Sawing Basics

V63WCWO3

Operator Variables
That Aid
Sawing Performance

Detroit BAND SAW

When making blade recommendations, there are a few questions we need to answer:

- Which blade do we use?
- Which tooth pitch do we use?
- Which blade speed should we use?
- Which feed rate should we use?
- What is the relationship between feed & speed?
- Why do we need a cutting fluid?
- Why do we need blade break-in?

Detroit BAND SAW

Which blade do we use?
Items that influence selection

- **Machine type—**Low cost, low performance machines will not allow a band saw blade to function optimally.
  - For low performance machines, select blades that can withstand higher shock, chatter, or **vibration**
  - The better the feed system on a machine, the higher performance blade that can be used effectively.

- **Production Rate–** The more cuts per hour or the longer the run time the higher the performance blades will be needed.

- **Cost Per Cut**-To lower the cost per cut, move to a higher performance blade.

Detroit BAND SAW

What Blade Do We Use?
Items That Influence Selection

Material Machinability-

Machinability is generally rated from 0 to 100%

(SAE1112, rated at 100%, is considered free cutting)

- Alloy type (Carbon vs. Nickel-based, etc.), hardness (Heat-Treated or aged), and material shape all affect material machinability
  - The higher the alloy, the lower the machinability rating
  - The higher the material hardness, the lower the machinability
  - Complex material shapes will lower the machinability rating due to increase shock

Abrasiveness- Abrasive material or coatings will reduce the life of a band saw blade- consider carbide tipped blades or carbide grit edge

Detroit BAND SAW

What Blade Do We Use?

Blade Families

Carbon

- **FlexBack–Low cost blade for plastics, woods, and non-ferrous applications**
- **HardBack–Greater rigidity than flexback allows up to 25% more performance**

Bi-Metal

- **Resists heat and wear at higher speeds and feeds**

Carbide Tipped

- **For use with highly abrasive metals and non-metallic composites**
- **Set Tooth – for nonferrous foundry applications such as cutting gates and risers, some exotic applications**
- **Triple Chip- for cutting exotic metals and for high production applications, some nonferrous foundry**

Detroit BAND SAW

What Tooth Pitch Do We Use?

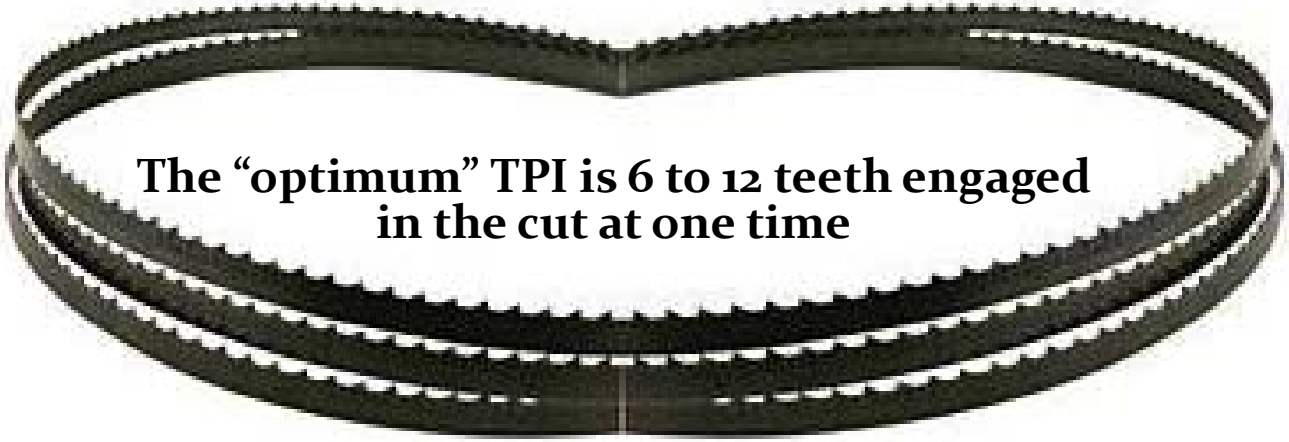
Number of Teeth in the Cut

Minimum – 3 teeth in the cut

- If there are too few teeth in the cut, the teeth can straddle the work piece, which can cause stripping.

Maximum – 24 teeth in the cut

- Too many teeth in the cut may cause the gullets to "overload", because there is not enough gullet capacity to hold all the chips, this can cause blade bouncing.



Detroit BAND SAW

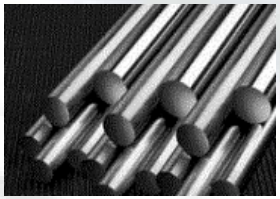
What Tooth Pitch Do We Use?

