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BY MIKE PRINCIPATO

Save the whales and manufacturers

Here's my full disclosure, even at the risk of an e-mail box full of snickering insults from regular readers who may be shocked by this admission: As an avid outdoorsman, I'm a bit of a tree hugger. And I think executives and owners of manufacturing companies ought to be as well.

No, I'm not ready to set sail with Greenpeace or picket an oil company's corporate offices. But I have, over recent years, developed a healthy respect for Mother Nature and a better understanding of the tiny, yet negative impact my entrepreneurial and personal lifestyle has on her. So, from the heating and cooling system I installed in my new building to my personal driving habits, I'm a lot more conscientious than I used to be about energy consumption.

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For example, I used to drive a Lincoln Navigator. Although the bling of several tons of black sheet metal and chrome might be the look an NBA star is going for, my new Mercury Mariner hybrid SUV gets twice the gas mileage and makes me feel, well, more socially responsible. I'm not deluding myself about the relative insignificance of downsizing my SUV. I'm fully aware that the 800 gal. of unleaded I'll save this year will be eagerly sucked up by somebody else's fossil-fuel burner or by a fleet of scooter-borne Chinese workers. But I can only control the efficient use of environmental resources in my itty-bitty corner of the universe—not everybody else's. When it comes to energy management on a national scale, that's the job of legislators in Washington, right?

Too bad, they have done nothing, until recently, about one of the most important energy issues of the day: the continuing government-imposed moratorium on natural gas and oil exploration off U.S. shores. Specifically, I'm talking about a tract of ocean floor more than a mile beneath the surface of the Gulf of Mexico known as Lease 181. You're going to hear more about this patch of federal property over the next year or so as legislation winds its way through Congress in a largely GOP-driven effort to open Lease 181 to drilling.

Why should you care? Because for 25 years the moratorium has prevented tapping into enough natural gas and oil to put a serious dent in America's energy crunch—enough natural gas, according to the National Association of Manufacturers, "to heat 100 million homes for 60 years and enough oil to drive 85 million cars for 35 years."

The oil and natural gas is in what's known as the outer continental shelf, which starts 3 miles from the U.S. coastline and extends 200 miles offshore, where U.S. jurisdiction ends. By all accounts, U.S. energy firms have the technology to extract these natural resources from the OCS in a responsible and efficient way. Meanwhile, U.S. manufacturers pay more for natural gas than any other developed nation.

We all know that just because you can do something doesn't mean you should. I'm not advocating that the extraction of natural resources from the OCS should occur without a better overall, and more judicious, use of current energy sources. Free enterprise is, as usual, already taking care of that. The rising cost of all fossil fuels has prompted the development and mass production of more fuel-efficient vehicles, heating systems, appliances and countless other consumer and industrial products.

Ironically, eco-consciousness is the reason natural gas is, for many, the energy source of choice. Meanwhile, despite one of the warmest winters in history, natural gas prices are still expected to climb, while outdated laws prevent trillions of Btu of the stuff that's resting right under our own watery turf from being used to help power the U.S. economy.

Call me crazy, but I thought the nation's laws were supposed to protect the nation's interests, not those of our competitors.

Fortunately, some clear-thinking lawmakers introduced legislation, H.R. 4761, to provide for exploration, development and production activities for mineral resources on the OCS. The Deep Ocean Energy Resources Act, as it is known, was approved by the House on June 29 and at press time was being considered by the Senate. Being a "less is more" kind of guy when it comes to the government, I don't normally endorse bills. I'm making an exception for this one, and think you should, too. Without more energy exploration, U.S. manufacturers are going unarmed into a global energy gunfight.

About the Author

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A bird's eye view of lean

BY STEPHEN HAWLEY MARTIN

To the uninitiated, the lean enterprise movement means simply doing more with less. They think this is accomplished by having everyone work harder. They are wrong. Lean means doing more with less by having everyone work smarter.

