Surviving on Short Runs

By Fred Hautau

E-mail: info@hautau.com

Website: www.hautau.com

"Our average production run is 1.2 cylinders." Said a rep for a leading hydraulic cylinder manufacturer. The challenge is to make money on those volumes. Short runs and multiple changeovers don't require the latest flexible manufacturing technologies or robots to make money. They require a more intelligent use of the basics, starting at the beginning of the process.

In the past, most manufacturers could schedule longer production runs that required only occasional changeovers, so longer setups and more work-in-process were accepted. In today's environment short runs are more common, so setup time must be reduced and scrap minimized to optimize the new workflow.

A major opportunity to achieve time and material savings in the manufacturing of cylinders, cross-tubes and other round tubular components is the cut-to-length operation. Equipment that combines cutting, full tube-end machining plus efficient material utilization can not only provide cylinder makers with a competitive edge, but in today's environment, a life-saving capability.

The processing of mixed long and short tubes presents a special set of challenges. The combined goals of tube cutting, end-machining, optimum use of material and fast setups are difficult to achieve using typical cutting equipment such as saws or conventional lathes.

Rotating vs. Fixed Cutoff Tools

Conventional CNC cutoff lathes use a fixed, single stationary cutting tool. During cutting, the tube rotates, which is noisy and inefficient. This type of machine typically machines just one end of the tube, then a secondary operation is usually required to complete the inside of the trailing end.

"Our average production run is 1.2 cylinders."

More advanced cutoff lathes have a rotating headstock with four tool-slides that allow finish machining of both tube ends in a continuous process. Here the cutting tools rotate around the workpiece. Quieter multiple rotating tools speed the process, reducing cycle times.

By holding the tube stationary during cutting, rotating-head machines eliminate problems associated with spinning tubes such as noise, vibration, and surface marking. Some of these machines have target stops for length adjustment, while more advanced machines use a precision hitch-feeder that allows cutting mixed long or short tubes without setting up special steady-rests or roller supports.

With rotating-head cutoff machines, the tube is chucked on both sides of the cut, and with some machines the tube ends can be positioned independently under servo control after cutoff. This feature allows programmable chamfering, radiusing, grooving and turning on both tube ends.

Weld-prep bevels can be cut on one or both ends of the tube. Plus the leading end of the tube can be faced and machined to eliminate trim cuts. Secondary chamfering or deburring operations are not required on any cut lengths.

If you want to reduce changeover time to a minimum, look for a system that has programmable chucks that will cover the full diameter range of the machine without changeover. Machines that use replaceable collets or chuck pads are setup-intensive and therefore less cost-effective for short runs.

