

# Bar Feeders Boost Bottom Line

## Bar feeders may be the most important component in automated manufacturing

With a wide variety of automation choices for consideration when trying to maximize your production on a single-spindle lathe, the bar feeder may be one of the most important choices you make. Many manufacturers, while putting great effort into squeezing an extra tenth of second out of the cycle time on their lathes, may give up great profit potential when choosing the bar feeding mechanism.

In Europe, full-size bar feeders are the rule and short loaders are rare by comparison. In Canada, mostly Ontario and some areas in Quebec, the majority of feeders sold for single-spindle lathes are short loaders, the type that simply feeds spindle length bars into the lathe.

"A large majority of lathes sold over last few years in the Canadian marketplace have been fixed headstock lathes with two inch or larger capacities," remarks Joe Axisa, Canadian regional sales manager for Edge Technologies, a U.S. bar feed supplier based in St. Louis, MO. "Most of these two-inch lathes are equipped with short loaders. Only 15 per cent or so are using 12-ft magazine loaders."

This is an economical way to automate the loading process, but is it the right choice? Our tendency to lean toward what at first seems to be the cheapest product may cost us in the long run.

Your run sizes, types of materials, part diameters, accuracy requirements, your ability to run machines unattended and a number of similar considerations, will help you to determine the type of bar feeder that is best for your shop. "Very simply, you need to do the math," notes Axisa.

### THE SHORT LOADER

Designed with a small footprint, some short loaders still offer many of the features associated with a 12-ft magazine feeder. Short loaders are optimally utilized when running small and medium batch production runs or work pieces with short bar lengths. Most are designed with features that allow easy set-ups and quick changeovers. The maximum bar stock length depends on the spindle length of the lathe and chucking package.

Pre-cut bars are loaded onto a rack, when the previous bar is complete. A mechanism lowers one bar into what is usually an adjustable U-shaped channel. With some models, the bar stock is loaded into the main spindle of the lathe by a linear feed mechanism with a toothed belt and servomotor. This allows for the feeding of the bar stock to a precise position without the use of a fixed bar stop. Upon a command from the lathe, a pusher moves the next bar forward into the spindle positioning it in the chuck, expelling the remnant into the lathe's part bin. Spindle liners are necessary to

accommodate different bar diameters. These liners should be changed every .080 in. of bar diameter variance.

Many short loader software packages include the shaftloading option as well as a sub-spindle "feed-on-the-fly" option with a return and wait pusher feature.

Some short loaders can be equipped with an axial shift device that allows for easy access to the main spindle so the spindle liners of can be changed efficiently. Depending on the model, the moving device may be configured for Z or X axis movement.

The obvious advantages of the short loader are the floor space savings and a smaller price tag. Other issues to consider: while processing the bar, there is no contact between the bar stock and the loading magazine, so whether the bar is round, square or hexagonal, high speed machining is possible with the use of a properly sized lathe spindle liner. Also, with larger diameter bars, the operator need only lift spindle length bars into position, rather than the weight of 12-ft stock, saving a possible injury.

Disadvantages include the need to cut the standard stock to spindle lengths, less unattended run time and the lack of a remnant retraction system.

### THE MAGAZINE BAR FEEDER

The 12-ft magazine bar feeder has the inherent advantage of using standard size barstock and offers a very large capacity for processing parts for many hours without the need for reloading.

Magazine bar feeders generally utilize a two-part, upper and lower, polyurethane guide channel system that is flooded with oil. The bar stock spins in this oil bath during the turning process creating a hydrodynamic effect that minimizes vibration. The rotation of the bar creates turbulence, keeping it in the center of the channel. The higher the rotation speed, the better centralization effect, keeping the bar stock "floating" in a oil bath. A hydrodynamic-type magazine bar feeder can help the lathe to achieve optimum cutting conditions.

The typical modern design for a magazine bar feeder is a double-pusher design that pre-feeds the bar into the spindle before the secondary pusher moves into place. The bar is gripped and the second pusher thrusts a collet onto the back end of the bar. The collet is attached to a rotating tip that allows the bar to turn freely in the guide channel while being supported from the rear. Most brands will support the bar at the front of the feeder with bushing blocks or a roller system.

After each part is cut off, the chuck opens and the bar feeder automatically advances the stock to the proper



length for the next part. When the bar is exhausted, the bar remnant is withdrawn to the central area of the magazine and a gripper extracts it out of the bar stock collet and deposits it in a collection basket. The channel opens, a new bar is lowered into place and the process repeats.

"Larger diameters represent more mass and more vibration when turned at higher speeds," explains Axisa, "This needs to be taken into account when choosing the correct magazine feeder for an application."