People who work in true lean enterprises are significantly happier with their jobs, on average, than those who work in traditional businesses. Why? Primarily because they are empowered to make decisions rather than wait for approval from someone higher-up. Lean means people have more control over their jobs and destinies.

Lean enterprises are distinguished by six key attributes.

1. The workplace is safe, brightly lit and immaculately clean.

Have you ever seen a "clean room" in a computer-chip factory or hospital surgical supply company? That's what lean enterprises strive for. At a manufacturer, the grease and oil drippings must go, because a clean environment is not only more pleasant to work in, it helps produce a mind-set that results in top-quality products.

2. The manufacturer makes products on a just-in-time basis based on customer demand—not to forecast.

Lean enterprises make products in continuous-flow production lines, which they schedule by customer demand using pull-scheduling techniques. This requires being able to convert lines quickly from one product to another or to easily change configurations based on output requirements that can change daily or even hourly. Ultimately, companies must be able to quickly set up and convert lines.

3. The company builds the highest quality possible (Six Sigma) into its products and processes—it does not inspect it in.

The company programs equipment to detect defects. It uses mistake proofing extensively. It finely hones root-cause, problem-solving skills. Each person is responsible for his own work, making quality inspectors obsolete—they aren't needed because every employee is an "inspector." Also, design and process engineers build quality into the design of a product and into the process used to make it.

4. The organization operates via empowered teams, not traditional management hierarchy.

A lean enterprise empowers teams on the shop floor and throughout the organization to make key decisions. When someone spots a problem, the team decides how to fix it. If a worker calls in sick, the production team decides how that job will be covered. The team never needs to call in management. In an assembly operation, for example, the company obligates workers to stop the line if they see a defect, and the line remains shut until the problem is fixed. This would be unthinkable in most assembly plants, where only the general manager can authorize such an action.

5. Workers provide feedback, visually present other information and freely share ideas.

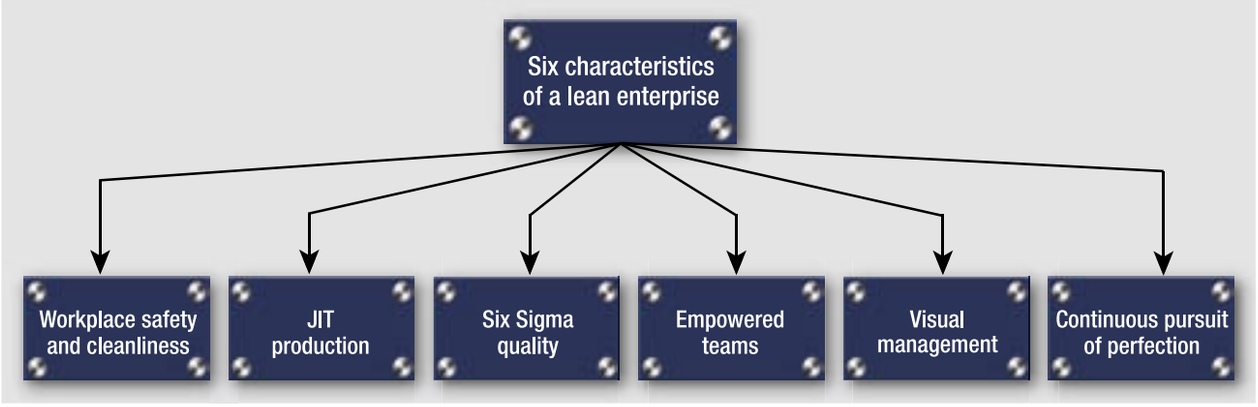
A baseball player can look up at the scoreboard at any time and see exactly how the team is doing and how many runs it needs to score to win the game. The same is true for a lean production team. Prominently positioned scoreboards display goals for the day, and progress toward those goals is updated hourly. Employees freely share ideas on overall company performance in meetings from the boardroom to shop floor.

