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Page 38



Z Corp's Lean Approach To 3-D Printers Fuels Growth

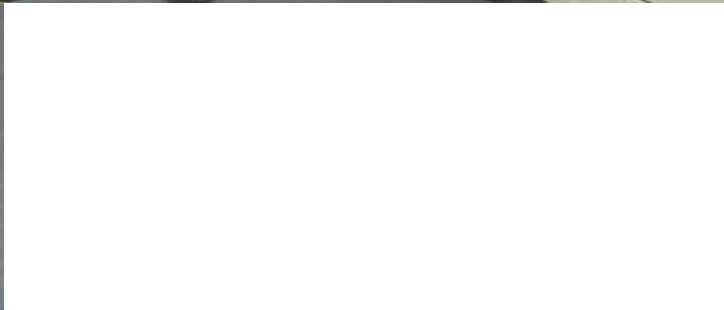
Page 8



**More Accurate
Temperature
Monitoring
From Altair**
Page 11



**Enhanced Power Tool Battery
Management From IR**
Page 37





Thin To Win

By Jeff Reinke

**Z Corp's
implementation
of lean
manufacturing
practices has
led to greater
production, flex-
ibility, efficiency
and profits.**

Evander Holyfield did it in 1984. Lance Armstrong achieved it in 2000. LeBron James followed in 2004. Mike Vogel experienced it in 2006. What's the common bond between this boxer, biker, baller and Vice President of Operations at Z Corporation? They've all experienced winning a bronze medal. The only difference is that instead of receiving accolades for athletic achievement, this Burlington, MA provider of 3-dimensional printers was recognized for excellence in manufacturing with a bronze medal from the Northeast Shingo Prize program.

Z Corporation, which is located about 35 minutes west of Boston, began operations in 1996. The company's genesis stems from an 18 month research and development program at the Massachusetts Institute of Technology (MIT) that examined the implementation of ink jet printer mechanics in creating product prototypes. As the project wound

down, those involved were able to take ownership of the technology, and shortly thereafter, began full-scale production.

As mentioned, Z Corp.'s product line works similarly to an ink jet printer, but instead of ink they rely upon a proprietary liquid binder and high-performance polymer blend. The printer's carriage, operating at about one vertical inch per hour, moves back and forth in building up product prototypes to the exact dimensions entered via a CAD drawing or other design software application. Those using the machines range from automotive manufacturers to shoe companies, and even those in the medical field who look to replicate results from MRI data to help illustrate problems and prepare surgeons for upcoming operations.

"We feel that our machines are the world's fastest and only high-definition color 3-D printers capable of producing physical prototypes of real-world objects with the ease and affordability of 2-dimensional

desktop printing,"

boasts Vogel. And a number of companies seem to appreciate the product's value. Production in 1996 had to meet the demands of selling merely ten units, whereas currently, Z Corp. is charged with delivery of these \$20- to \$50,000 machines to 800 customers annually.

While this growth has been exciting, it's also made the integration of new processes and production approaches a must. The trick was implementing these changes without negatively impacting flow, profits, or an ability to keep growing.

More Output, Less Inventory

"Our rapid growth and production model made us a great



These photos above, below and to the left and right show Z Corp.'s 3-D printers in various stages of production. Each phase of assembly is done at a unique work cell with dedicated personnel. Additional employee training and Kanban replenishment strategies have been key in managing work flow.

fit for lean manufacturing procedures,” states Vogel. “And after implementing these processes we’ve been able to get more output with the same resources and space. Although our production rate has tripled over the last couple of years, our inventory levels have not changed

that dramatically,” he explains.

Because the vast majority of their printer components are supplied from outside vendors, in accordance with Z Corp.’s design standards, the company’s primary production activities involve assembly, inspection, testing and shipping. This translates to juggling inventory and supplier production to

mesh with incoming orders.

Lean manufacturing centers around:

- Inventory reduction.
- Eliminating downtime.
- Reducing floor space requirements.
- Eliminating inefficient steps in the production process, a.k.a. improving workflow.
 - Avoiding overproduction, which adds to the space needed for inventory and product storage, and consumes areas that could be used for meaningful production.

