New Plant Eliminates Roadblocks to Improvement

Power Curbers’ dilemma — operating lean in an old plant built for batch-and-queue — is one many manufacturers will face in the next five years.

Tonya Vinas

No matter how successfully a company sustains lean manufacturing, its ongoing continuous improvement efforts eventually will hit a roadblock. For one North Carolina manufacturer, that roadblock was an outdated headquarters complex that was limiting continuous improvement (CI) potential with unmovable walls, constrained spaces, and separate floors. The solution: designing a new plant to supercharge lean improvement.

Many manufacturers will face the same problem in the next five years. According to the Manufacturing Performance Institute’s 2008 Census of Manufacturers, over 70 percent of U.S. manufacturing plants are more than 20 years old. When manufacturers built them, operations cranked out product in batches, and sales filled orders from warehouses bursting with finished goods. As manufacturers adopted lean, they adjusted as best they could by moving machinery around and converting warehouses to supermarkets. But as some lean companies refine their techniques and become more mature in their implementations, they are finding that they’ve reached the limits of improvement in their older plants. They are building new plants specifically designed to minimize activity that adds no customer value and maximize activity that creates customer value.

In Brief

Construction-equipment manufacturer Power Curbers has been on a fruitful lean journey and has reorganized into value streams to increase customer-value creation. In 2006, company leaders realized its 42-year-old headquarters complex was limiting continuous improvement. In response, they purchased a new plant and redesigned it to support specific lean goals.
For privately held Power Curbers, a $40 million company that manufactures construction machinery in Salisbury, NC, a new plant became a necessity in 2006. After 42 years in the same location, employees found themselves working in a mishmash of buildings, building additions, temporary trailers, and even in a paved lot — space limitations forced production employees outside to wash painted parts and finished machines.

Inside, raw material, purchased goods, machined parts, and work-in-process (WIP) traveled along disjointed pathways, and functions that worked together were located in opposing directions or on different floors. Employees had to walk long distances to attend training and meetings or just to talk with others. The waste irritated company leaders such as Craig Neuhardt, Power Curbers’ vice president of manufacturing. But the site’s limitations did not allow for correction.

“It just was a natural growth of a small business,” Neuhardt said. “We started out with small machines, and everything could be moved by hand. And then as we grew, like companies tend to do, we made things more complicated.”

CEO Dyke Messinger, who had introduced lean to the company in the mid-90s, decided the old plant was limiting his company’s potential and launched a search for a new site. It didn’t matter whether the building existed or he had to build it. The important thing was that it had to be designed to enable growth and CI.

Messinger found his site a few miles away, and the company relocated about a year and a half later. He and other company leaders designed and supervised the extensive rework of an existing 42,000-square-foot plant, specifically aiming to:

- Make value streams more effective
- Improve one-piece flow
- Increase flexibility
- Reduce material handling
- Improve customer service.

The company has been able to achieve these and ancillary improvements, such as increasing cross-training time by reducing per-unit production time, at the new plant. In fact, Power Curbers has increased its flexibility and efficiency so much that it is in the process of moving the production line of another company it owns from a Tennessee plant to the Salisbury plant. Production managers easily made room for the relocated equipment (four machines) and will absorb the work that had been done by five people without new hires, overtime, or another shift. By doing this, Power Curbers has achieved a highly-desired but often-elusive goal of lean production: to be able to increase output while adding only the costs of material and minimal overhead — labor, machinery, and other non-labor production costs are already on the current operations’ balance sheet.

“It worked so well, it was almost like magic,” Neuhardt said. “We knew that there were such huge inefficiencies to what we were doing at the old plant, that the payback would be tremendous no matter what we did.”

The new plant supercharged Power Curbers’ existing continuous improvement efforts. Improvements made since moving to the new plant include:

- Cutting delivery time for a finished machine in half from ten to 14 working days to 7.5 days at 2.5-day takt time; or five days at 1.5-day takt time.
• Eliminating half the forklifts and saving more than 600 hours of material handling each month. They now use one forklift and two tuggers (vehicles about the size of a one-person golf cart), which each operate about 80 hours a month.

• Reducing raw-material inventory by 75 percent

• Achieving 98 to 99 percent order-to-fill rate on overnight delivery of replacement parts to existing customers.

As significant as these improvements are, Neuhardt and Messinger stress that the new plant is not entirely responsible for them. Much lean work took place at the old plant. Without first establishing a solid lean foundation, a company would be wasting money and resources to design and build a new “lean” factory, they said.

“We could have done most of the lean things that have really added to our productivity at the other building if we wanted to, but we would have had some limitations,” Neuhardt said. “For the basic lean lessons, it really doesn’t matter what your building looks like.”

Prior to the move, the company’s lean efforts eliminated $700,000 in raw-material inventory, cut material handling by 40 percent, and eliminated more than 6000 annual computer transactions through combined purchasing. But the physical structure of the site began to frustrate enthusiastic employees such as Lisa Veach, manager of the company’s replacement-parts value stream.

“My feeling is, if you can’t give customers 24-hour delivery on a machine’s parts, then you shouldn’t be in the business of making that machine,” Veach said.

**More Effective Value Streams**

At the old plant, Veach worked in a cramped office in the middle of the main building, trying to manage a newly-formed value stream and comply with her next-day service rule. Power Curbers had reorganized into four value streams (machines, molds, parts, and research and development) in 2006 as part of a lean accounting conversion, but the plant didn’t have space for value stream members to sit together as a group. Collaboration within and among value streams suffered, and the teams lacked cohesion.

“No one ever went to see Lisa because of where her office was,” Neuhardt explained.

To address these value stream challenges, Power Curbers included in its new plant design:

• Cubicles to replace offices in order to foster more collaboration. Value stream members now sit together in groups in a large office area, separate from but near the production floor. Administrative support and other non-production employees sit in nearby, designated areas.

