# The Importance of Innovation in a Down Economy

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Although it might seem strange when demand is down, now is the best time to invest in product development initiatives that improve productivity. The reason why it is so critical to focus on productivity at this stage of the economic cycle is that although many businesses currently have excess capacity, reduced inventory levels are making production scheduling a hand-to-mouth exercise, and when the current economic situation starts to improve, manufacturers will need innovative solutions to keep up with demand.

Only companies who have learned the importance of constant innovation – even in a down economy – will be able to provide productivity enhancing technology to enhancement-deprived customers. As part of a clearly defined growth strategy, these companies never let an economic slump prevent them from improving their product offering. The best manufacturers are also improving their supply chain – from manufacturing to packaging and distribution – to increase the effectiveness of their organization's internal operations, and to improve the accuracy and efficiency with which products are delivered to their customer base.

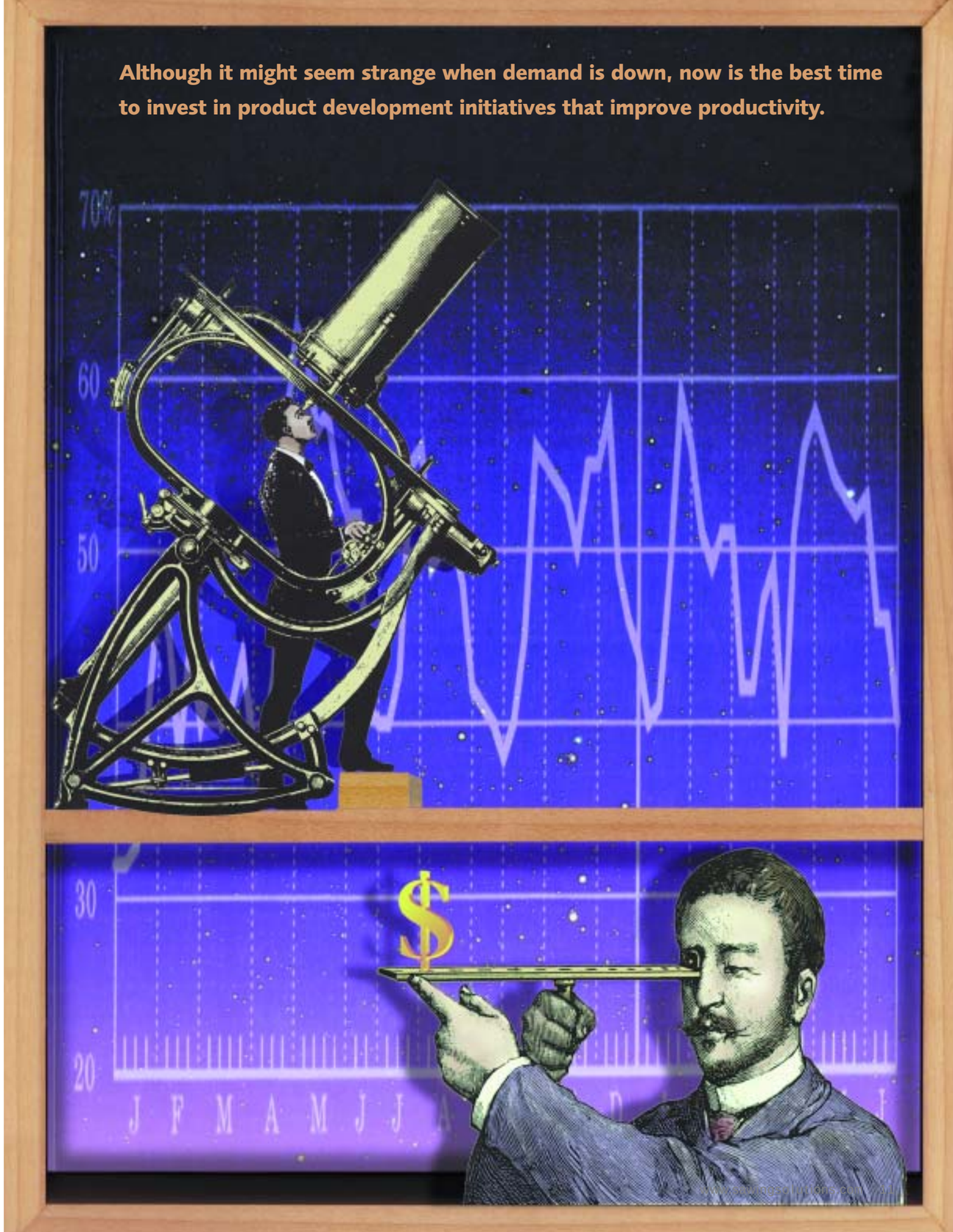
## Saw Industry Positioned for Growth

To keep pace with a rapidly changing manufacturing environment, the process of band saw blade production has continued to evolve. Early band saw blades were manufactured through a "hobbing" process, whereby teeth were added to carbon steel strips by feeding the blade through a hobbing machine. This manufacturing method would present problems when the hobbing machine would experience what is called a mechanical run-out (i.e., a tailsteady not being clamped securely, a worn or loose bearing in the tailsteady, or a worn or undersized location diameter on the hob arbor).