6. The pursuit of waste reduction never ends.

"Simplify, simplify, simplify!" is the battle cry. The quest for improvement has a starting point but not a finish line. The core idea is that an organization eliminates any and every activity or expense that does not, in the view of the end user, add value. This includes all company functions and processes—not just unnecessary or redundant work on the factory floor. Elimination of inventory, for example, is especially critical since inventory tends to hide manufacturing and distribution bottlenecks that must be identified and opened up. The lean initiative considers moving goods, parts and components in and out of storage wasteful.

Lean enterprises enjoy a number of strategic advantages over nonlean competitors. First, a lean manufacturer is typically the low-cost producer in its industry. This allows it to set the market price, as lean-producer Dell Inc. has done in the PC world.

What makes a lean producer low cost? Based on this author's experience, lean manufacturing often requires half the space and 25 to 40 percent less direct labor than mass manufacturing. Inventory is often cut to a 2- or 3-day supply, freeing up cash flow.



S.H. Martin

About the Author

Stephen Hawley Martin is the author of several books. His newest, from which this article was adapted, is called "Lean Enterprise Leader: How to Get Things Done without Doing It All Yourself." For additional information, visit www.leantransformation.com.

Tools of the lean trade

Lean tools are proven practices that help companies move closer to the ideal. The following are definitions for some of them.

- **Error Proofing:** Also known as poke-yoke or mistake proofing, it involves the redesign of equipment or processes to prevent problems from occurring or moving onto the next step.
- **5S:** Adapted from five Japanese words that start with "s" but have been rewritten as sift, sweep, sort, sanitize and sustain. 5S helps a company organize what it needs and eliminate what it doesn't. This helps to quickly identify problems.
- **Five Whys:** A method of obtaining a problem's root cause by asking five times why the problem occurred and then why did that cause occur.
- **Kanban:** A signal, often in the forms of cards, that a downstream process can use to request a specific number of a specific part from the upstream process.
- **Kaizen:** A structured process to engage those closest to the process to improve both the effectiveness and efficiency of the process. Its goals are often to remove waste and add standardization.

Information provided by the Lean Learning Center, Novi, Mich. For more information, call (248) 478-1480 or visit www.leanlearningcenter.com.

Down-hole device

BY BILL KENNEDY,
CONTRIBUTING EDITOR

Sterling Machinery Co. Inc. makes a number of variations of a down-hole drill component called a backhead. (Down-hole drills are used in the construction, oil and gas drilling, mining and other industries.) One end has a tapered API thread to hold the drill bit, while the other end is threaded so it can screw into the drill casing.

In the first step for a typical backhead, programmer David Harley redrew the customer's part drawing and then programmed the machining operations in Esprit CAD/CAM software.

Sterling made the part from a 6"-dia. × 18¾"-long 4340 steel bar, heat-treated to a hardness of 295 to 321 HB. Using a hoist with a magnetic grip contoured to grasp the bar's cylindrical surface, Sterling placed it in a 3-jaw chuck on a Mori Seiki SL45 CNC lathe.

The first operation was facing and preturning the bar's OD to remove scale. A Valenite VP1510 coated carbide CNMG-543 insert turned 4" of the bar at 350 sfm, 0.018 ipr and a 0.030" DOC. Then, following center drilling, a YG-1 1⅜"-dia., coated carbide spade drill, run at 236 rpm and 12 ipr, drilled the bar axially to a depth of 2.5".

After the part was turned around in the chuck, the previously used CNMG insert rough-faced and profiled the OD at the same speed and feed but at a 0.200" DOC, leaving 0.030" for a finish pass. The shop performed finishing with a DNMG-432 insert run at 400 sfm and 0.010 ipr. Next, on the 3½ in./ft. taper profile just finished, a Kennametal grade-KC5010, NDC-3040R3 Top Notch cresting insert created 3¾" of a 5-tpi API thread. A G97 canned threading program kept the spindle speed steady at 300 rpm, feeding at 0.2 ipr and requiring about 11 passes at varying DOC. Tolerance on the tapered thread was ±0.005".