What’s interesting to note is that Vogel does more than just talk a good game when it comes to these principles. He and Z Corp. have seen the results, which brings up a key point. Not only did they invest the time and energy into training employees and updating their processes, but the compa-

ny also tracked their results to ensure a proper fit.

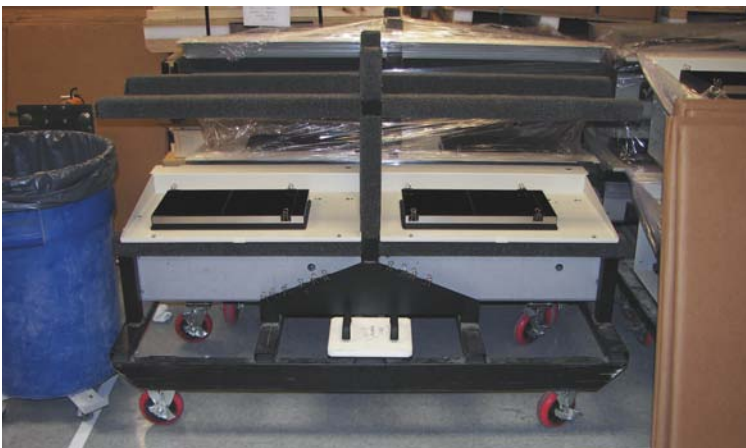
People Power

“After implementing these lean principles, the area where we’ve seen the most dynamic improvement has probably been work flow,” continues Vogel. “Whereas before we had a single person assembling each individual printer whenever an order came through, now we have teams that work in one of four production cells. This allows us to have more than one printer in the pipe line at a time and create a smoother flow from station to station.

“The end result is having greater control of our inventory and production cycle. We’re able to prepare a month ahead of time in order to have the right quantity of parts and work space. This preparation leads to more personal attention at each work station, which translates to a higher level of overall product quality. Basically, it boils down to storing small amounts in order to produce a higher volume more efficiently and more effectively. So we’re able to give our customers a better printer at a better price.”

Vogel states that the implementation of lean manufacturing principles lowered their costs on one printer line by nearly 20 percent.

The improved quality comes from a greater focus on the task being done at each individual work station. This single-piece, standardized approach also utilizes Kanban with a two-bin replenishment system. So when one bin of a com-





(left) Each work cell at Z Corp. is set-up ahead of time with the proper tools and components. Additionally, work cell postings (above) and documentation (right) keep employees accountable in executing replenishment strategies.

ponent is empty, it's filled by a team member dedicated to keeping each work station fully stocked, ensuring an uninterrupted workflow. "Kanban has proven to be a great resource in managing the parts and components that come from our outside suppliers," states Vogel.

Employees have also been empowered to provide their thoughts on these new processes, and offer feedback on how they can be improved. In 2006 Z Corp. paid out over \$50,000 in employee bonuses relating to production improvement suggestions. Furthermore, training, while extensive in each individual's area of assembly, has also been expanded to include overall operations and equipment maintenance. This enables them to address problems on the spot,

minimizing production slow-downs.

While the growing sales figures for Z Corporation have already been documented, the

results from their implementation of lean manufacturing principles are equally impressive:

- A 300 percent output increase since 2003.
- Employee productivity is up by more than 45 percent.
- Inventory turns or cycle times have improved by more than 50 percent.
- An on-time delivery rate of 95 percent.

While current operations continue to flow smoothly, Vogel is forced to keep an eye on continuing developments. With a product category that changes every three to five years due to new technology, a different set of challenges constantly looms on the horizon.

"Just like anybody else, we're constantly reviewing suppliers to make sure they're able to provide the right volumes at the right prices and in accordance with how we want to manage our inventory," states Vogel.

"Plus, we won the bronze last year, so now the goal is to continue improving towards winning the gold."

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Units like those pictured above are capable of creating incredibly detailed models like the engine block shown here.