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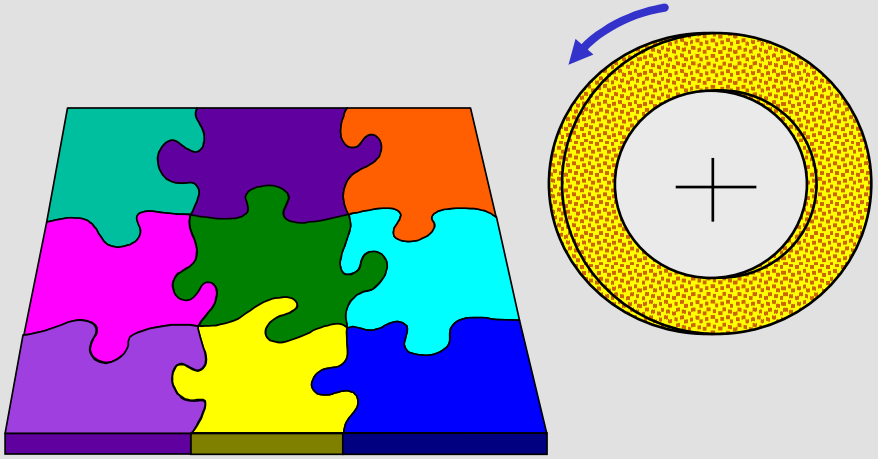
Dicing Troubleshooting



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Dicing Troubleshooting

Contents:

- Top Side chipping
- Back side chipping
- More chipping on one side of the kerf
- Cracks on the die edge
- Cut perpendicularly problems
- Cuts are not straight
- Kerf much wider than blade thickness
- Dies are flying off the mounting media
- Blade & flange set vibrating excessively
- Burrs on substrates with soft metalizations
- Too much blade wear
- Excessive blade breakage
- Saw gets into overloading

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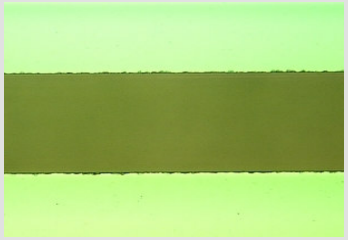
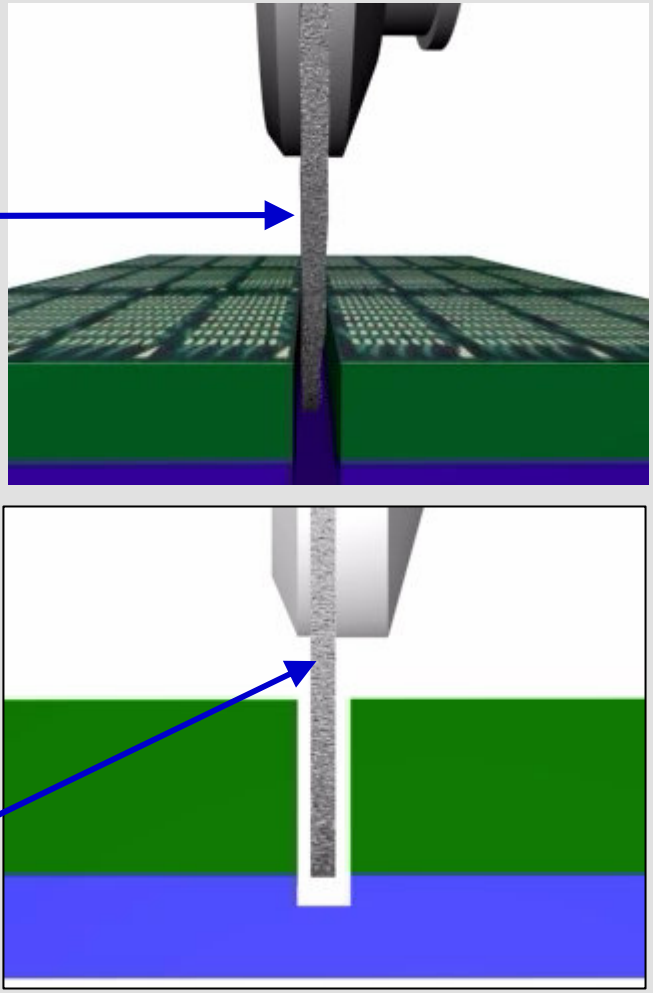


Top side chipping

Decrease the diamond grit size:

- Try uncoated diamonds [When using resin]
- Optimize the diamond concentration
- Try softer binders
  - Freer cutting
  - Higher wear
- Minimize vibrations
  - Dynamically balance the flange/blade on the saw
  - Optimize the spindle RPM
- Improve the mounting to eliminate die movement
- Optimize the exposure left
- Adjust the coolant pressure and align the nozzle flow



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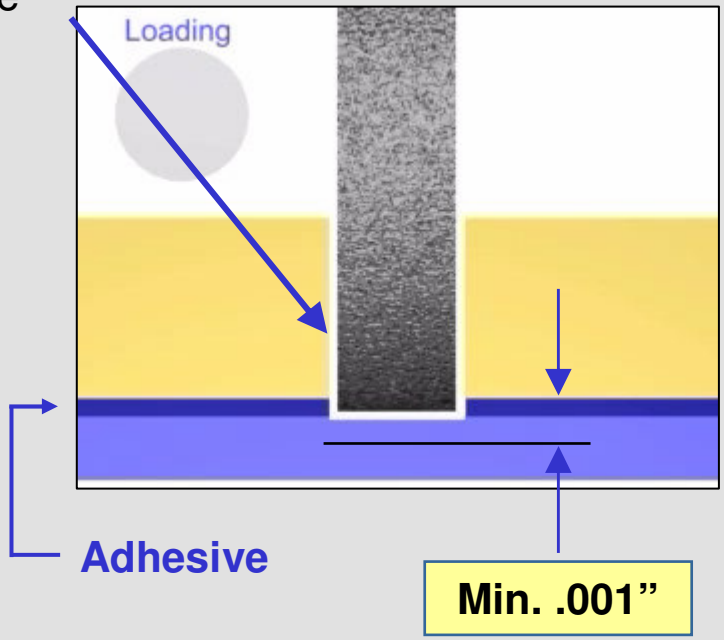
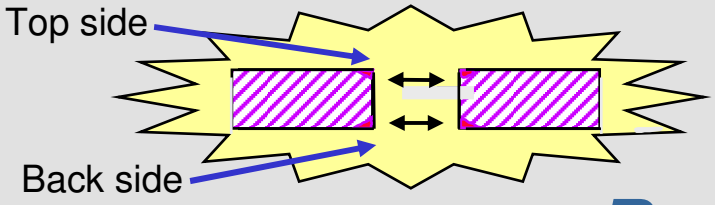
Back Side Chipping

