Saw Blade Fundamentals

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Topics

- Anatomy of a saw blade
- Terminology
- Applications
- Choosing the blade
- Service
Saw Blades
Saw Blade Terminology

- Hook or Rake Angle
- Tooth Top
- Shoulder
- Expansion Slot
- Bore
- Pin Holes
- Plate or Body
- Carbide Tip
- Gullet
- Top Clearance
- Diameter
- Kerf
- Plate
- Side Clearance
Saw Blade Terms

• Diameter - The outside dimension of the saw blade measured across the complete blade through the center.
• Bore - The inside center hole where it mounts to arbor
• Keyway- Cut-outs into the bore to fit over keys on the arbor.
• Pin Holes – Small diameter holes outside of the center hole used in driving the saw blade or attaching to sleeves.
• Bolt Circle – The measured dimension between the centers of pin holes.
Saw Blade Terms

• Kerf- The width of the blade teeth (also-width of material removed)
• Plate- The steel, main part of saw blade. Usually referred to in regards of thickness.
• Z- The number of teeth on the blade
• Chip load- Measurement of thickness of material removed by each cutting edge during a cut.
• Rim speed- The speed of the blade in linear dimensions
• Hook Angle – The measured angle between the leading cutting edge referenced at 90 degrees and the face of the cutting edge.
Saw Blade Terms

Hook angle

Kerf

Plate

K

HK

PT

1

2
Common hook angles

- 15 - 20 degree – solid natural wood (rip saws)
- 5 - 10 degree – composite boards (panel and beam saws)
- -5 - 0 degree – aluminum cutting, plastics, scoring blades
- Negative angle – scoring blades, aluminum cutting, table saw
• Q. What is a glue-line or glue-joint finish???
• **Answer. Simple-** Any glue joint that does not come apart.

• Basically, we define a glue-line finish as a cut quality that holds a tolerance of +/- .004” of parallelism over 8ft.

• This accuracy in the edge allows for gluing boards together with breakage.

• **Break test-** the failure should occur in the wood, not the joint

• In the past, this type of finish typically required a secondary operation using a jointer as traditional methods may not have worked well.
Special Applications

• Saw strobes- In some applications where the wood is heavily twisted, stressed or wet, strobes are needed to keep material from rubbing on blade. They are extra cutters integrated into the plate.

• Coatings- Some applications that produce a lot of buildup on blade like pitch, can cause too much heat so a coating is used for lubricity.
Types of Teeth

• Carbide Tipped - Standard for most blades, low initial cost

• PCD - Poly-crystalline diamond - 300-500 x the life of carbide. Requires consistent feed speed, consistent hold-down and consistent material. (MDF, HDF, carbon fiber, glass, aluminum, solid surface)
Applications

- **Ripping** - Cutting the material parallel to the grain

- **Cross-Cutting** - Cutting the material perpendicular to the grain
Types of Teeth

Tooth Configurations and Blade Diagram

- Flat Top Grind (FTG)
- Alternate Top Bevel (ATB)
- Hi-ATB
- Triple Chip Grind (TCG)
- Combination (4+1)
- Conical Flat
Types of Teeth

Flat top tooth

**Flat Tooth**

- Cutting pressure is not divided
- Most common for ripping in solid wood

Triple chip tooth

**Triple Chip**

- Cutting pressure divided into five different areas
- Good for glue-line and man-made lamination material
Types of Teeth

• Triple Chip / Flat

– For machining:
  • Composite Board
  • Hardwoods for glue-line finish
  • Particle Board, MDF
Types of Teeth

- ATB (Alternating Bevel)
  - For machining
    - Cross-cutting
    - Solid Woods, standard ripping
Determining The Proper Blade

• To select the best blade for a machining process, you must have:
  
  • A clear understanding of the specifications of the machine
  • Know what the materials to be cut are
  • The operating conditions
  • What is the desired finish quality
Determining The Proper Blade

- What is application- Ripping or Cross-Cutting?
- What is the material?
- How thick is the material?
- What will the feed rate be?
- What is the desired cut quality?
Determining The Proper Blade

• General Guidelines:

• There is no universal blade for every application
• Thin materials require more teeth to perform well-reduced contact pressure
• Thick materials require less teeth-better chip removal
• Hard and dense materials use more teeth to reduce the load on each tooth
Based on answers from previous page, we then need to calculate the number of teeth needed by calculating our chip load.

To do this, we calculate our rim speed using the saw blade diameter and rpm of the saw

- Rim speed = diameter x 3.14 x rpm / 12
- Chipload = feed rate (fpm) x 12 / # of teeth x RPM

- .015” Standard cutting, .010” fine finish (glue-line), .005” for plastics, composites and MDF
## Rim Speed of Saw Blade in Feet per Minute

<table>
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<th>Blade Diameter</th>
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<th>4000</th>
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<td>25000</td>
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## Chip Load per Tooth

With saw arbor running at 3600 revs. per minute the following summary gives the feed rate per revolution and the chip load per tooth in relation to the feed rate per minute into the saw.

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<th>Feed per/min (feet)</th>
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<th>150</th>
<th>200</th>
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<tr>
<td>Feed per/revolution</td>
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<td>.500</td>
<td>.666</td>
<td>.833</td>
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Once all the math is complete, we can narrow down the blade required.

Overall, yield vs expected cut quality vs blade life may require some adjustments in kerf, number of teeth or feed rate.
To get the most life and performance from a saw blade, it must be serviced regularly and properly. A properly maintained saw blade can have 20-30 sharpenings.

- Running tools beyond normal wear results in poor finish quality, increased horsepower and energy consumption, increased heat, vibration and noise.
- Dull tools are more dangerous to operate.
- Tools run too long will not get the same amount of sharpenings before end of tool life.
Blade Servicing

- When having blades serviced, both the face and the top of the saw tooth must be sharpened.
- Minimum removal must not be less than .05mm from the face of the tooth and .2mm from the top of the tooth.
- If the wear mark or rounding of the tooth is not entirely removed, it can result in a considerable reduction in performance time.
- When the tooth height, as measured from the tip seat, reaches 1mm, the saw blade is at the end of its life and should be replaced.
- Blades should be serviced regularly for optimum cut quality and to extend life of tips.
Blade Servicing

NEW

GROUND

0.41”
10.5mm

0.21”
5.2mm

H

0.189”
4.8mm

0.183”
4.6mm

Roughly .2mm (0.008”)
Kerf loss
Questions?