

A Guide to Fabrication Techniques

Fabricator's Journal

Advantages and disadvantages

Abrasive saw / chop saw

- Can be used with any type of alloy
- Blade is either wet or dry
- Easy to use, requires little set up time
- Not very precise
- Produces heavy burr and kerf

Band saw

- Fastest method for cutting
- Not portable
- Larger and more expensive than a cold saw, an abrasive saw, and portable shears
- Can be fully automated
- Good for cutting shapes
- Vertical band saw can cut curves

Cold saw

- Cuts cleanly but slowly
- Versatile
- Has a fixed blade
- Uses a cooling fluid
- No heat affected zone
- Especially useful for cutting brass, bronze, and aluminum.
- Can cut precision angles

Lathe

- Used on round stock only
- Typically used for making turned balusters and pickets
- Not very versatile
- Only shapes/contours one workpiece at a time
- Cannot add lateral detailing

Shear

- Some electric shears are portable
- Provide a clean cut
- Not as fast as the band saw

Ironworker

- Versatile
- Very applicable to ornamental fabrication
- Doubles as a shear and break press

Cutting technologies II

By Rachel Squires

“Which type of equipment you use for cutting depends on the size of the material and amount of production plus the capacity of the equipment you have,” says Rick Uhl of Christopher Metal Fabricating, Grand Rapids, MI. *“For example, if you don’t have a big enough saw, you use a torch.”*

The type of cutting equipment you use may also depend on the type of metals you cut. *“You cut aluminum almost exclusively on a band saw, using a relatively fine blade, because of the saw’s ability to make a clean and precise cut,”* says Ron Hill of Classic Iron Supply. *“But for cutting steel you’d change to a courser blade, using either a cold saw, a chop saw, or an ironworker.”*

Still other factors may determine what cutting equipment you use, like the type of fabrication you specialize in. A firm specializing in commercial structural stair fabrication would probably invest in more specialized equipment, like a shear or a lathe, than a fabricator who specializes in making custom furniture.

Something else to consider is the size of your shop. For the one- to five-man ornamental fabrication shop *“the essential cutting equipment is an ironworker and a chop saw or cold saw,”* says Tom McDonough of Eagle Metal Fabricators, Ft. Lauderdale, FL.

For those of you who are considering purchasing new cutting equipment for your shop, the following information should help you decide which type of equipment is best for your shop’s specific needs.

Abrasive saw

Abrasive sawing is a basic, manual method of cutting. It is versatile

because it can be used with any alloy. An abrasive saw, or chop saw, uses either a wet or dry circular blade that grinds through the workpiece.

While an abrasive saw is easy to use and requires little or no setup time, it cannot provide a square cut or tight tolerances, and it produces significant kerf and a heavy burr.

“Abrasive saws are dirty and dangerous, spinning at 3,500 r.p.m.’s,” says Pat Thornton of Pat Mooney Inc., a supplier of circular and band saws. *“The only advantage is the equipment is very cheap.”*

Band saw

Band saw cutting is the most common method for cutting rod, bar, pipe, and tubing, and is especially good for large-volume cutting. Some band saws can handle large product bundles, and some can be fully automated and use computer numeric control (CNC) technology.

The blade on a band saw is a continuous band of metal, a belt, available in various tooth configurations that rotates on two wheels. Each configuration has advantages for particular products or applications. Depending on the model’s design, the blade’s approach to the metal may be horizontal or vertical.

Since the product on a band saw can be manipulated around the blade, it is good for cutting a variety of shapes, such as squares, rectangles, curves and circles. Although some band saw models produce a burr and do not achieve tight tolerances, horizontal bandsaws that feed the blade to the material are relatively accurate and do not leave a significant burr.

Cold saw

A cold saw is a metal saw blade that uses a cooling fluid. The blade is fixed (doesn't walk or wander). "A cold saw doesn't leave a burr," Says McDonough. "It's just slower than a band saw, but it cuts cleaner and more precisely." Because it is a cold cutting process, cold sawing does not produce a heat-affected zone, making it especially useful for cutting alloys such as brass, bronze, and aluminum. Additionally, precision angles can be cut using a cold saw.

Lathe

Lathe cutting is only used on round stock and works one piece at a time. "A lathe contours round stock, but cannot add lateral detailing," says Ron Hill of Classic Iron Supply. The stock is held by a collet and is rotated as the cutting tools shape it. A cooling liquid controls the temperature and reduce tool wear. Depending on the cutting tools, kerf loss can be significant.

According to Hill, unless you are making turned balusters and pickets exclusively, lathe cutting is not cost effective. "Unless you're putting out 66 balusters every two weeks, you should really sub out lathe work. You can also buy ready-made turned balusters. But buying your own lathe for minimal lathe work probably won't be cost effective."

Shear

"Shearing, or cutting off, is generally done on flat stock," says Hill. "Although, there are certain machines out there that have special dies that will cut round, angles, molded cap rail, or tubing."

While speed and volume are the benefits of shearing technology, standard size shears are probably better suited for structural work yielding large cutting production runs. "Miscellaneous and structural fabricators who do a lot of stairs and plate work would use a shear," McDonough says. "But shears and press brakes together can cost upward of \$100,000 and run about \$5,000 a year to maintain. Ironworkers, which can dou-

ble as a shear or brake press, are really more practical for ornamental fabricators."

Ironworker

"The benefits of an ironworker are many, from the smallest shop to the largest industrial fabrication facility," says Amy Pieh of Pieh Tool Co. of Burlington, WI. "The ironworker is a versatile machine. It is, in the long run, less expensive to operate than cut-off saws or band saws. Health wise, it is safer to use because it does not emit hazardous iron particles or leave sharp burrs on the cut material and has excellent safety guards, which allow the operators to keep their hands away from the blades."

Ironworkers will bend, punch, notch, and shear flat bar, angle iron, pipe, and solid bar stock. The flat bar shear, angle shear, and punch ram are all key specifications to consider when purchasing an ironworker. "Larger machines will do more, and purchasing will be dependent on what the operators needs are, what they are trying to accomplish, and how thick their wallets are," Pieh says.

When purchasing an ironworker, it is also important to consider throat depth of the punch, the stoke, and the type of pump. The throat depth gives you the capacity to work wider materials. When you increase the size of RAM, the pump needs to increase to support the machine's abilities, therefore increasing the size of the machine. Some machines may have rotating punch stations giving a capacity to put more than one tool in the machine, therefore allowing more versatility without having to change out tooling for a job.

The stroke is the height of the punch or the height of the shear. As the capacity changes, the size of material capacity increases. Again a larger stroke and punch yields larger work.

"Another thing to consider is that some ironworkers offer nicely sized tool tables making them more adaptable in shops," says Pieh.

What to watch out for

- Watch out for burrs on saw blades that can scratch the workpiece
- Make sure blades (and wheels on certain equipment) are properly aligned
- Always check manual for safety information
- Always test equipment with trial cuts before purchasing

Thanks to the following for their help with this article:

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NOMMA Education Foundation (NEF)

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October marks the first anniversary of *Fabricator's Journal*. We hope you find this series of technique articles helpful. Are there any aspects of ornamental fabrication you'd like to learn more about? Do you have some techniques or helpful tips you'd like to share with other NOMMA members? Send feedback to Rachel Squires. E-mail: rachel@nomma.org. Phone: (423) 413-6436.