- Maintain a min. cut depth of .001” into the tape
- Use the hardest tape to minimize loading [UV-Polyester].
- Use thinner tape for better tape flexibility
- Optimize the handling & curing when using PVC type tapes
- If possible use a wax/glue type mounting
- Optimize the feed rate / spindle RPM
- Dress the blade to minimize loading
- Add additives to the coolant to lower the surface tension of the coolant
- Optimize the diamond concentration to minimize the blade edge radius
- Use a higher wear bond to minimize loading

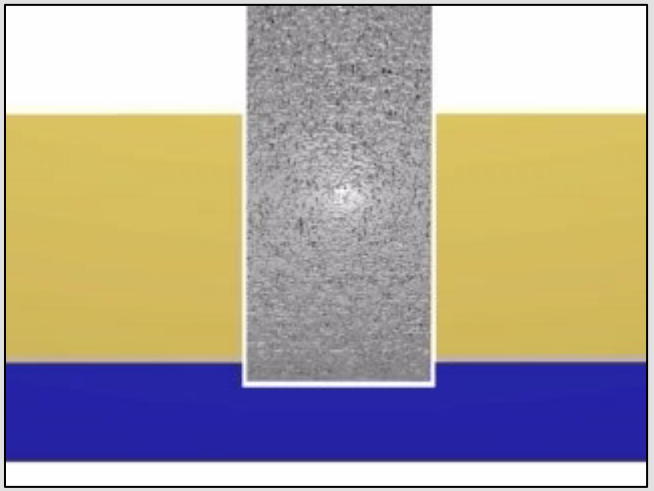


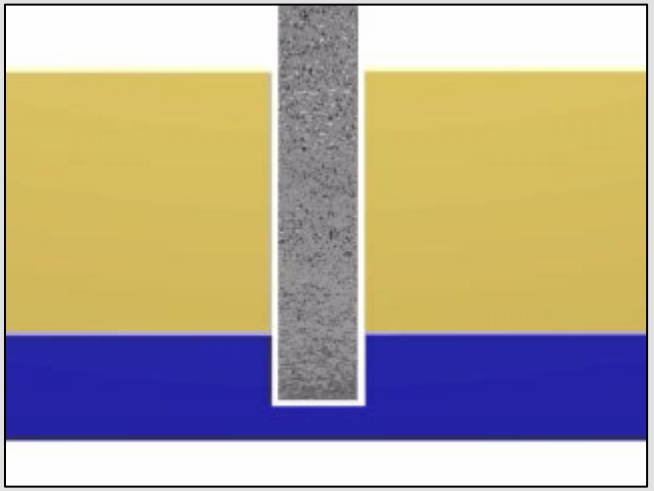


Back Side Chipping

Cont.

- Use the thinnest blade possible to minimize the radius on the blade edge





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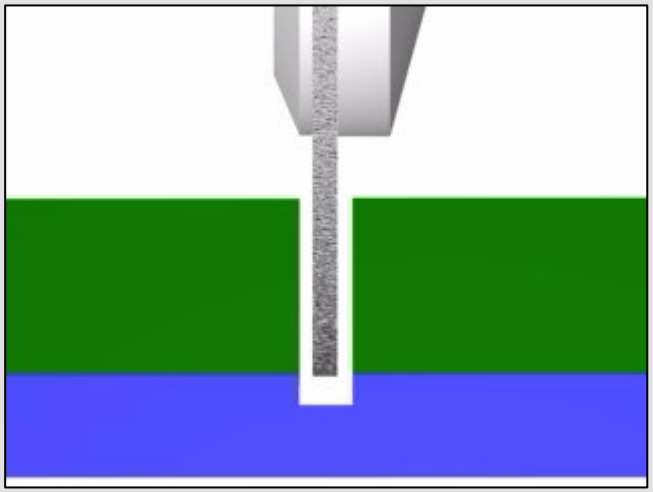
Back Side Chipping

Cont.

- Adjust the cooling nozzle and minimize the flow to reduce blade vibrations



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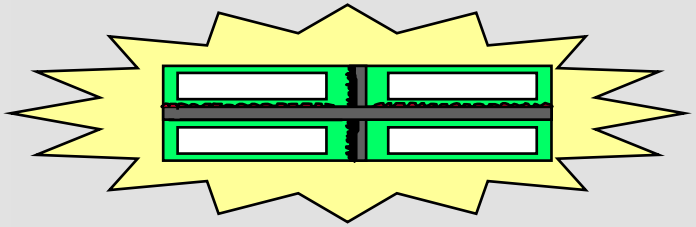
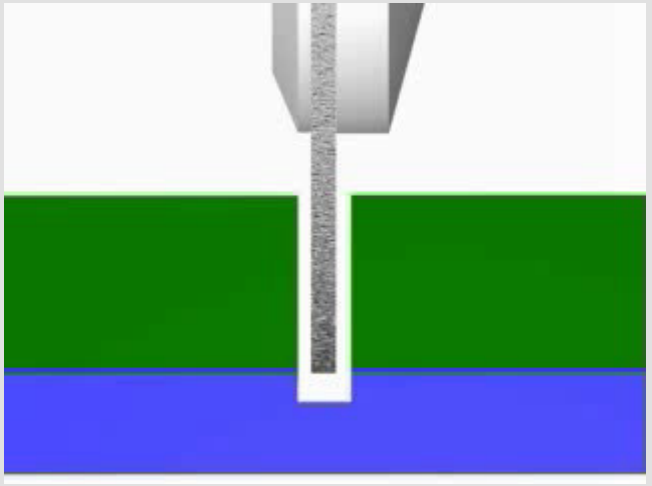
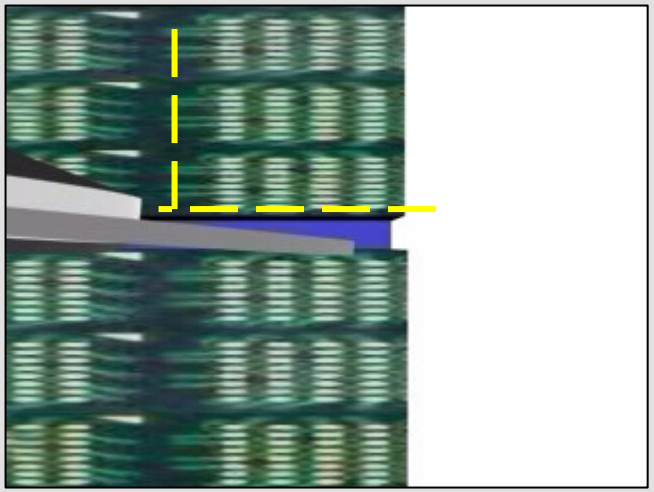


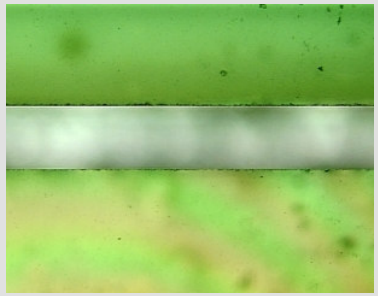
More chipping on one side of the kerf

In order to define the cause of side chipping dismount the blade and remount it at 180° in the flange, If chipping remains on same side then :

