

Seven Questions to Ask Before Deciding: Should I Ream, or Should I Bore?

Fine boring heads and reamers can both finish established holes, but how do you decide which is best for a particular hole finishing application? As with most things in a machinist's life, the decision is not always simple. Fortunately, the following seven questions should help you navigate your way to the best tool for the job at hand.

1. Is hole straightness a priority for this piece?

We know that standard drills can walk, shifting the location of a hole, even with proactive measures like spot drilling. It happens. That's OK because hole straightness is not paramount to every single component you'll machine.

However, you'll have jobs that will end up in the scrap bin if they can't meet the required hole straightness. For example, size and straightness are key when machining pin and bushing holes, which is when you want to tool up your boring bar. They're a reliable remedy for finishing existing holes that have run off course a bit too much. Boring tools are remarkably sturdy and can maintain the same tool path from beginning to end.

While a reamer tends to "follow the leader" and can be led astray, your boring bar isn't influenced as much by the pre-existing hole's path. If the existing hole is untrue, your reamer may be led astray, but the boring bar can methodically "chip" away at any obstacles that try to push it off course.

2. Do I need to reduce my cycle time for this application?

Have an order with a pressing deadline? Need a competitive advantage to win that contract? If the components have to be completed quickly, boring probably isn't going to be the best option for you. It's pretty simple. Reamers have an advantage over boring tools when it comes to speed. Simply put, a tool with multiple teeth (i.e. reamer) can be fed harder and faster than the single tooth on a boring bar.

Investing in a modular (a.k.a. replaceable head) reamer might reduce production times even further. Solid carbide or carbide-tipped modular reamers can be run about five times higher than HSS. Also, changing out the replaceable head takes seconds compared to replacing the entire tool on the spindle. While a standard chucking reamer costs less than a replaceable head reamer, the quality produced and time saved justifies the investment for most manufacturers and machine shops.

3. Is this run high-volume production work?

Since rapid production is necessary for high-volume hole finishing applications, you'll need to go with a reamer to maintain the cycle speed (see previous section). A reamer's multiple cutting edges allow for much faster feed rates than a boring tool with a single point cutting edge.

Reamers are top-notch when it comes to high productivity and surface finish, but keep in mind that they tend to travel down the path of least resistance. If your existing holes aren't straight enough, you'll still need to establish the required straightness with a boring pass before reaming.

4. Is this a low-volume production run?

Let's face it. There are benefits to embracing one-off requests, short-run contracts and smaller production runs. When manufacturers allow for this flexibility, they can gain business from other

companies with various goals. They could be looking to improve their existing product designs, testing their market with small batches of new designs, or offering customization and exclusivity to their customers.

If you're machining products that are a high-mix/low-volume, it's probably not cost-effective to finish the holes with a reamer. If a production run consists of prototypes, products with variable customization, or short-runs, typically boring tools are your go-to tool.

- 5. Is the hole diameter tolerance tighter or looser than 0.0004" (0.010mm)?** This one is easy to remember. *Bigger than 0.0004" (0.010mm), then bore.* Boring bars remove larger amounts of bulk material at a higher material removal rate (MRR).

With four to ten cutting edges, reamers are designed to remove smaller amounts of material at each pass. This enables a reamer to hold much tighter hole tolerances.

6. Am I machining holes with interrupted cuts?

If your components include key holes, cross-holes and other types of interruptions, boring tools will perform much better for you. Why? There are a few reasons.

- **Chip Control:** A single point tool leaves room for chips to escape while a reamer tends to trap and recut them, causing damage to your tool's lead angle.
- **Cost-savings:** Interruptions are hard on cutting teeth. It's much more economical to index an insert than to replace an entire reamer.
- **Cutting Forces:** When multi-fluted tools like reamers pass through an interruption in a workpiece, teeth exiting and re-entering the *interrupted* section are impacted by the unloading and reloading of cutting forces. These alternating cutting forces vicariously affect the teeth that are machining through the *uninterrupted* portion of the cut too. This causes inconsistent hole size and finish.

7. Is my required surface finish less than one micrometer?

Workpiece material is a big variable when it comes to surface finish, but if the components you're machining require a surface finish of one micrometer or better, then a reamer is usually the best choice. Reamers are engineered to deliver single digit RAs and micro finishes. In fact, you're likely to get surface roughness in the order of 0.2 – 1.0 μm (micrometers) with a modular reamer. Fine boring tools remove more material and generally deliver a roughness between 1 – 5 μm .

You want to "finish" strong. These seven simple questions can help you navigate your way to the best tools for a particular job. If you're machining a more complex part or struggling with any holemaking application, contact a holemaking specialist you trust in your area.