If we are going to maintain the efficiencies of a 12-ft magazine feeder on our high-volume production jobs and take full advantage of current high-speed technologies, the magazine bar feeder must be engineered to stabilize a large amount of spinning mass at high rotational speeds. The feeder must also be built to absorb the vibration and harmonics from a rotating bar subjected to accelerating and decelerating speed levels during the cutting process.

A strong base is important to support the magazine and actuation mechanisms without deflection and have the ability to dampen vibration from imperfectly balanced barstock. Weight can be the critical element. Heavier bar feed machines fair better under these circumstances.

An example of a manufacturer's consideration for this need can be found in German manufacturer FMB's larger 2-in. and 3.1-in. capacity units, which are built around a massive, single-piece, 13-ft cast iron base that serves as the backbone and foundation of the bar feeder. Improving performance in the larger-capacity, 12-ft magazine systems is more of a priority because the speed impediments are more prevalent in stock sizes more than 1.5 in. These larger diameters are available on most current machine tools.

Many of the larger diameter applications run cold rolled sheared steel or hot rolled material. "When bars such as these have straightness problems, and are used with an application that requires a 12-ft magazine bar feeder to keep up with the lathe's output, 80 to 90 per cent of the time the customer has chosen an FMB. Those units have the mass to handle the vibration when running at the necessary speed," Axisa explains, "Customers want a heavy bar feeder to take the abuse that type of stock is going to dish out."

In some smaller companies, the channel changeover is an issue and they may do job changeovers once, twice or three times a day. This may result in valuable time lost. When stock size changes are required on a frequent basis, quick-change guide channels help keep production rate high. "If a (guide channel) changeover takes 30 minutes or more, customers will shy away from those models," Axisa says, "The FMB is popular, the channel change is quite quick."

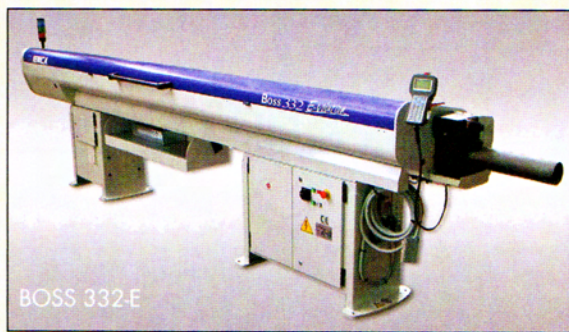
Many jobs need to changeover less often, so the bar feeder can be dedicated to a particular size material. In these companies the application may be a production run so the guide channel can be sized closer to the stock size for the longer run.

Capacity is an issue when considering 'lights out' production. The lack of an operator on site demands a certain confidence that the automation system houses reliable electronics and is hardy enough for prolonged unattended operation.

Many 12-ft bar feeders can be fitted with special machinery to add additional run time before an operator needs to re-load stock. "Some customers in the Canadian market see

### lemca BOSS-E series

The new BOSS 545-E bar feeder from lemca of Italy is designed for fixed headstock style lathes. It boasts a rugged design and rapid changeover time (under 30 seconds). The patented guide channel on this bar feeder is completely closed during machining cycles. The BOSS 545-E has an adjustable feed speed of 700 mm/sec and an adjustable return speed of 950 mm/sec. It can handle round bars 5 to 45 mm in diameter and hexagonal bars 5 to 36 mm in diameter. Depending on the model, the machine can take bar lengths ranging from 3,200 mm to 4,400 mm.



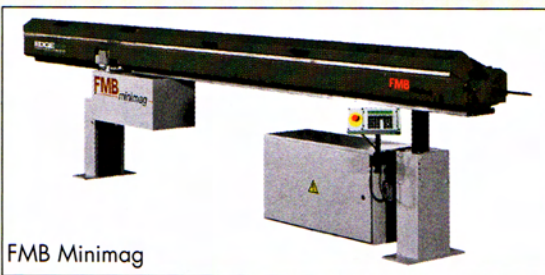
The BOSS 332-E is built for use on sliding headstock lathes. It can take a round bar ranging from 3 to 32 mm in diameter, hexagonal bars from 3 – 27 mm in diameter, and bars up to 3,200 to 4,400 mm in length. Like the 545, the BOSS 332-E has a speedy changeover time (under 30 seconds). It also has an adjustable feed speed of 700 mm/sec and an adjustable return speed of 950 mm/sec.