- Adjust the cooling nozzle
- When dicing on tape, optimize the mounting handling to minimize die movement
- Change to a UV tape (stronger adhesion)
- Check the spindle alignment to the X movement







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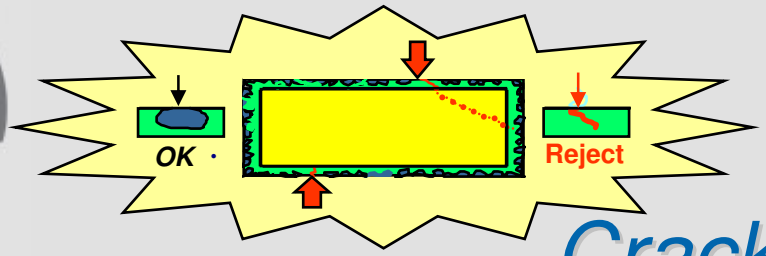
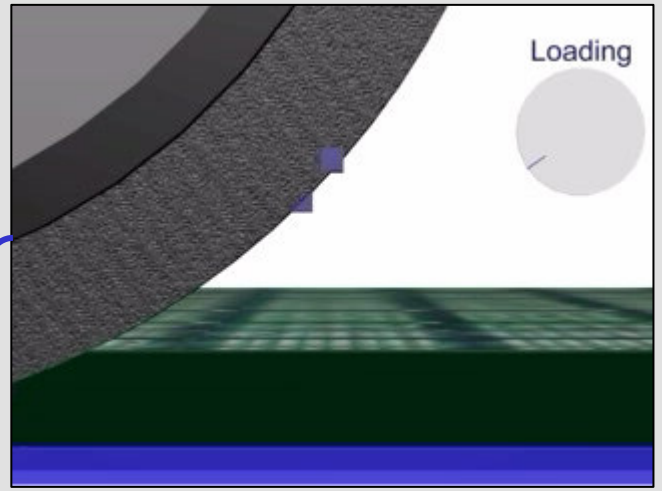
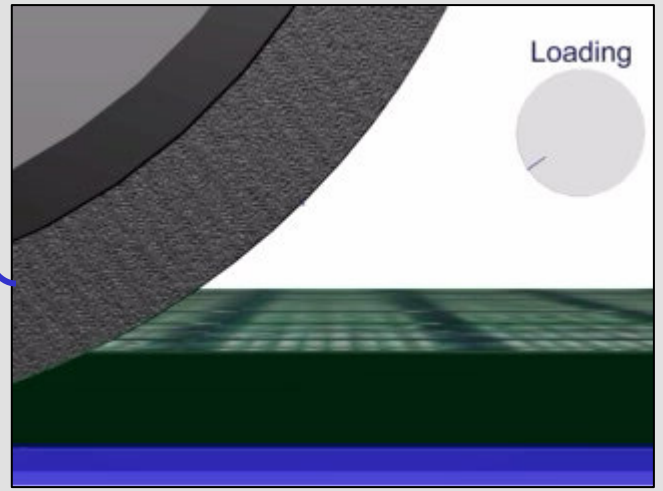


Cracks on the die edge

- Use a larger diamond grit (to minimize loads)
- Use a more wearing type blade (softer matrix)
- When using resin blades, optimize the diamond type - coated / uncoated.
- Lower the diamond concentration to minimize loading
- To minimize loads, redress the blade to expose new sharp diamonds





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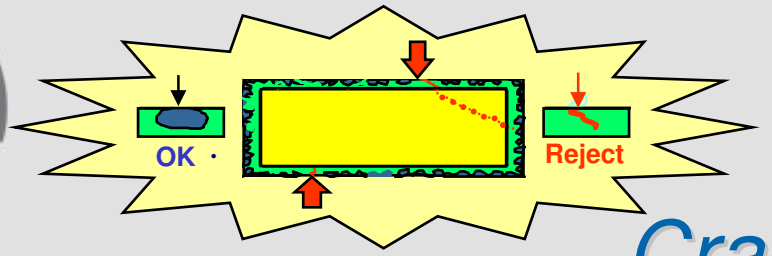
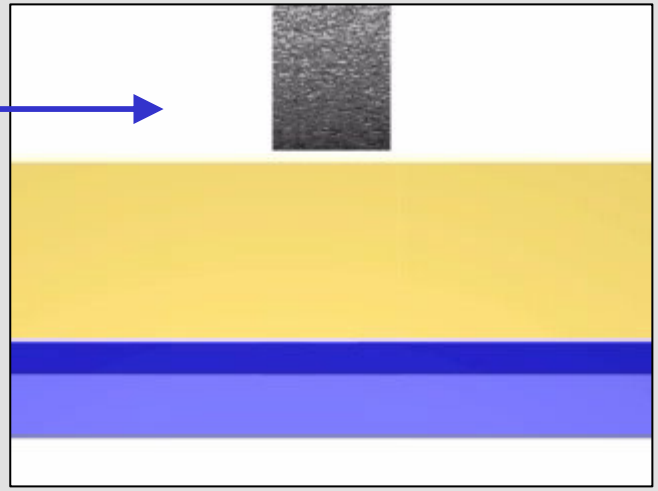


Cracks on the die edge

- Use a two step cut
- Optimize the mounting method / material to minimize blade overloading
- Optimize the coolant alignment and flow
- Lower the feed rate to minimize loading
- Optimize the spindle RPM
- Minimize blade vibrations