Number of Teeth in the Cut

Conditions that influence pitch selection:

- **Soft materials:** Require fewer teeth and more gullet capacity
  - Aluminum, Copper, Bronze, Carbon Steels

- **Tough Materials:** Use a moderate amount of teeth in the cut – in the 12 to 18 tooth range
  - Inconel, Hastalloy, Waspalloy, Monel, Steels



- **Hard Materials:** Use more teeth in the cut – in the 18 to 24 tooth range
  - D-2, Die Steels, Stainless Steels

- **Machine capabilities:** constant feed machines can use a coarser pitch, whereas gravity feed machines typically require a finer pitch

- **Production or blade life:**
  1. For production cutting, use tooth pitches near the coarse end of the range
  2. For good finish or smoother cut surfaces, use finer teeth
  3. For best blade life, run in the middle to the fine end of the recommended tooth pitch range

Detroit BAND SAW

What Tooth Pitch Do We Use?

Optimizing Tooth Pitch

To determine the number of teeth in a cut with variable pitch band saw blades, we need to use the <u>average</u> of the pitch to do so:

Pitch	Average
3-4 Pitch	3 ½ TPI
4-6 Pitch	5 TPI
5-8 Pitch	6 ½ TPI
6-10 Pitch	8 TPI
10-14 Pitch	12 TPI

Example: Calculate the number of teeth in the cut for the following: 4” bar stock, using a 3-4 variable pitch blade

- Bar Stock Size x Avg. TPI = # of Teeth in the Cut (4 x 3.5 = 14)
- A 2-3 Variable Pitch blade would have 10 teeth in the cut (4 x 2.5)
- A 4-6 Variable Pitch Blade would have 20 teeth In the cut (4 x 5)
- A 6-10 Variable Pitch Blade would have 32 teeth in the cut (4 x 8)

Detroit BAND SAW

What Blade Speed Should We Use?
Items That Influence Selection

- **Material Machinability Rating** – The lower the machinability rating the slower the band speed will need to be
- **Blade Selection** – The cutting edge (tooth tip) of the blade will govern the speed at which the blade can run (FlexBack = Slowest Cutting, Carbide = Fastest Cutting)
- **Cutting Noise / Vibration** – Cutting noise or vibration is a killer to a cutting edge – if either is present, the speed must be decreased
- **Coolant / Cutting Fluid** – If the coolant is adequate, use the standard cutting chart speeds. When cutting dry, reduce the speed by 40-50%

Detroit BAND SAW

What Blade Speed Should We Use?
Selection Influences

Blade Speed is measured in Surface Feet Per Minute (S F P M)

Remember, when considering blade speed, consider the saw.. If the saw has limited or no ability to adjust speed you must work with what you have!

Another Rule of Thumb

100 – 200 – 300

Hard Materials – set the blade speed for 100 S.F.P.M. to start…(30 Meters)
Med Materials – set the blade speed for 200 S.F.P.M. to start…(60 Meters)
Soft Materials – set the blade speed for 300 S.F.P.M to start… (100 Meters)

… Then adjust the speed as needed to get the required result!

Detroit BAND SAW

What Feed Rate Should We Use?
Items That Influence Selections

Blade Feed Rate is measured in Square Inches Per Minute (S I P M)

- **Material Machinability Rating** – Remember – Measured in percentages of 0% to 100% with 0% being the most difficult. The lower the rating %, the slower the feed (cutting) rate will need to be.

  Example: "Machinability Rating, 15%' = low rating

- **Blade Selection** – The cutting edge of the blade will govern the rate at which the blade can cut.
- **Cutting Noise / Vibration** – Cutting noise or vibration are cutting tool killers. If either is present, the feed rate most often must be **increased** to eliminate

- **Coolant / Cutting Fluid** – If the coolant is adequate, use the standard cutting chart rates. When cutting dry, reduce the feed by 50 to 75%

Detroit BAND SAW

What Feed Rate Should We Use?
Items that Influence Selection

Chip Formation:

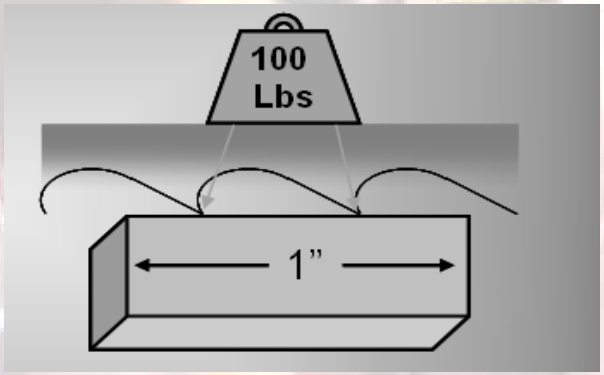
- Light chips cause short blade life
- Heat from rubbing, not cutting, will work-harden some materials and dull the cutting edge
- Chips formed when the blade is cutting correctly have a bright metallic color
- Chips formed when the blade is over feeding have a heavy thick tan or blue color (Stainless steel will not change color)

Detroit BAND SAW

Feed & Speed

What is the relationship between feed, speed & tooth pitch?