In the first step for a typical backhead, programmer David Harley redrew the customer's part drawing and then programmed the machining operations in Esprit CAD/CAM software.

After center drilling, a special 18½"-long × 1⅝"-dia. Lumco Manufacturing drill with a TiAlN-coated spade blade drilled the part axially at 200 rpm and 12 ipr, meeting the 1⅜"-dia. hole drilled earlier. The hole mouth was then chamfered with a CPMT-3252 coated carbide insert held in a 1"-dia. boring bar and run at 300 sfm and 0.006 ipr.

Next, Sterling moved the workpiece to an Okuma LB35 CNC lathe and the API-threaded end was clamped in a 3-jaw chuck, gripping the OD beyond the thread.

A CNMG-433 insert then rough-faced and profiled several features at 400 sfm, 0.014 ipr and a 0.105" DOC. This end of the part has a tolerance of ±0.002" for its length from the face to the shoulder. Sterling finished the profile with a VNMG-332 insert run at 500 sfm and a 0.020" DOC. Feed fluctuated between 0.006 and 0.002 ipr to maintain fine surface finishes in certain small details.

Next, three OD grooves were machined. A Valenite VTG-4.0N40TG grooving insert roughed one groove 0.450" wide × 0.130" deep and another 0.440" wide × 0.123" deep, at 450 sfm and 0.006 ipr for both. About 0.010" remained on the groove bottoms and walls for finishing. Then, a VSG-3.18 N25PG insert, run at 500 sfm and 0.004 ipr, put an edge break on each groove's OD and finished the bottoms and walls. That same insert then cut a 0.190"-wide × 0.111"-deep groove, plunging twice to rough it and then profiling the walls and sides to finish it.

Harley said the next step, creating a double-lead thread, was the most challenging part of the process, "because they don't make an insert that will profile it." The 2¼"-long OD threaded area started 3½" from the part's API-threaded end. "You've actually got two threads that start 180° from each other," Harley said. "The pitch is 0.469" to 0.467", and it's got a 45° angle on one side and a 30° angle on the other."

When drawing the thread in the CAD software, Harley attached points 0.006" apart along the thread and profiled it by moving the starting point for each pass. "Once I threaded it one time, I moved the starting point twice the pitch distance and then threaded it again," he said.

Sterling Machinery

Sterling Machinery produces about 70 styles of backheads for down-hole drills.

Together, producing the two threads required about 180 passes, each 0.006" to 0.007" deep. The SNMG-543MP insert that cut the thread was held in a MSDNN855 toolholder, which positioned the corner of the square insert perpendicularly to the part. Run at 125 rpm, the feed equaled the thread lead at 0.936 ipr. Cutting the thread took about 30 minutes.

The next step was machining a "quick start" feature on the double-lead thread, which involved flattening the beginning of the thread profile so it would be easier to begin screwing it into the drill casing. The part print specified cutting the first and last thread to a minimum thread crest width of 0.060". A TPG432 insert, run at 35 sfm and fed at 0.936 ipr, performed nine 0.022"-deep passes to finish about 0.020" above the thread's root.

Next, a ¾"-dia. solid-carbide boring bar tooled with a NPGR-52L insert taper-bored the 1⅜"-dia. hole created earlier, running at 350 sfm, 010 ipr and a 0.050" DOC. "We needed to use the carbide bar because we were getting some chatter," Harley said.

The hole tapered outward from a smaller diameter at the part face to the site of an ID groove 2" deep in the part. That 0.410"-wide × 0.060"-deep groove was then machined with an Iscar grade-GIFI4.00E-.4 IC908 coated carbide insert held in a boring bar. The insert plunged straight in three times at 250 sfm and 0.006 ipr, and then finish-profiled the groove. The NPGR insert used earlier to rough the bore then finished it at 400 sfm, with the feed varying from 0.004 to 0.008 ipr.

The backhead was then transferred to a table where a Pro-Pen engraving machine marked the part number and size of the API thread.