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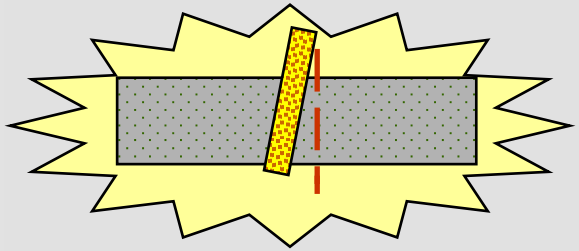
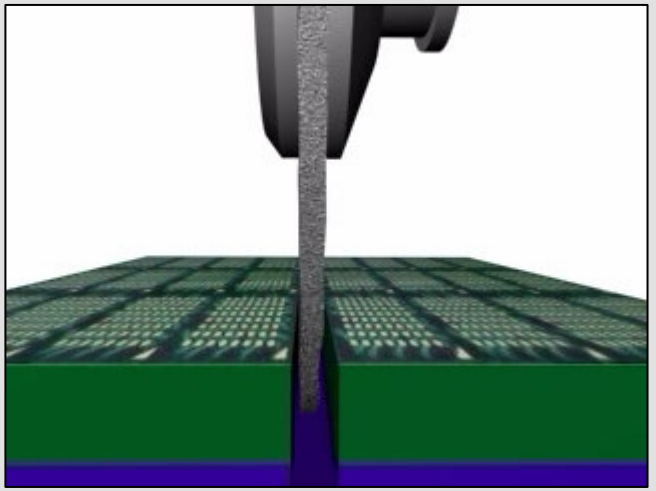
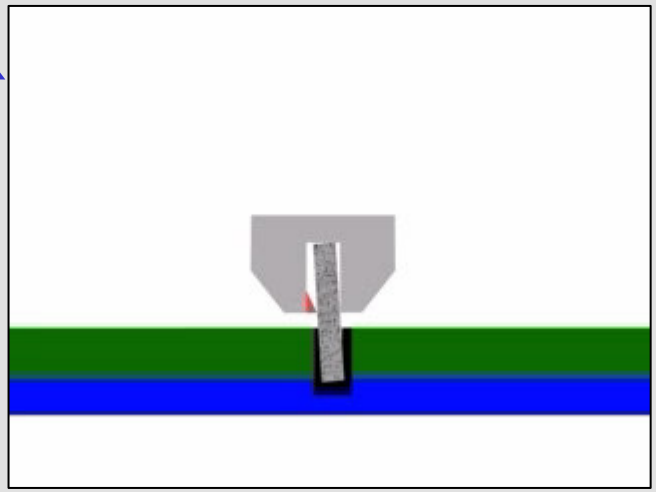


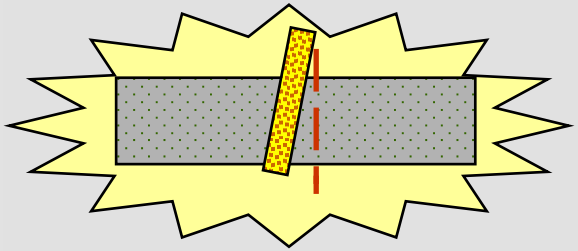
Cut Perpendicularity

- Too much Exposure left



- Damaged flange

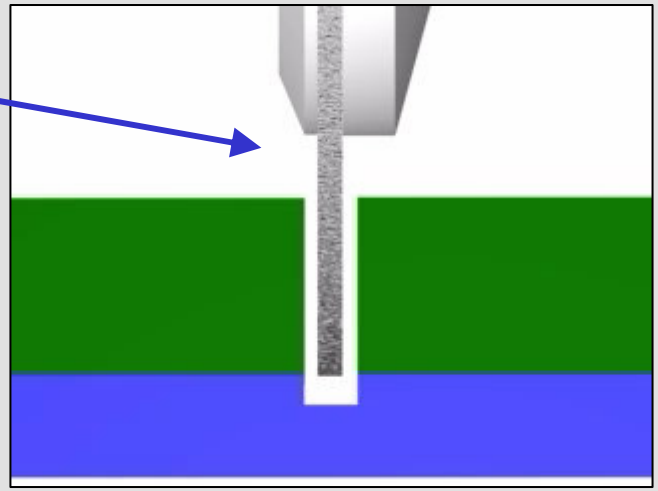


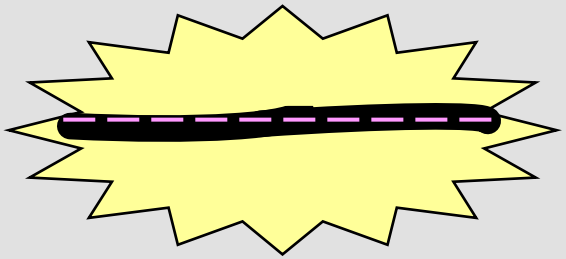


Cut Perpendicularity

Cont.

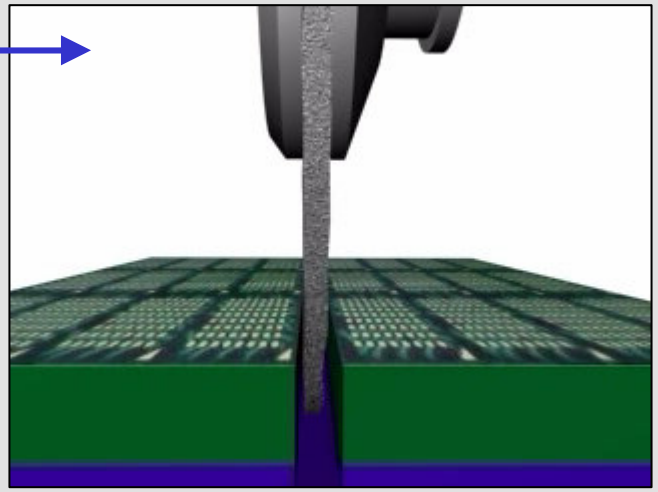
- Adjust the cooling nozzle & the coolant flow
- High ratio of exposure to blade thickness
  - Check the option of using a thicker blade
  - Reduce feed rate and / or increase the RPM
  - Add additives to the coolant
- Optimize the blade to minimize loads:
  - Use a Lower diamond concentration
  - Optimize the diamond size
  - Lapped blades will minimize side friction
  - Use serrated blades to minimize the loading
- Improve the mounting method

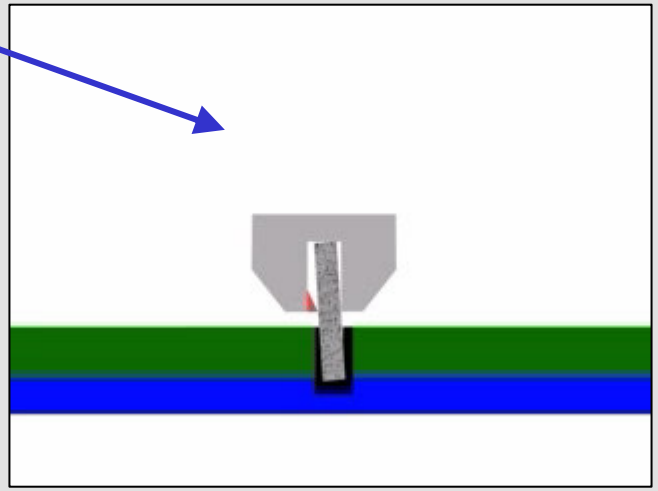


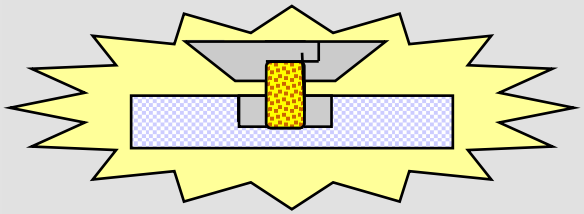


Cuts are not straight

- Too much exposure left
- Damaged flange
- High ratio of exposure to blade thickness
- Too much load:
  - Reduce feed rate and / or increase RPM
  - Use larger diamonds if possible.
  - Add additives to the coolant
- Diamonds are too large on thin blades [not enough binder]