In later years, the blade manufacturing process was made more consistent through the use of milling techniques. Milled blades offered considerable improvements in consistency and cutting rates, however, it soon became clear that productivity was ultimately limited by the hardness of the tooth tip. The nature of the band saw application prevented tooth tips from becoming substantially harder than the blade body because the blade body had to be able to withstand the fatigue generated by the looping path around the drive wheels and through the band saw guides.

A solution to this problem materialized in the late 60s when bi-metal band saw blades were developed. To improve durability, bi-metal blades combined the hardness of a high speed steel edge with the flexibility of an alloy backing material. With the inclusion of strategically aligned spaces between each high speed tooth tip, the blade could sustain a substantial amount of abuse in most cutting environments. Today, a limited number of manufacturers have been able to use tooth grinding technology to bring the performance of bi-metal blades to the absolute limits of its potential.

If the combination of high speed steel and a flexible backing produced a high performance saw blade, what might the combination of carbide tooth tips and a flexible steel backing yield? In the simplest terms, this combination would yield a more durable and better performing saw blade. Although forming a reliable connection between carbide inserts and the flexible steel backing is no easy task, especially within the constraints of the narrow kerf requirements of a band



saw blade, when it is done correctly, the results can be impressive. When run properly on a good machine, carbide tipped blades have the ability to substantially outperform regular blades on all durability and functionality evaluations. Future advancements in carbide tipped blade technology will continue to take band saw blade functionality and strength to the next level.

### Increasing Productivity

Band saw blade manufacturers are meeting productivity challenges today by employing inventive product development strategies. By experimenting with new materials, surface enhancements and heat treating techniques to extend blade life and enhance product versatility, the best band saw blade manufacturers can help customers significantly improve the efficiency of their sawing operations. Some blade manufacturers are taking advantage of the latest developments in 3D computer-aided design (CAD) and other innovative design technologies to accelerate the product development cycle. Progressive blade makers also realize the importance of providing their employees and customers with training in both traditional instructor-led settings and via the Internet through e-learning technologies.

### 3D CAD Making an Impact

Traditionally, two-dimensional CAD programs were used to create rough new design concepts, which were then prototyped and sorted in the field through trial and error. Evaluating design prototypes in the field is a time and resource consuming process that often yields ambiguous results. In their efforts to shorten the development cycle, top product designers have embraced the solid modeling features of the latest 3D CAD software applications. These powerful tools allow for new designs to be virtually proven up front. Time-consuming field testing is no longer necessary for sorting ideas, but is used instead for final design confirmation only. Using 3D CAD packages, engineers can now design and model tooth geometries and then view and quickly manipulate them in multiple orientations and formats.

Solid modeling technology allows blade designers to optimize both tooth profile and set configuration for specific sawing applications in the most cost- and time-effective manner. Machining simulation technology allows ideas for new blades to be tested in virtual (computer-based) cutting applications. Chip loads, mechanical stresses, thermal distribution and chip morphology can be estimated before a new design is actually prototyped. Once promising geometries are identified, three-dimensional models are then developed and fine-tuned using finite element analysis (FEA) tools. FEA technology simulates all of the stresses a blade will encounter during the cut, and helps to identify the design's weakest points. Based on this information, engineering resources are then concentrated with pinpoint accuracy on the elements of the blade's construction that need the most attention.

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Once the design process is complete, blade samples are then manufactured to precise specifications. In order to further understand a new tooth design concept, blade samples are tested in various applications using sophisticated measuring techniques to monitor the cutting forces, in all three planes, that will put stress on the blade during its use in the field.

The use of video microscope technology allows manufacturers to zoom in on the cutting process to further analyze chip formation in super slow motion. Scanning electron microscopy, X-ray diffraction (XRD) and X-ray fluorescence (XRF) techniques are also used to dissect blades after initial testing has been performed to assess the viability of new designs and materials. Advances in blade geometry through FEA and rigorous computer modeling allow thousands of virtual tests to be performed before any metal is actually cut. Blades that look promising in computer evaluations are turned into reality and tested in both a manufacturer's test center and in the field.