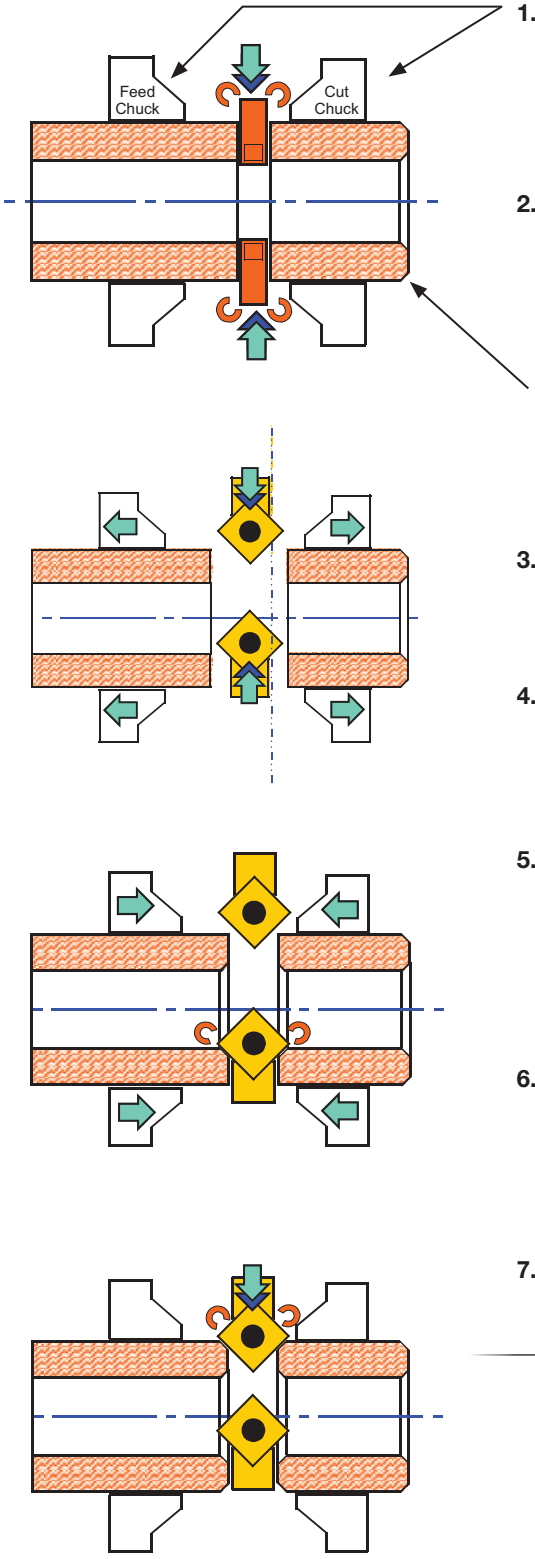
Optimizing Material Utilization

Tubing used to produce the cylinder sleeve or barrel has typically been honed or skived and burnished in full lengths before cutting and so has a high value. Getting the best use of this expensive material is essential to controlling product cost. Material lost due to trimming, drop lengths and unused remnants is often overlooked or is considered to be an unavoidable loss and is factored into the cost of the product.

Purchasing pre-cut lengths from a tube supplier reduces in-house scrap, but this eliminates the flexibility that most cylinder builders need for short runs, low inventory and quick-turnaround times. Plus the cutting house will include their scrap and setup costs in your bill, and if you supply the material, they may have little incentive to optimize material use.

Consider a common production schedule that calls for a number of long cut tubes and that leaves a usable remnant. Ideally, this remnant would be cut into one or more shorter tube products so a minimum amount of material is wasted. But this can be difficult to accomplish with conventional lathe or sawing methods.

First, the different cut lengths must be calculated to leave the minimum drop length. In some cases reducing the long tube quantity and cutting more short lengths is best. If the machine does not have length optimization software to help, calculating the best combination of cuts requires considerable skill and time, while the cutting machine usually sits idle.



Cut & Chamfer both ends at once—here's how …

1. The tube is clamped rigidly by two 6-jaw hydraulic chucks.

   This centers the tube and maintains precise control of both tube ends after cutoff.

2. The cutoff tools (up to two) advance and part the tube.

   Servo-controlled tool feed optimizes tool life and cycle time.

   The leading end of new tubes can be faced and chamfered in many cases. This can eliminate trim cuts and reduce material waste.

3. Both chucks pull back.

   Complete cuts are verified as the tube is pulled apart.

4. The ID chamfer tool advances inside the tube.

   The position automatically changes according to tube ID

5. Both chucks move in. The ID chamfer tool retracts to cut the ID chamfer on both tube ends.

   ID chamfer depths can be different on each tube end.

6. The OD chamfer tool advances and chamfers both tube ends OD's.

   OD chamfer depths can be different on each tube end.

7. The chucks both pull out and the tools retract.

Advanced methods of tube processing are simple, fast and precise.

- *Chamfers are consistent on short, long or mixed length cutting.*
- *No secondary operations required.*

Even with a skilled setup of a mechanical length stop, initial cuts may be out-of-tolerance, so adjustments must be made and scrap is produced. When cutting sequenced lengths, length stops need to be adjusted repeatedly and cut lengths vary as a result. Automatic loaders or programmable stops can help, but these often lack full integration into the setup and cutting process.