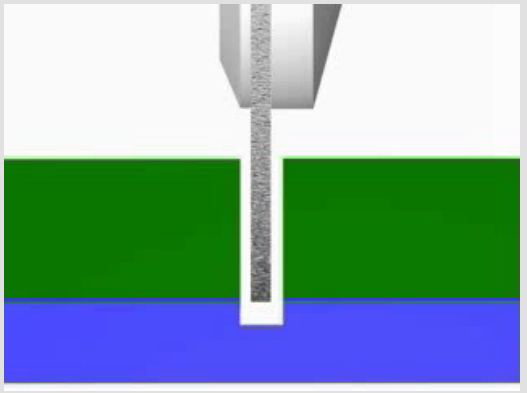




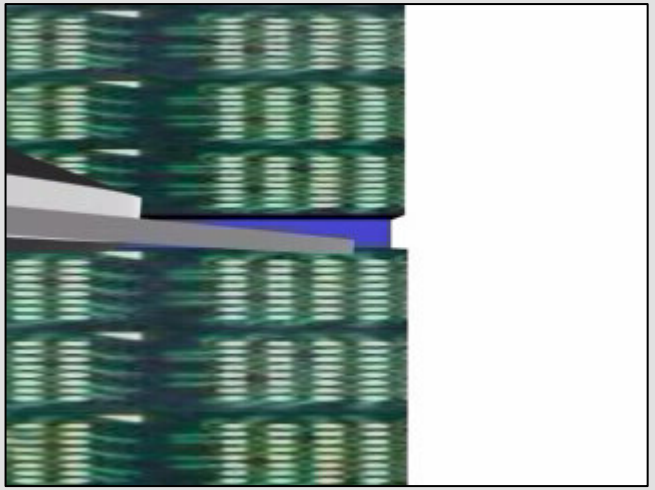


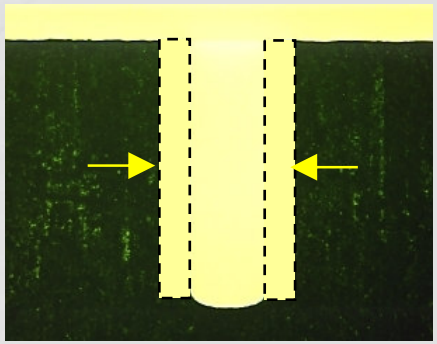
Kerf wider than blade thickness

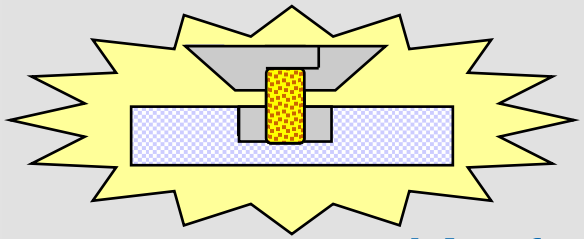
- Check for any flange defects
- Check and optimize the mounting to eliminate any die movement
- Check for any defects on the blade edge and on the side surfaces



- Check the 90 ° degree alignment of the spindle to the table [X] movement.
- Check Wheel mount Axial run - out







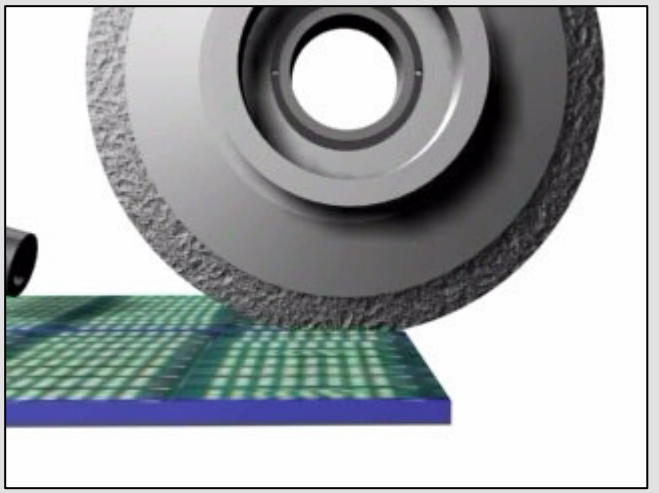
Kerf wider than blade thickness

Cont.

- Try a higher RPM for better blade stiffness

- Slow down the feed rate to minimize the load
- Add coolant additives to minimize the load

- Optimize the coolant flow for :
  - Better blade & substrate cooling
  - Blade vibrations
  - Die movement



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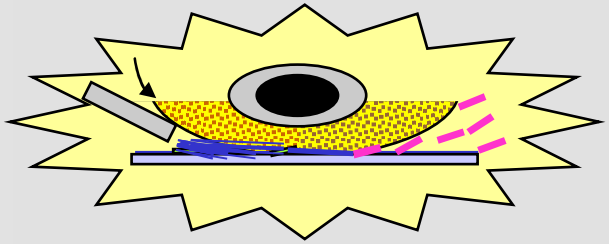
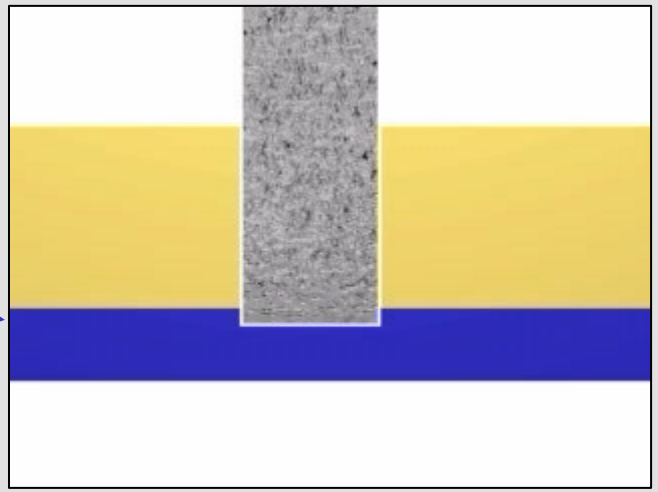
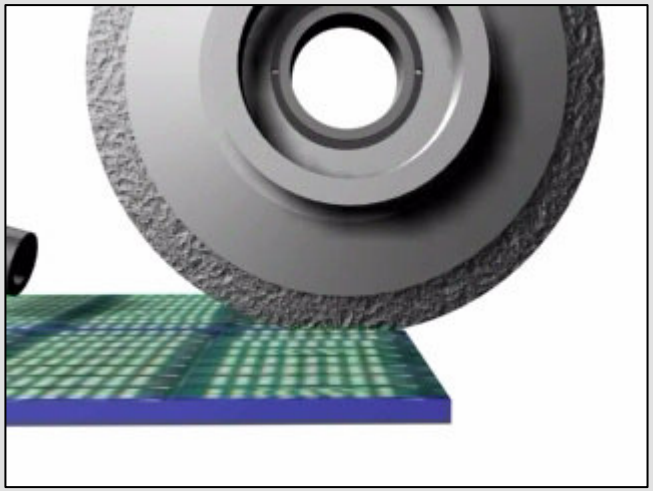