### Tornos Robobar MSF-316/6

The new Robobar MSF-316/6 bar feeder is made by Tornos of Switzerland. A compact bar feeder for multi-spindles, the machine offers simplified loading and compact size, among other features. The Robobar MSF-316/6 has a FANUC control and a maximum bar speed rotation of 6,000 rpm. It can handle a maximum bar length of 3.1 m. This system weighs 1,070 kg.

### Edge Technologies – Patriot 338 and 551 and FMB Minimag 18

Edge Technologies of St. Louis, MO, offers the Patriot 338 and 551, both newly developed automatic, magazine-equipped bar feeders. The 338 and 551 can handle round, square and hexagonal bar stock. Both machines feature an adjustable forward feed rate of 750 mm/sec and an adjustable return feed





## MACHINE TOOLS / BAR FEEDERS

rate of 1,000 mm/sec. They can handle bar lengths up to 3,810 mm and bar diameters ranging from 5–51 mm.



The Patriot bar feeders come equipped with features such as double pushers, a dual anti-vibration bushing device, touch screen controls, quick change guide channels and Swiss package adaptor components. The two-pusher system reduces the overall length of the unit by as much as four feet. A short pusher pre-feeds the bar then retracts. A second full length pusher lowers into position to continue the feeding process.

Edge Technologies (which is a branch of parent



firm, Hydromat) also distributes bar feeders made by German company, FMB. One of the latter's more prominent products is the Minimag 18, a compact bar loading feeder that automatically loads round, square or hexagonal bars into CNC lathes. The machine can process bars ranging from 2–18 mm in diameter. It has an adjustable feed rate that goes from 0–300 mm/sec, an adjustable forward feed rate up to 300 mm/sec and a return feed rate up to 600 mm/sec.

### LNS America Inc. Hydrobar Express 332

The Hydrobar Express 332 automatic bar feeder from LNS America is designed to feed bar stock into Swiss or fixed headstock lathes. Depending on the model, the Hydrobar Express 332 can take bar stock ranging from 2,300–3,850 mm in length. Partial changeovers can be done in two minutes while full changeovers take eight minutes.

The Express 332, "is completely self-contained and neatly stores all changeover components within its enclosure," states LNS literature. Oily parts drain within this storage area and the oil is filtered back into the system, with no fuss or mess.

the benefit of not having to load the standard magazine every 30 or 40 minutes," says Axisa, "they can add extended magazines that double the capacity and some have even added 2.5 ton bundle loaders to the bar feeder for extended runs."

Where floor space is an issue, consider a shortened version of a magazine feeder. There are many 6-ft versions of the same models that feed the standard 12-ft stock. You will need to cut each 12-ft bar once, but you will gain all the advantages the hydrodynamic magazine feeder has to offer, yet in a smaller footprint.

### SWISS TURNING

Bar feeders for today's Swiss style lathes need to be more versatile than ever, with many applications now as large 38 mm and as small as 0.8 mm. Today's magazine feeders offer this range with advancements in bar support technology.

Some manufacturers use a roller steady rest system at the front of the feeder. These devices feature adjustable polyurethane rollers that fit tightly around the diameter of the bar during the turning process, eliminating most of the vibration with larger stock sizes and acting as an accurate guide for the smallest stock. With some models, bushing blocks replace the rollers for hex and square applications.

In a relatively new development, both the Minuteman 320 and Patriot 338 from Edge Technologies have a set of rollers that attaches to the lathe's headstock and moves with the Z axis during cutting operations, creating a dual anti-vibration device. This stabilizes the bar stock between the guide channel and lathe spindle, maximizing RPM potential.

These support mechanisms usually work in conjunction with a synchronization device. The synchronization device creates a mechanical coupling, linking the lathe headstock's Z-axis travel to the bar feeder's pusher to ensure synchronous movement and no loss of connection between the bar stock and collet-pusher. On most Swiss applications, a telescopic nose will be installed on the rear of headstock for full bar coverage.

In the Canadian market about 30 per cent of Swiss lathes are outfitted with single tube feeders. Tube feeders are also oil-filled hydrodynamic units that are well suited for applications that require short part lengths and short runs. The feeder needs to be manually reloaded after each bar is used, so labour needs to be a part of the purchasing equation. The units are lower cost than a magazine feeder but downtime may be an issue. Machine productivity loss with each bar change can take place when a bar runs out and the machine sits idle while waiting for the operator, who may have his hand full at another machine, to become free to load another bar. If the choice is made based solely on machine price without a long-term calculation, the longer term payoff is missed, and a we may leave money on the table.

### ECONOMICAL FEEDERS

There has been a recent trend in the US for manufacturers to turn to the least expensive bar feeders for their new purchases. The weak dollar compared to the strong euro has driven prices of European equipment higher, giving Asian manufactured bar feeders a competitive advantage in the US and Canada.