Unfortunately, when the setup time associated with reducing the remnant length exceeds the cost benefit, options are to inventory the various remnants to be re-cut later, or scrap them altogether.

Software Solution

New cutting systems include length optimization software that makes it easy to setup length combinations to minimize the scrap length and eliminate stored remnants. Some machines also measure the overall tube length at the loader and recalculate for each tube so that random length tubes can be processed automatically.

Integrated scrap-tracking software can allow you to see a history of scrap generated for each material type. This information can help the operator make sure that the overall loss from trim cuts and remnant pieces is minimized.

Ideal Capabilities

The best approach for producing tubular parts will be one that combines cutting, full tube end machining and efficient material utilization. Ideally, you'll get a system with programmable setup for both product diameter and optimum cut lengths, so idle time is virtually eliminated.

The tube cut-off machine should handle a wide range of diameters without setup or adjustments, functioning as a tube "vending machine." The total time required to changeover both length and diameter should be just a few minutes.

The tube loading and feeding system should accept full bundles or partial length tubes with little or no changeover, so the occasional re-cut piece can be processed with minimal setup time.

Another Option:
Single-End Machining After Cutoff

If obtaining new cut-off equipment is out of the question, another option for producing cylinders in short runs is to use machines specially-designed for tube endfinishing after cutting to length with existing cutoff equipment. Unlike conventional lathes, these endfinishers hold the tube stationary while a rotating boring spindle cuts the tube end profile.

When hand-loading a conventional lathe, the lathe must be stopped, the access door opened, then the tube must be loaded through the headstock and held against an adjustable stop for chucking. Manual chucks are most common, and require a considerable effort and skill to use. Some lathes have powered chucks that speed-up the loading, but these chucks typically require jaw or collet setup when changing diameters.

Single-endfinishers offer distinct advantages over lathes when used for machining cylinder profiles. The tube is quickly and safely loaded through the stationary chuck to a retracting stop that provides a safety barrier between the tube and tooling. The spindle never stops, which saves energy and reduces cycle time. A typical end-finishing sequence may include a length check, automatic chucking, machining and un-chucking, all in just a few seconds.

Endfinishers usually accept quick-change tooling heads that can be preset to cut the most common end configurations. Some have servo tool feed that allows a fast peck-feed motion to control chip buildup. For fastest changeover, it's important that the machine has an automatic tube chuck that covers the full diameter range.

Cost efficient programmable controller allows for three different lengths from the same tube, maximizing productivity and material utilization.