Then, the head was clamped on a Haas indexer in a Tree VMC with the API-threaded end exposed. Two wrench flats, 2¼" wide × 1" deep and beginning 5.75" from the part end, were milled with an Iscar 1½"-dia. inserted-slab milling cutter at 600 rpm, 6 ipm and a 0.200" depth per pass. After completing the first flat, Sterling indexed the part and milled the other flat.

The final operations took place on an Enshu 650 VMC, where the backhead was clamped in an indexer mounted on an angle plate. Nine 40° holes were drilled through the OD into the 1⅝" bore on the end opposite the API thread. First, a YG-1 ⅜"-dia. coated carbide endmill, run at 3,000 rpm and 2.5 ipm, plunged and interpolated a flat circle at each hole location. Then a Sumitomo ⅜"-dia. carbide drill produced the holes at 2,000 rpm and 8 ipm.

The last operation required drilling six ⅝"-dia. holes into a 45° chamfer on the OD behind the API thread. The ⅞"-deep holes were made to hold press-fit carbide button inserts. The bottom of each hole had two unique radii. Sterling previously applied a drill to make each hole, a specially ground endmill to form the radii and, finally, a reamer to size the hole. Sterling worked with drill supplier SGS Tool to create a special drill with the required radii ground on its tip, and now completes the holes with a single tool, run at 700 rpm and 7.5 ipm.

Total machining time for the head was about 1.25 hours. In producing approximately 70 different backhead styles, Sterling machines about 9,000 of the components annually.

For more information about Sterling Machinery Co. Inc., Mena, Ark., call (479) 394-4248.

BY DR. JEFFREY BADGER

Timid operators and moaning wheels

Archives MNATP, Collection Meillassoux

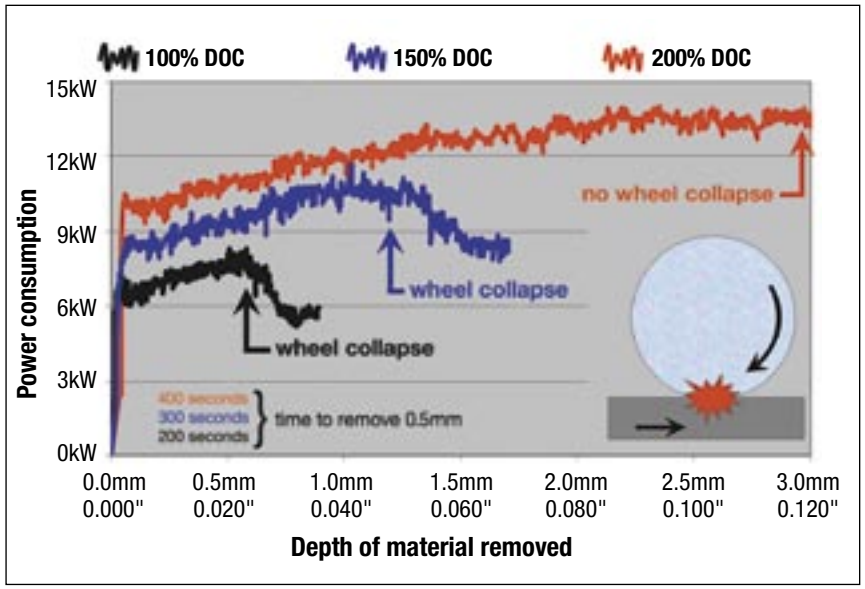
Dear Doc,

Our company does a lot of basic surface grinding on HSS to remove stock. After dressing, the alumina wheel cuts freely. But then it slowly starts to moan, then screech and, finally, howl. Then, suddenly, the howling stops, but we get lots of chatter marks and a rough surface finish on the workpiece. Dressing is then needed again. What's going on?

The Doc Replies:

What's happening is your machine operator is being timid. He's not tearing into the workpiece as he should when surface grinding for high stock removal.