Dies are flying off the mounting media

Optimize the mounting:

- Use glue or wax if possible
- When using blue tape, optimize the curing
- Use a harder tape with stronger adhesive (UV-type)
- Slow down the spindle RPM
- Lower the feed rate
- Adjust the cooling flow and pressure





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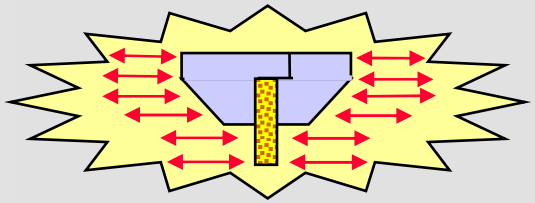
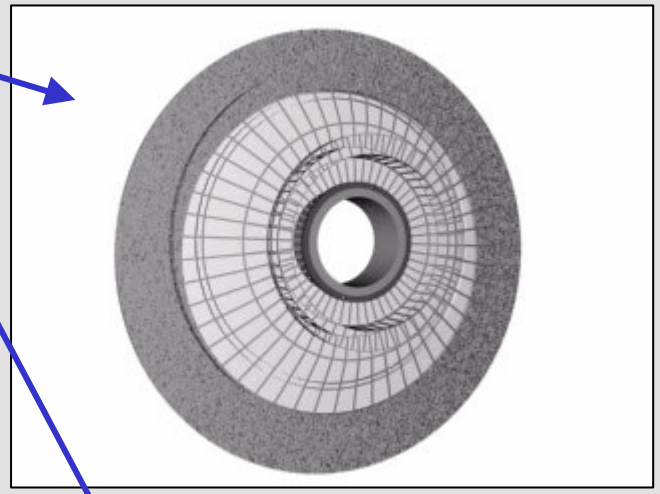
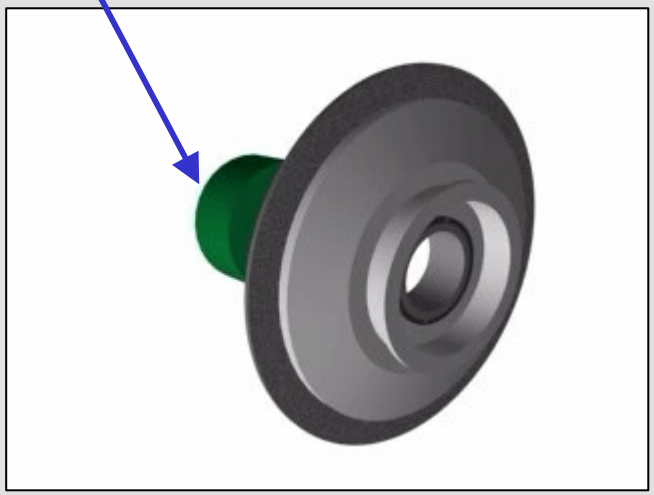
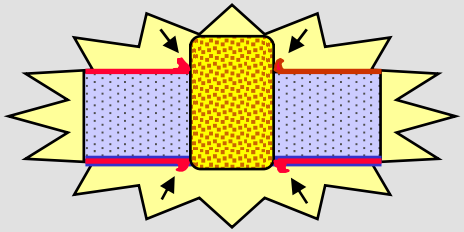


Blade & Flange Set- Excessively Vibrating

- Loose blade I.D. can cause vibrations
- Check for defects on the spindle wheel mount
- Run the spindle without the flange set
- Clean the spindle and the flange parts and reassemble
- Check for defects on the back side flange
- Check the flange for loose parts
- Try different RPM's (harmonic vibrations varies on different saws)

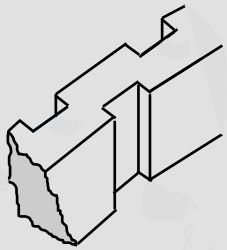


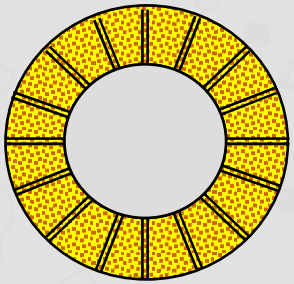




Burrs on Substrates with Soft Metallization

- Back side burrs: try a harder tape or if possible change to wax or glue mounting
- Optimize the coolant to minimize loads
- On resinoid blades use lapped blades to minimize load
- Try the resinoid special side grooved blades
- Optimize the spindle speed and feed rate - Lowering the feed rate will minimize the load and the burrs.
- Add coolant additive





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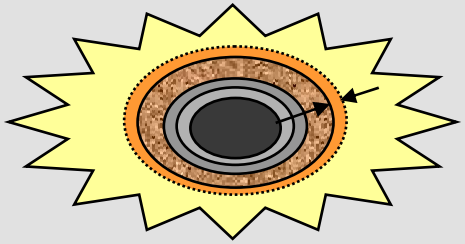
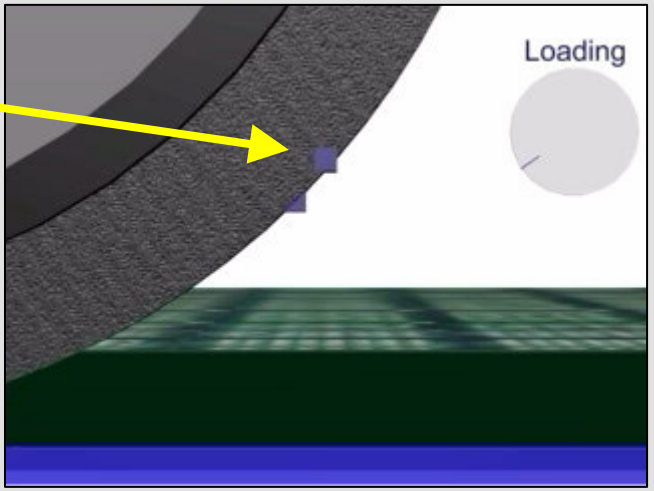
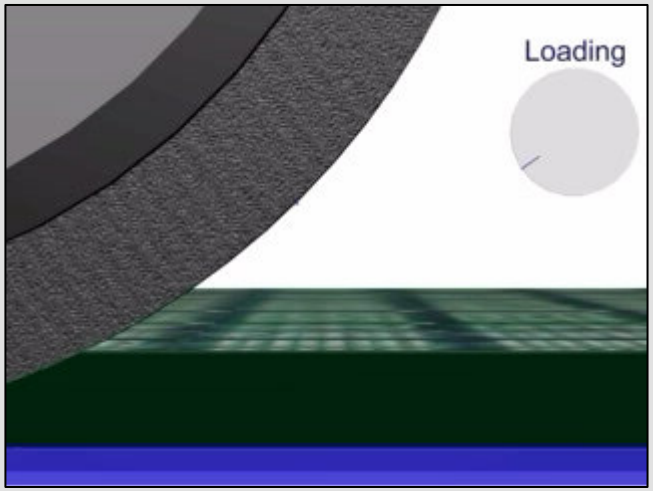