Assuring a Profitable Outcome

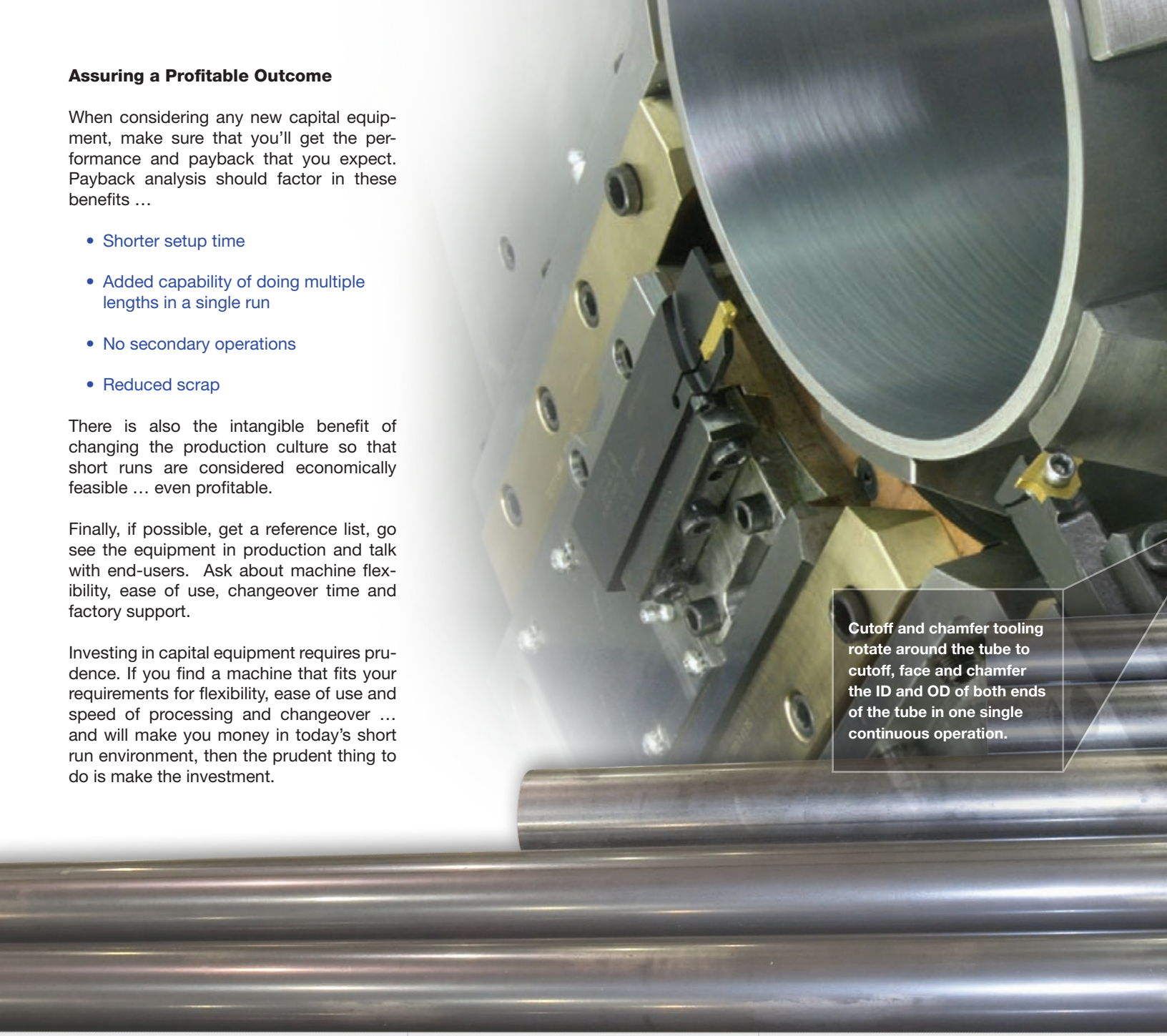
When considering any new capital equipment, make sure that you'll get the performance and payback that you expect. Payback analysis should factor in these benefits …

- Shorter setup time
- Added capability of doing multiple lengths in a single run
- No secondary operations
- Reduced scrap

There is also the intangible benefit of changing the production culture so that short runs are considered economically feasible … even profitable.

Finally, if possible, get a reference list, go see the equipment in production and talk with end-users. Ask about machine flexibility, ease of use, changeover time and factory support.

Investing in capital equipment requires prudence. If you find a machine that fits your requirements for flexibility, ease of use and speed of processing and changeover … and will make you money in today's short run environment, then the prudent thing to do is make the investment.



Cutoff and chamfer tooling rotate around the tube to cutoff, face and chamfer the ID and OD of both ends of the tube in one single continuous operation.

See for Yourself!

For a video demo, visit our website: **www.hautau.com**

For more information, call **765-647-1600** today, or send an e-mail to **sales@hautau.com**.

Made with Pride In the USA

HAUTAU

Best from the inside out

11199 State Rd. 101
Brookville, IN 47012
Tel: 765.647.1600
Fax: 765.647.1620
www.hautau.com