Dressing creates a sharp wheel that cuts freely, but as grinding proceeds, the grits in the wheel start to become dull. That's when the moaning starts. When grinding aggressively, the forces acting on the dull grits are large enough to fracture them in two or cause them to pop out of the bond material. This is a self-sharpening wheel. It may moan a little, but it doesn't screech and howl.



Power consumption vs. depth of material removed for three different material-removal rates. Grinding more aggressively delays wheel collapse and reduces

When grinding timidly with a small DOC and slow table speed, however, the dull grits don't fracture or pop out—they just become duller. Or, if you're experiencing loading, the wheel doesn't wear away to remove any loading, and the loading just accumulates. In either case, forces and power consumption increase to the screeching and howling level. When they become too high, the wheel suddenly collapses, resulting in rapid and uneven wheel wear as the grits break out of the bond material. This is what happens when the howling stops. Then, the wheel is sharp again, but it's no longer true. And that's when you get the rough surface finish and chatter marks.

The solution is to tell your operator to grind more aggressively. The figure shows that the operator was grinding timidly, and the wheel collapsed after grinding a 0.5mm depth. He then increased the DOC by 50 percent and found the wheel was able to grind a 1.2mm depth before collapsing. Of course, power consumption was higher because the metal-removal rate was higher. But the power consumption didn't increase as rapidly because the wheel was self-sharpening.

He then increased DOC again, to double the original, and was able to grind a 3.0mm depth without the wheel collapsing. Again, power consumption was higher because of the higher mrr, but it was only 50 percent higher instead of double because the wheel ground more efficiently. And, he didn't hear any screeching or howling. Also, by doing this, he was able to grind a 0.5mm depth in 200 seconds instead of 400 seconds.

The natural instinct is to slow things down when problems arise. Sometimes that is the solution. But in other cases the solution is to grind faster and deeper. The wise grinder knows boldness is virtuous.

Dear Doc,

I resharpen carbide blades and stick my resin-bonded diamond wheels to open them up. However, I don't see much of a difference compared to when I don't stick them. I use the alumina stick that comes with the wheel. Am I doing something wrong?

The Doc Replies:

The four keys to successful sticking are size, aggressiveness, speed and hardness. This goes for both CBN and diamond wheels.

First, use a stick with a grit size that's at least two grit sizes smaller (which is indicated by a larger number) than the diamond wheel's grit. If the grits in the stick are the same size or larger than the grits in the diamond wheel, they won't be able to fit between the diamond grits and dig out the bond material.

So, if the diamond wheel is 120 grit, use a 180-grit stick. If your wheel designation uses FEPA grit sizes, use the formula:

$$\text{grit mesh number} = \frac{15{,}600}{\text{FEPA grit size (µm)}}$$

An FEPA 181µm grit is equivalent is about an 80/100 grit (15,600/181 = 86). So, use a 150-grit stick. Keep in mind that the stick your wheel supplier includes with the wheel is not necessary the right grit size.

Second, stick it aggressively. Don't be timid. Third, slow down the wheel rpm. If the wheel is running at 3,000 rpm, stick it at 750 rpm. If you can't change the wheel speed, then turn off the wheel and stick it until it comes to a full stop. It's not as scary as it sounds. Fourth, use a soft-grade stick, H-grade or so.

About the Author

Dr. Jeffrey Badger is an independent grinding consultant. His Web site is www.TheGrindingDoc.com. E-mail grinding questions to him at badgerjeffrey@hotmail.com. Dr. Badger will be speaking about reducing grinding costs at the Competitive Manufacturers Conference at IMTS 2006, Sept. 6-8.

Motormouth madman

INTERVIEWED BY DANIEL MARGOLIS, ASSOCIATE EDITOR

CTE caught up with outspoken guitarist and hunter Ted Nugent at this year's Precision Machined Parts Association National Technical Conference in Dearborn, Mich., where he was the keynote speaker. During the interview, "the Nuge" spoke about manufacturing, current affairs and music.

CUTTING TOOL ENGINEERING: What is your take on the state of manufacturing in this country?

