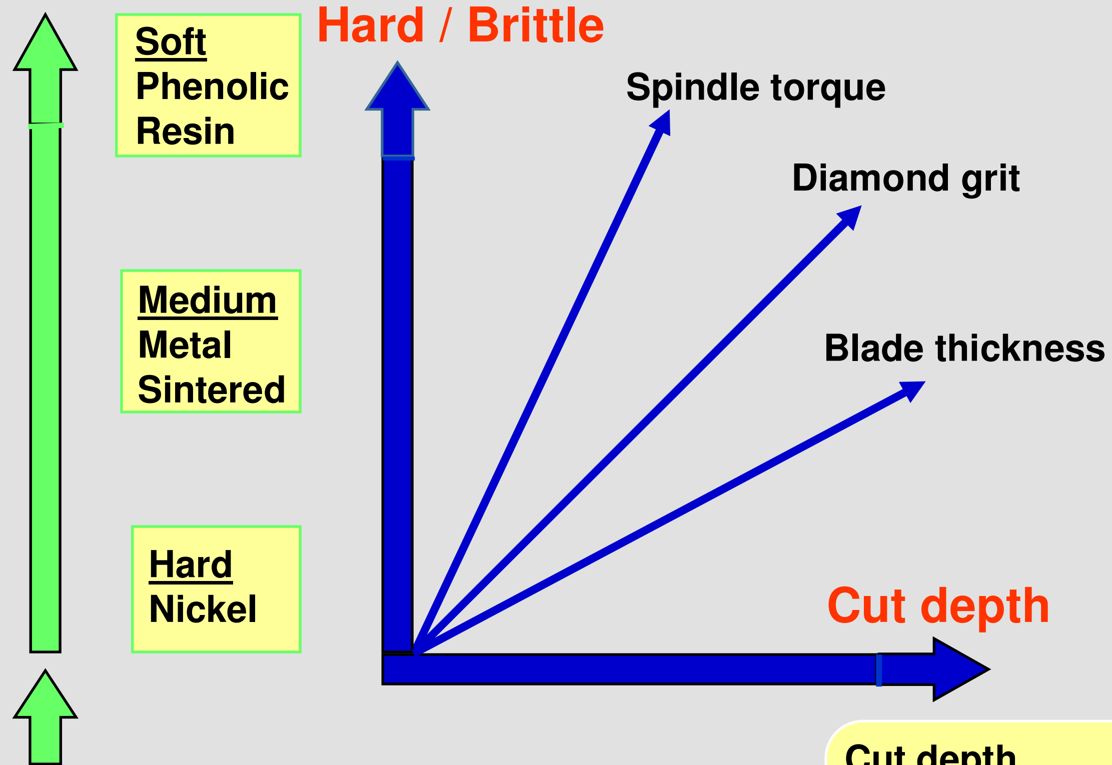
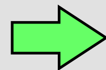
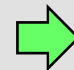
The Effect of Blade & Dicing Parameters on Cut Quality & Throughput



- Cut quality
- Throughput
- Blade wear



Blade & Process Parameters



Cut depth
Feed rate
Spindle RPM
Blade thickness
Diamond grit / %
Blade exposure

Dicing Seminar

Dressing

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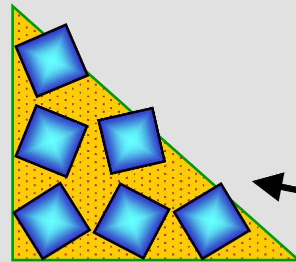
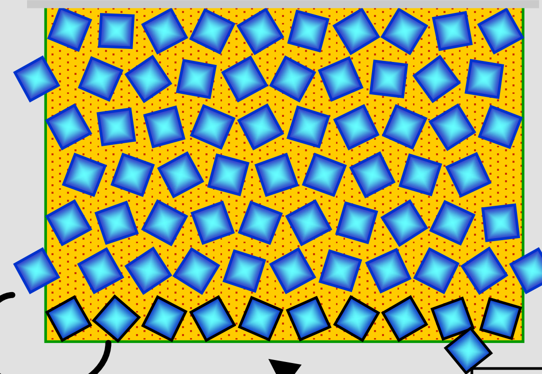
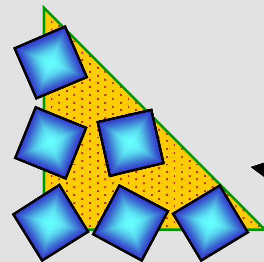
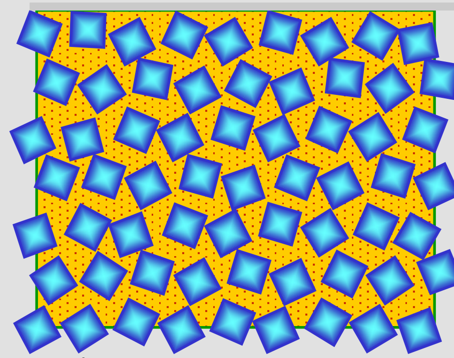
Nickel Bond Dressing

Before dressing
Diamonds are not exposed

Blade edge

Blade edge after dressing