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Creating an efficient offline band sawing system

Part II : Sawing specifics

By Doug Harris
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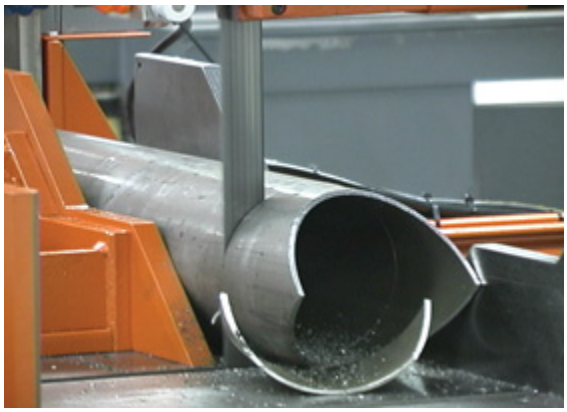
Planning an offline band sawing system can be complicated because it can affect, and is affected by, many interrelated factors. Breaking it down to infeed, sawing, and outfeed helps to frame the planning by breaking it down to three subprocesses. Furthermore, answering 15 pertinent questions can help you tailor an efficient sawing operation to your specific facility and sawing applications.

Editor's Note: This is the second article in a two-part series on offline band saw cutting. Part I, which appeared in the September issue, focused mainly on material handling and included some related information on sawing. Part II focuses solely on saws and sawing.



Answering a few of the most commonly asked questions can get you off to a good start in selecting the optimal saw, blade, and coolant system for maximizing cutting efficiency.

What shapes am I going to cut—square or round?

The shape of your most common workpiece determines whether you should purchase a saw with a canted (tilted) blade or a noncanted blade.

A standard noncanted vertical saw or standard noncanted horizontal saw is suitable for round workpieces. If you are cutting square or rectangular material, a forward-canted blade is advantageous. A canted machine cuts a more consistent area, can cut approximately 30 percent faster than a noncanted machine, and extends blade life. If you are going to cut both shapes, a forward-canted blade is the better choice because you gain all the benefits when cutting square or rectangular workpieces and experience none of the drawbacks when cutting round stock.

What types of cuts do I typically make, straight or miter? How much miter cutting do I do? To what tolerances?

The answers to these questions determine whether you need a horizontal band saw or a vertical band saw.

For straight cutting, a horizontal machine is more cost-effective than a vertical machine. For mitering less than 20 percent of the time, a horizontal mitering saw is the most appropriate choice. If mitering exceeds 20 percent of the saw's work load, a vertical band saw is the best choice because it offers high production rates and versatility at a reasonable cost.

If you perform miter cutting more than 10 percent of the time and you need to cut miters on both ends of the piece (also known as box frame cutting or opposite miters), a vertical band saw is the logical choice. On a

vertical saw, the head pivots around the horizontal axis of the center of the machine, allowing you to keep the vises closer to the work. The closer the vises are to the piece being cut, the greater the stability and accuracy of the cut. Keeping the vises closer to the cutting zone also dampens vibrations that occur naturally during the cutting process.

On horizontal mitering band saws, the saw head moves away from the vises as the head is rotated. Depending on the style and type of machine, the vises can be a considerable distance from where the blade is cutting, allowing more vibration. Vibration destroys blade life and affects the straightness of the cut.

For bundle cutting, what shapes are the bundles—square, hexagonal, or some other shape?

Square tubes are bundled into square- or rectangular-shaped bundles for clamping stability. Round tube typically is bundled in a hexagon that requires special vise jaws for even clamping. These vise jaws must be interchangeable or at least adjustable.

For bundle cutting, how do I square the end of the bundle?

Squaring is not necessary when cutting a single piece. However, if you are going to cut a bundle or a layer of material, squaring is necessary if the cutting tolerances are tight.

One method of squaring the material is to do a trim cut. This is the most common method and requires the least time and effort. Some operators do, however, square the material manually using a sledge hammer. This method tends to bend or distort the material and therefore is not always satisfactory. A third option is to square the material by running it through a squaring station, which takes more time because it must be done off the saw.

What blade size do I need?

Material hardness and size determine the beam strength you need; blade size determines the beam strength.

The harder the material, the more beam strength you need. An example is a 1-in. by 1-in. piece of stainless steel tubing. A 1-in. blade would cut this successfully. However, if the workpiece were a 5-in. piece of stainless steel tubing, the same blade would have difficulty making the cut.

The beam strength of the blade decreases by the cube of the distance between the vises. If the guide spacing between the fixed guide and the movable guide increases from 2 in. to 4 in., the decrease is a factor of 2^3, or 8—in other words, you would have one-eighth the amount of beam strength available from the blade to make the cut. This is crucial because the beam strength and the set of the blade control the squareness of the cut and the amount of deflection as you transition through the material.

As a blade wears it has a greater propensity to cut out. This occurs because every time you raise the saw head, the blade drags against the workpiece. The blade's back side dulls first, so when you try to cut the material, the blade wants to wander toward the front side. The beam strength of the blade restrains the blade from wandering. Also, as you get into the tougher materials, the amount of feed force required to cut the material can increase drastically. It is once again the beam strength of the blade that restrains the blade from wandering.

The larger and the harder the material, the more beam strength is required to make a straight cut. For example, a 1-in. blade is 0.035 in. thick and 1 in. wide. A 1-1/4-in. blade is 0.042 in. thick and 1-1/4 in. wide. A

1-1/2-in. blade is 0.050 in. thick and 1-1/2 in. wide. The larger the blade, the larger the cross-sectional area; the larger the cross-sectional area, the greater the beam strength.

What are the tooth selection parameters?

Tooth selection is critical when cutting tube or pipe because the blade cuts a varying cross section as the cut progresses.

A common guideline is to keep at least three teeth engaged in the workpiece at all times. The larger the cross section, the more force is required. A saw that has a feed rate independent of the feed force helps to ensure that three teeth are engaged in the work at all times.

What are my coolant system options?

After designing the cutting area, you need to analyze coolant system options. The two choices are flood and mist.

Flood-type coolant systems provide better heat transfer, lubricity, and blade life than mist systems do. However, coolant tends to flow through the tubing and spill onto the floor, creating OSHA concerns, EPA concerns, and a general housekeeping nightmare. Using a lift-and-tilt system on the discharge side of the saw to drain the coolant before using a crane to lift the material can reduce or eliminate coolant spillage. Using pans on the material handling tables and transfer trucks prevents getting coolant on the floor; a coolant storage and retrieval system lets you reuse the coolant.

Mist systems can be effective when cutting tubing or pipe. They are cleaner, with less dripping, than conventional flood systems. In addition, a saw used for cutting a hollow workpiece such as a tube or pipe cuts air much of the time, so it requires less coolant than a saw used for cutting solid pieces such as barstock or structural sections. However, blade life can be shorter when using a mist system rather than a flood system.

An Overview of the Entire Cutting Operation

For straight cutting, a horizontal machine is more cost-effective and efficient than a vertical machine. For mitering less than 20 percent of the time, a horizontal mitering saw is appropriate. If mitering exceeds 20 percent of the saw's work load, a vertical band saw is the best choice—it offers high production rates and versatility at a reasonable cost.

Remember that the harder and larger the workpiece, the greater the beam strength required to perform a fast and accurate cut. Greater beam strength is achieved with a larger band.

In addition to the saw selection, pay close attention to your material handling system. Material handling is critical because if you increase the cutting speed but don't make any changes to the material handling system, you won't see any increase in throughput.

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