Ted Nugent: It's embarrassing. Certainly, we all know America has turned into a service-oriented industrial force. I use the word industrial because we're industrious, but it is becoming service-oriented. And if you off-shore and farm out your productivity, then you're off-shoring your wealth. I emphasize the power, value and integrity of being productive. That should mean you have products to show for it in your own family and, certainly, in your own country with the unlimited—I do believe I can use the word 'unlimited'—natural resources that America has, if managed for sustained yield and managed for productivity. It's a sad day when Korea, Thailand, China and Japan are beginning to out-produce America.

CTE: What are your thoughts on oil exploration and the environment?

Nugent: The liberal take on oil and gas is not unlike their take on hunting and meat. As long as they don't have to see it, they'd like their steak rare, thank you. As long as they don't have to witness or even admit to the process by which the Cordon Bleu arrives, they'll just keep ordering it and then condemn someone for shooting a pheasant. It's not unlike the denial involved in efforts to save our environment. I did [the TV show] "Politically Incorrect" 16 times and the greatest time was with some gal named Butterfly, who would climb into a redwood tree and sit there for 2 years to save the tree. Now, I'm just a guitar player, but while she was sitting there, I planted over 100,000 trees. Not [by] myself, but [through] my organization and my Kamp For Kids. I guess you'd have to ask yourself, if you have 2 years to monitor wood, would you sit in one tree or would you plant 100,000? That hippie mentality can be traced to every ill in America.

CTE: Another contentious issue I'm sure you'll have a comment on is the immigration situation in this country.

Nugent: I'm not gonna give you an opinion. We have laws. They are designed, for the most part, with logic as the guiding force. For all peoples, tribes, neighborhoods, homes and countries, job No. 1 is securing the borders. As a dad, as a husband, my number one job? Secure the border of my home! No one unauthorized in. That's not an opinion, that's a universal truism. A decent person—who wants security, safety and a healthy environment—secures his borders.

CTE: How would you describe your sonic identity when playing your Gibson Byrdland guitar?

Nugent: There is no guitar that sounds like mine. There is no guitar that's made like mine. Mine has a spruce top. It's the only hand-carved, arched, spruce semihollow body that has ever been used in rock 'n' roll. It was created by [Billy] Byrd and Hank Garland as a streamlined jazz instrument; hence the spruce, for richness and an earthy warm tone, instead of a brittle tone. See, everybody was getting brittle, because Chuck Berry was so beautifully brittle. My sonic identify has a thickness and a richness and a defiance factor. People have asked me what scales I play and I say, 'Well, I have a scale I hang my deer from. It's the only scale I have!'

Daniel Margolis and Ted Nugent.

CTE: How do you control your guitar's feedback?

Nugent: I've got the feedback down to such a … I hate to use the word science because it's so much more than that. I did a Nova public television special about how I utilize the feedback and the position of my guitar so it will go berserk when I want it to, but be contained when I don't want it to feedback, and that is a really fine line. In fact, it's most demonstrative when I allow someone else to touch my guitar, and it hurts them [laughs]. No matter who tries to play my guitar, they can't stop the feedback, which I think is just hysterical.

CTE: What's your major goal?

Nugent: My goal, like all my musical goals, is to blitz down that road less traveled. Defy myself. Demand and force myself to try different ideas to make sure my fingers don't just go where they want to go.

3-D made easy

BY BILL FANE

Included in the long list of things that I do is teach Autodesk Inventor. At the start of the first session I ask my students, "How many of you have done 3-D solid modeling in AutoCAD?" Most raise their hands. Next, I ask, "How many of you have enjoyed it?" It is rare to see a hand raised.

I suspect that will change as more users adopt AutoCAD 2007 from Autodesk Inc., San Rafael, Calif. Well over 90 percent of the additions and changes to the CAD program involve 3-D capabilities.

Many users are reluctant to switch to 3-D because previous experiences with it have left a bitter taste. Here is a revelation: 3-D does not have to be obtuse and difficult. Nonetheless, 3-D tends to turn people off.