Example: 1” solid work piece, 100 lbs feed pressure on the blade

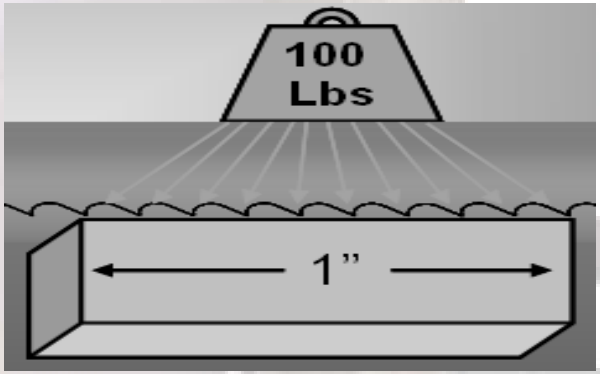


Blade # 1

2 TPI equals 50 lbs. per tooth penetration pressure

Blade # 2

10 TPI equals 10 lbs. per tooth penetration pressure



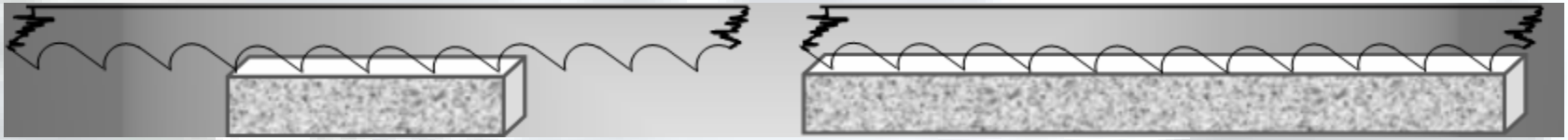
Detroit BAND SAW

The Relationship Between Feed, Speed, &Tooth Pitch

Feed, Speed and Tooth Pitch are directly related.

To change the cut result, change only one variable at a time.

Increasing the Work Size will **decrease** tooth penetration.



A **larger** Tooth Pitch will **increase** tooth penetration.

A **smaller** Tooth Pitch will **decrease** tooth penetration.

Increasing the Blade Speed will **decrease** tooth penetration.

Reducing the Blade Speed will **increase** tooth penetrat

Detroit BAND SAW

Why Do We Need a Cutting Fluid?

Lubricating the cutting edge will reduce the heat that is generated by cutting friction – too much heat in the cut is one of the main reasons for blade failure.

- **A flood of coolant helps wash the chips from the gullets**
  - **Chips become work-hardened in the cutting operation**
  - **If chips are dragged back through the cut a second time, they can damage teeth**

- **A flood of coolant helps cool the blade's cutting edge and saw guides, extending blade life.**

Remember: flood coolant whenever possible and only use coolant where chips are present – do not use coolant on materials that produce a powder, such as gray iron

Detroit BAND SAW

Why Do We Need Blade Break-In?

- **New, sharp teeth are more fragile than lightly honed teeth**
- **Break-in hones the teeth and helps make all teeth the same height**
- **Proper break-in results in less blade stripping and longer blade life**

Break-in Procedure:

1. Set proper blade speed for the machinability and size of material to be cut
2. Reduce the normal feed rate by approximately 50% of the regular rate for the first few square inches
3. Watch the chips
   - ☐ Small flakes = Insufficient feed
   - ☐ Heavy blue chips = Excessive feed
   - ☐ Spring curled no color = Proper feed rate

   (During break-in, it is important that the band always produces chips)
4. As you break-in the blade, graduate the feed rate to 100%

Detroit BAND SAW

Blade Break-In

Helpful Hints

- Recheck the blade tension after making a few cuts
- Never start a blade in an old cut
- Do not stop a blade in the cut without first stopping the feed
- Any break-in (even if it's not the ideal break-in), is better than no break-in at all.

Detroit BAND SAW

Sawing Basis Summary

√ The Blade To Be Used

√ Tooth Pitch- The Number of Teeth in the Cut

√ Blade Speed

√ Feed Rate

√ Cutting Fluid

√ Blade Break-In

Detroit BAND SAW