Competition for this lower priced bar feeder market in the US has accelerated the pace of technological advancements.



The quality of the economical bar feeders continues to rise as prices fall. "Edge Technologies has recently introduced the Patriot Series, two economical magazine bar feeders, a 3-38 mm unit and a 5-51 mm version," explains Keith Crowther, president of AMT Machine Tools, Ltd., a dealer based in Toronto, "They rival some of the better, higher-priced feeders on the market and we should see this type of equipment getting market share."

For the most part, the Canadian buyer has yet to change his way of thinking. Market price is not as sensitive as it is in the US. "Customers seem to want quality equipment that will pay off in the long haul," says Crowther, "the Canadian buyer is sophisticated, and wants the best product that money can buy and will spend now to get a return later." Despite the burgeoning low-cost feeder market in the US, where our bar feeder equipment originates, Canadian users continue to purchase quality units. "There have not been a lot of low-cost bar feed equipment with the deals I have been involved with," Axisa adds, "at least not yet."

#### SERVICE

Service is a major issue for parts manufacturers because as we all know, when the bar feeder is down, the lathe is down...and that costs money. Users can naturally assume that these products will come from the US through a Canadian dealer. There are dealers in Canada, like AMT Machine Tools Ltd., that does bar feeder repairs and installations. Major service issues will usually involve help from the States, either in the form of a technician on-site or phone support, so it would be wise to do some research on the distributor's service practices.

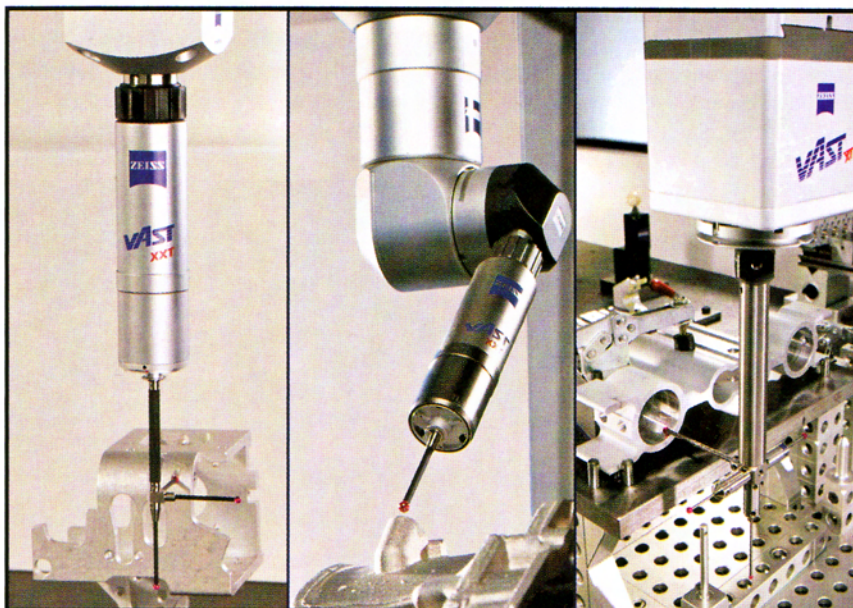
#### DO THE MATH

Knowledge about the different bar feeder brands, their features, and knowing whether a 12-ft magazine bar feeder is the best for your application or if a short loader will do the trick, will make the difference in maximizing your profits. A good sales representative will ask the right questions and help you make the right choice. What is your remnant cost? What is the cycle time, part length, cut off

width and what is your typical production run, short or long? When an application doesn't require maximum RPM, you may be better off going with a 12-ft magazine bar feeder and still achieve the RPM you need, and in the end be more efficient.

Get help from a knowledgeable sales professional and make an educated decision on where your cut-off point is for going from a short

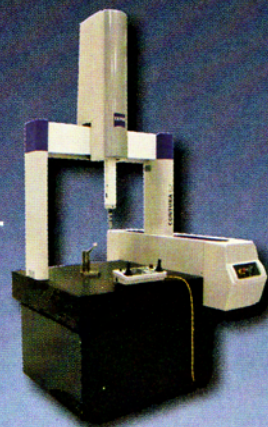
loader to a 12-ft magazine bar feeder. Or maybe a single tube feeder is best. Your final bar feeder purchase decision isn't the end. It's the beginning—the beginning of years of production and many tons of material that will pass through your lathe. Make the right bar feeder decision to increase your productivity and maximize profits. Simply put, you've got to "Do the math." **CM**



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