AutoCAD 2007 fixes that. The underlying principles of 3-D have not changed, but the interface certainly has. Autodesk has vastly improved both model creation and editing.

When you start AutoCAD 2007, a dialog box asks if you want to work in the 3-D modeling workspace or the AutoCAD classic one. If you select the 3-D workspace, the AutoCAD interface appears unfamiliar, but it is still AutoCAD inside. The 3-D workspace simply sets up a perspective viewing space, fiddles with the colors a bit, and groups all the 3-D create, modify, display and render commands together in the new "dashboard." Everything is still available in the traditional menu and toolbar locations, so using the dashboard is not mandatory. It is even possible to flip back and forth between the 3-D and classic workspaces while working on the same drawing.

The real world is mostly 3-D. If you aren't there yet, then you should take a serious look at AutoCAD 2007.

Let's start with the basic extrude function. If you have an existing closed polyline loop that you want to extrude into a solid, simply select it and then select the extrude icon from the dashboard. The polyline loop will begin to dynamically extrude as you use the mouse to drag the height up and down. You can then either click when you obtain a suitable size or enter an exact value, as desired. Note that "object snaps"—tools that allow for precise drawing within AutoCAD—to existing geometry will work.

In the past, the UCS (User Coordinate System) was the downfall of many a 3-D beginner. Both the concept and the implementation was a little awkward. The new Dynamic User Coordinate System (DUCS) functionality in AutoCAD 2007 nicely eliminates this problem.

Let's assume you want to add a cone on the middle face of a previously created shape. Just click the cone icon in the dashboard and then hover the cursor for a moment on the desired face. The software shows how the UCS automatically switches to align with that face, as shown by the UCS icon. You can now locate the base of the cone on the desired face and then specify the height. The location and height can be dynamically dragged or precise values can be entered. The UCS reverts to its previous orientation when the command ends.

The "bonus round" here is that you can use standard AutoCAD object snaps while locating and sizing 3-D objects. The double-bonus round is DUCS also works while creating standard 2-D objects such as lines, circles and arcs.

Previously, the built-in solid objects included the basic shapes for boxes (bricks), wedges, cylinders, spheres, cones and toroids. To this list, AutoCAD 2007 adds multisided "pyramids" plus the ability to loft between a series of cross-section profiles, to sweep a profile along a path and to create varying-radii 3-D helixes. The fact that you can now revolve or extrude an existing face without having to draw a new profile is a real time-saver.

Editing solids in earlier releases was not just difficult—it was almost impossible or, at best, impractical. It was often easier to delete the solid and start over.

Solids in AutoCAD 2007 can now use most of the same editing tools you have come to know and love when 2-D editing. For example, grip editing can be used to drag faces to a new location. If desired, you can enter an exact value during this process or use object snaps to existing geometry. In addition, the properties palette now supports 3-D solid objects.

Section planes can be added to a model. Grips can be used to change its position, size and cutaway side so you can see inside a complex part as you work on it. Flat 2-D drawings can be generated based on the current view of the model.

AutoCAD 2007 replaces existing rendering and visualization functionality with a new and faster visualization engine. The new engine opens up several new capabilities.

For starters, there is a new direct and easy access to 3-D orbit. Simply press and hold the shift key, then use the middle mouse button to reorient your view of the model. This can be done transparently within other commands.

You are no longer limited to working in wire frame or a couple of shaded modes while creating and editing models. Instead, AutoCAD 2007 comes with several predefined styles such as "realistic" and "conceptual." In addition, you can create custom visualization styles wherein you can define such things as lighting and colors.

AutoCAD 2007 introduces a new file format, so earlier releases cannot open a 2007 file. The good news is you can "save as" back to a Release 14 drawing or a Release 12 .dxf file. AutoCAD 2007 can also produce files in the popular .pdf format for viewing by people without AutoCAD.

The real world is mostly 3-D. If you aren't there yet, then you should take a serious look at AutoCAD 2007. △

About the Author

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