### Advancements in Coating Technologies

Although the benefits have been proven through experience with smaller cutting tools such as drills, end mills and inserts, the various processes required to apply coatings have been difficult to adapt to larger cutting tools such as band saw blades. Chemistry, application method, surface preparation and fixturing are all critical in the coating process. The introduction of harder tooth edge materials, and improvements in manufacturing technologies such as grinding, are helping surface treatments become increasingly feasible and more important in the design of the most durable and fastest cutting band saw blades.

Surface treatments that provide improved hardness and toughness to the tooth edge enable the blade to run at higher speeds and feeds by protecting the tooth from excessive abrasion. Applying protective coatings results in a significant increase in productivity without decreasing blade life. In addition to vacuum-based hard coatings, advancements in non-vacuum-based coatings are also being studied for their lower investment costs. These studies have included improved versions of carburizing, nitriding, boriding and carbo-nitriding. Furthermore, semi-vacuum-based technologies and duplex processes are being studied for specific applications in the band sawing industry.

Although several attempts have been made in the past to deliver the benefits of coatings to the band saw industry, early adopters of this technology should not be discouraged by any mediocre results experienced with blades that were introduced before all of the challenges related to surface preparation were resolved. Now that manufacturers have been able to address these issues, the second generation of coated band saw blades is showing tremendous potential as organizations work diligently to maximize cutting rates and extend blade life with a broad spectrum of application specific coatings. Some of these advanced coatings include Titanium Nitride (TiN), Titanium Aluminum Nitride (AlTiN) and Titanium Carbonitride (TiCN). Multi-layer combinations of these coatings can also be customized for specific production cutting applications.

### The Future

Sometimes, though, the biggest advancements in band saw productivity come from something other than machine or blade technology. Two pertinent examples are improved preventive maintenance programs and operator training. Knowing what blade to use and how to set feeds and speeds are the secrets to achieving the lowest cost per cut. In addition, if your machine is not in top working condition because of a lack of preventive maintenance, you might not receive the best possible results. To alleviate these problems, some blade manufacturers offer preventive maintenance programs to their customers at no charge. Other companies rely on third-party supply services to provide their customers with various levels of preventive maintenance training.

In another effort to improve productivity, some manufacturers are using web-based technologies to extend the reach and effectiveness of traditional in-plant training. Web-based training creates a virtual classroom where operators with any level of experience can brush up on sawing techniques at their own pace and in the comfort of their own office, simply by logging into the manufacturer's web-based training program and following instructions. Many studies have shown web-based training to be as effective as traditional instructor-led courses at improving work performance. Also, not having to send your people to a remote location for training can have a positive impact on the overall productivity of your organization.

### The Time is Now

As discussed throughout this article, the band saw blade industry understands the importance of product innovation in a down economy. Focusing valuable resources on productivity, regardless of the industry in which you are involved, will work to your advantage when the clouds begin to lift and the sun shines on an improved economy.❖

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# Nicely's Cyclical Industry Analysis

Ronald E. Nicely, a Pennsylvania-based business forecasting consultant, publishes a monthly newsletter that analyzes market and industry trends and forecasts. In his July 2002 issue, Nicely reports that the GDP is projected to end 2002 up by +2.7%. Based on this and other historical data Nicely forecasts that continued growth in the overall economy will start to have an impact on manufacturing. He explains that Total Industrial Production will finish 2002 with a slight decline of –0.2% and recover to +3.9% in 2003.

For example, new orders for Domestic Metalcutting Machine Tools, as reported by AMT and AMTDA, were down –31.4% year to date compared to last year. Nicely explains that it will be late in 2002 before solid growth will begin and although 2002 will still be negative overall, we'll see positive growth occurring in 2003.

The following graph is a representation of the current cyclical status of all the major segments that influence Metalworking Product Billings. Based on data at the end of June 2002, all but two of the segments are currently in the negative portion of the cycle. With four segments now in the Decelerating Decline Phase and only two in the Accelerating Decline Phase, you should be seeing some slight month-over-month gains in your sales. In 1998, the majority of these segments were in the positive position in the cycle — generating very strong domestic orders and billings. It will take over a year to have all, or at least a majority, of these segments move into the positive area of the cycle. Until that occurs, look for only slight gains in your orders and billing activity.

For more information on Nicely's Cyclical Industry Analysis, call Ronald Nicely at (724) 537-0228 or email him at nicelyguy@msn.com.