Excessive blade wear

- Optimize the blade matrix:
- Use a larger diamond grit
  - Use a harder blade matrix
  - Use a higher diamond concentration
  - Optimize the diamond type
  - If possible, use a thicker blade
  - If possible, try a serrated or side grooved blade
- Optimize the mounting media
- Optimize the spindle RPM & the feed rate
  - Higher RPM acts like a harder blade
  - matrix
  - Higher feed rate increases loading
  - and wear
- Optimize the coolant:
  - Align the cooling nozzle
  - Optimize the cooling flow
  - Add additives, if possible
  - On deep cuts try a high cooling
  - flange





Uneven Blade Wear

- Adjust the coolant Pressure and align the nozzle flow
- Dismount the blade and remount it at 180° in the flange. If the uneven wear becomes a mirror picture than change the blade.
- Check for Y-Offset (Dicing is not in the middle of the street).
- Try a softer blade (higher wear) to reduce the load.
- Check the spindle alignment to the X movement

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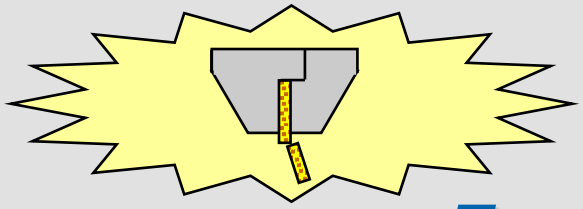


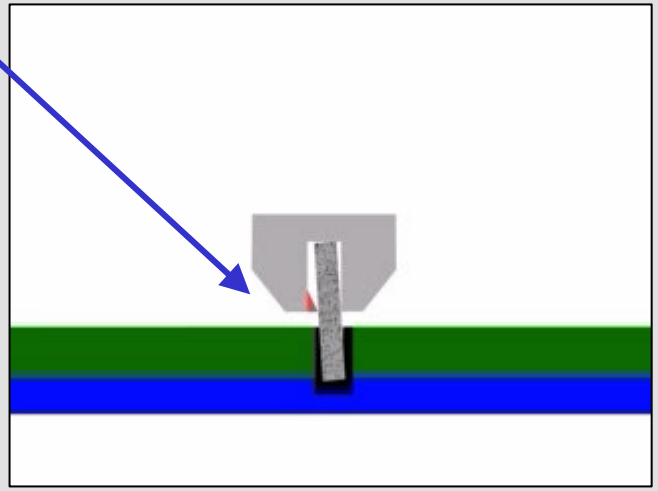
Excessive Blade Breakage

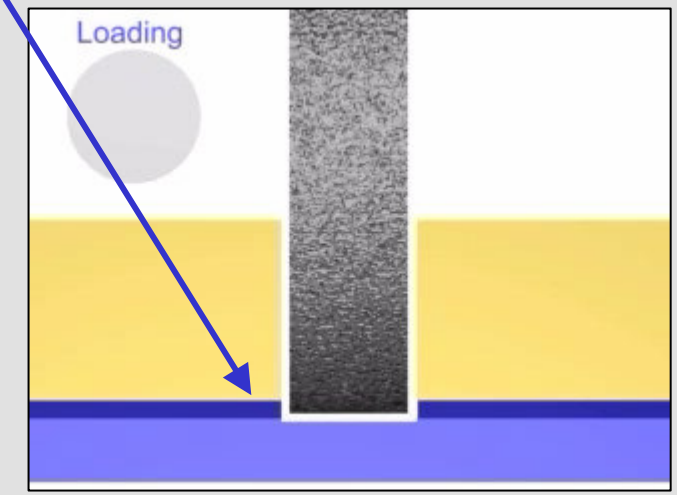
- Check the flange condition
- Maintain a min. cut depth of .001” into the tape

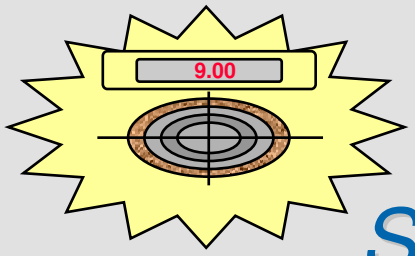
  min. into the tape
- Minimize the exposure left
- Check the saw slide movements [X,Y]
- Try a lower Diamond conc. to minimize loads
- Use a thicker blade if possible
- Optimize the mounting to minimize vibration

  and blade loading
- Optimize the coolant
- Optimize the cutting parameters to minimize

  loads

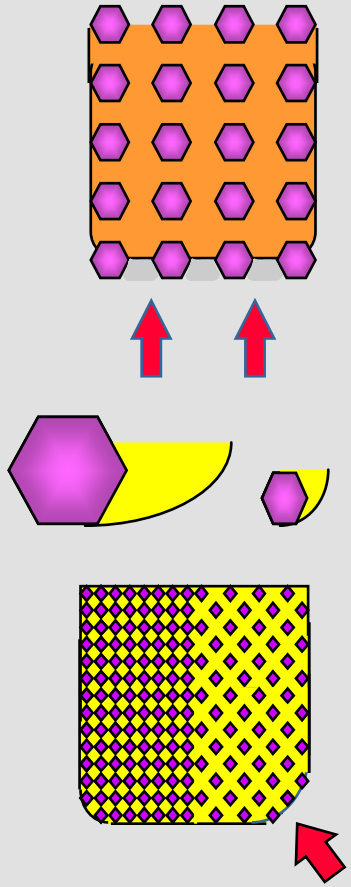






Saw gets into Overloading

- Dress the blade to expose new diamonds which will minimize loading
- Use a higher RPM for higher spindle torque
- Lower the feed rate
- Use a blade with a larger diamond grit
- Use a blade with lower diamond concentration
- Use a softer blade binder
  - Higher wear
  - Less load
- Make multiple cuts



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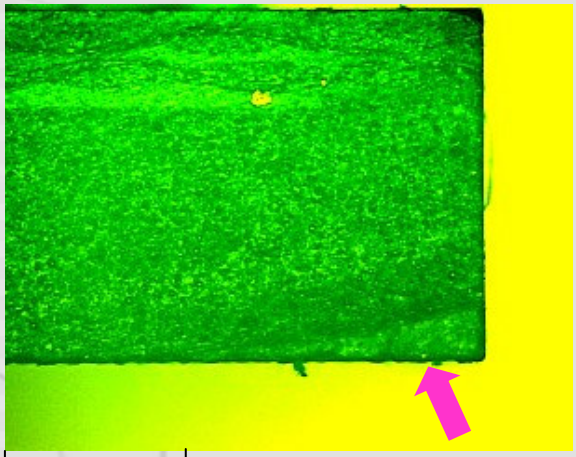
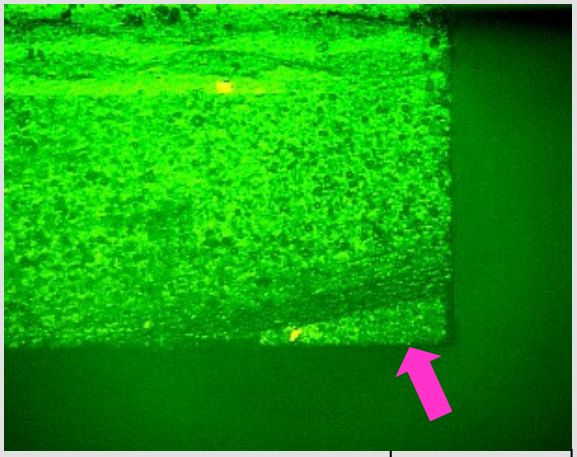
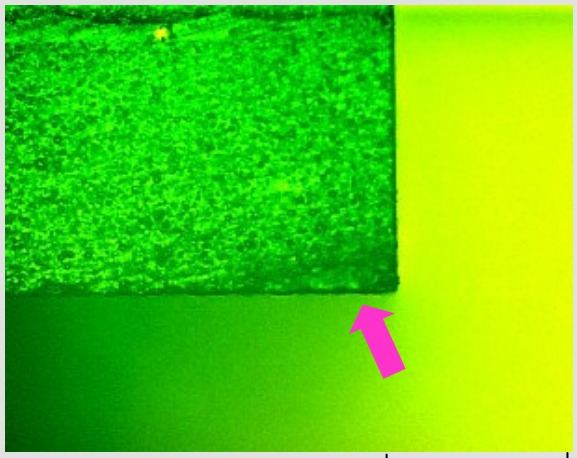
Protrusion on Package Singulation - BGA



500 µm



500 µm



500 µm

Protrusion thickness – 0.006 -.0010mm

Protrusion on Package Singulation - BGA

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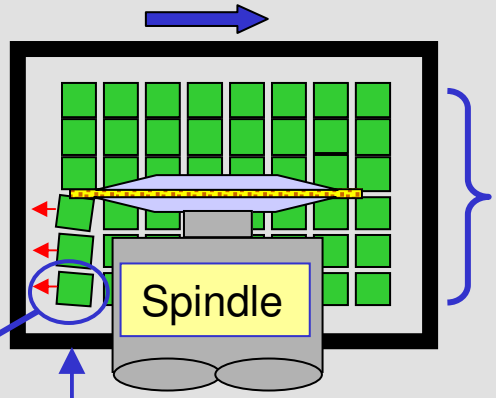
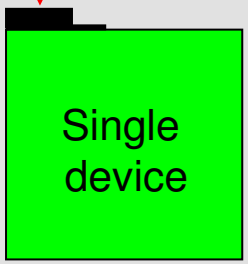
A remaining lip due to load and device movement

Vacuum tray movement



Second index

Protrusion



Device movement at the end of the dice line (In extreme cases not only at the end of the dice line)

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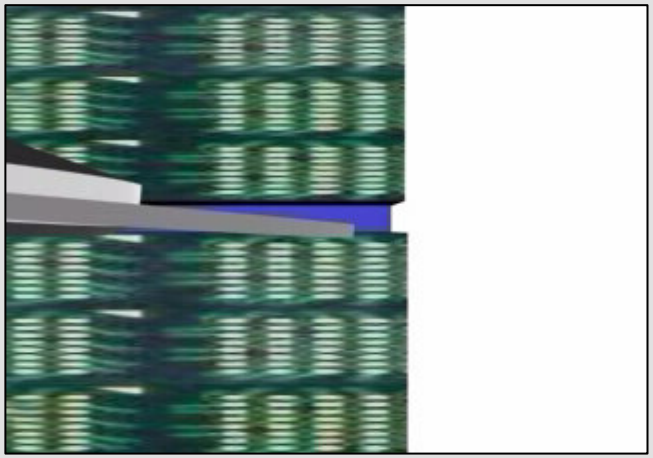
Options to Eliminate / Minimize the Protrusion

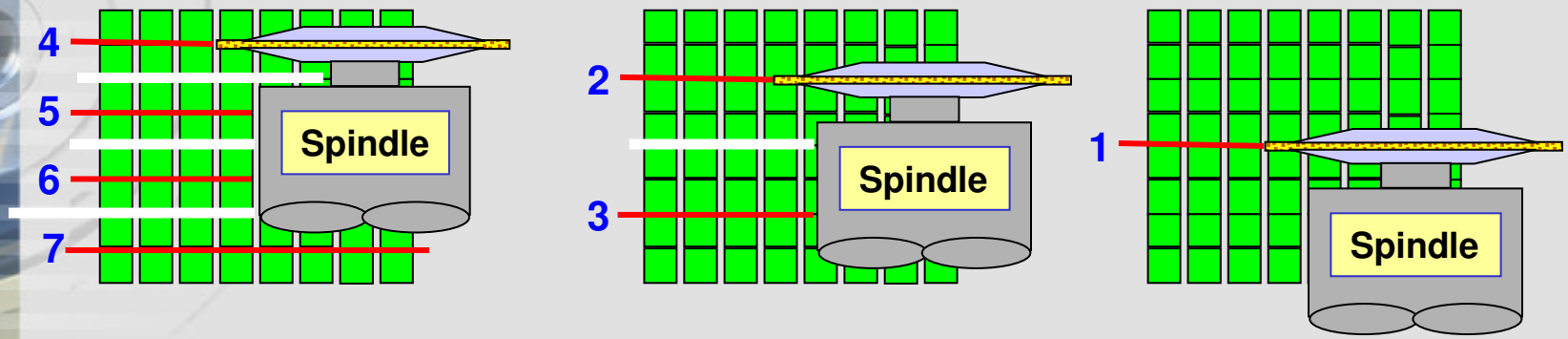
- Slow down the feed rate on the second index at the exit of the cut.
- Improve drastically the device vacuum clamping during the dicing. This is a key issue.
- Improve the flatness of the device clamping area in order to minimize any vacuum lose.
- Adjust the cooling nozzle & pressure. A too much pressure may "help" the device to move and loose its clamping.
- Make sure your spindle is perfectly aligned (90 degree) to the X movement. If not perfectly 90 degree it can cause a wider cut and side forces that may move the device. See the attached Video (Double Click)



Options to Eliminate / Minimize the Protrusion

- **Use a more wearing type blade to minimize the load.**
  ADT has many different options to explore this option.

Second Index – “steps” dicing to minimize die movement:



Step # 4,5,6 & 7 **Step # 2 & 3** **Step # 1**