• Ample meeting space and storage/production space for value-streams. The parts value stream also received additional dedicated machinery on the production floor.

• All activity takes place on one floor, so employees can move around quickly.

• A visual system that assigns a different color to each value stream. All machinery, signs, kanban cards, and other material belonging to the value stream — as well as performance charts, flow charts, schedules, etc. — include its unique color.

Additionally, the company used the move as a catalyst to eliminate obsolete inventory, which not only took up valuable space but also caused confusion during parts picking and other processes.

Value-stream effectiveness has improved. An example is the labeling system that Veach’s team developed. They brainstormed about a way to effectively manage unique information for their stream’s thousands of parts. They developed a standard labeling system in which each product label carries all of the information any handler from Power Curbers’ receiving dock to the customer’s receiving
dock would need to know. The labels elimi-
nated the need to search for parts or infor-
mation, contributing to the 98 to 99 percent
overnight fill-rate achievement.

Improving One-Piece Flow

In 2003, Power Curbers’ leaders made
a significant decision that was painful but
fruitful. In order to simplify processes and
become more focused on process improve-
ment, the company eliminated four of
seven machines in its product line up. As
the remaining “large” machine, Messinger
and others chose the 5700 model, which
has been built since 1984.

Messinger said without that reduction,
the company would not have achieved
what it has with lean. “It allowed us to get
away from batch-and-queue and allowed
us to customize how we do a lot of differ-
ent things,” he said.

Process customization for one-piece
flow for the 5700 started at the old plant but
has been expanded at the new plant. These
customized processes include:

• Using hand carts to convey the 1200
  parts needed to build the 5700. (The
  molds and parts value streams also use
  the cart system.) A parts picker loads the
cart according to instructions and parts
footprints drawn on the cart. The cart
not only is a conveyer, but also a visual
verification device: With the dedicated
spaces marked, the parts picker can look
quickly to double check if any parts are
missing before he rolls the cart to the
next process, and production workers
can verify correct parts’ use at the end of
a task by making sure no parts for that
task remain. Additionally, the location of
the cart at any given time tells people
the status of the unit in process.

• Designing paint buggies for the machine,
  parts, and molds value streams to hold
appropriate parts as they move through
the painting and washing process and
on to assembly. The buggies (48 of them)
are about the size of a rolling wardrobe
rack and are custom designed to carry
specific machined parts on hooks.
Drivers move them around on tuggers.

• Not only is the buggy an easy way to
move the heavy parts between process-
es, but it also acts as a visual proofing
device much the way the parts carts do.
Also, painters and washers use the
buggy holding racks as fixtures (to hold
the piece in place) during processing.
This has eliminated the need for separate
fixtures. Additionally, the buggies
reduce the amount of process time
because painters and washers don’t
have to move the part to reach both
sides. Now, they simply walk to the other
side. The part stays stationary in the fix-
ture. Finally, the buggies serve as an
easy-to-move dedicated drying station.
So, the plant floor doesn’t need to dedi-
cate a separate area for drying.

Without the parts carts and the paint
buggies, Power Curbers would have had to
purchase expensive conveying devices,
such as belts, to move materials and parts
around. Not only did carts and buggies
eliminate the need for these major capital
purchases (conveyers, fixtures, drying
space) but they also improved one-piece
flow and increased flexibility: If flow rate
drops because of decreased demand, pro-
duction employees just store the unused
carts and buggies instead of idling expen-
sive machinery. If flow rate is increased,
Power Curbers can add carts and buggies
much faster and with less expense than
adding additional machinery.

Increasing Flexibility

By achieving true one-piece flow at a
high level of efficiency, Power Curbers
gained the ability to quickly and inexpen-
sively change its production cycle based on
demand. Neuhardt adjusts the flow rate by
adjusting takt time, which fluctuates
between 1.5 to three days for a 5700 based
on customer demand. (Takt time is the rate
of customer demand divided into available
capacity.)

“When we were doing machines in six-
piece to eight-piece batches, in rough terms,
it would take almost six weeks from when
they cut the first piece of steel until they had
a finished good," Neuhardt said. "Now, the average purchased material is here 48 hours before it's on a machine, and we have seven to nine days of machined parts depending upon takt time. That difference was all necessary, nonvalue-add time."

Also to improve flexibility, Messinger and Neuhardt made sure the plant's exhaust system could be adjusted if tasks such as welding and painting, which require additional ventilation, relocate or expand. Electrical and overhead pulley systems also were designed to adjust to machine or process reconfiguration.

Reducing Material Handling

The parts carts and paint buggies drastically reduced material handling for welders, painters, and washers. Machinists have a much easier time handling material as well. Power Curbers' employees designed and built many proprietary, labor-saving ergonomic tools to reduce cycle time.

By reducing operator time for so many tasks, Power Curbers has freed up time for cross training, which has increased. Recently, to meet a tight service-parts deadline, Neuhardt and others used packaging skills learned during cross training to help the parts value stream package the shipment and make its deadline.

Improving Customer Service

Power Curbers' new plant has had a quick and direct impact on speeding up customer-response rates and improving quality.

For example, prior to moving to the new plant, the parts value stream was so limited in what it could do that it didn't even track fill rate. Inefficiency and lack of standard processes meant parts infrequently shipped within 24 hours. Now, 98 to 99 percent of parts arrive the day after a customer orders. Having dedicated space and machinery helped achieve this, as did the massive reduction in obsolete inventory. At the old plant, performing a complete inventory count would take five days. Now it takes one and a half. Finding ordered parts is much easier and takes much less time without the confusion of obsolete inventory. Additionally:

- Customers receive higher-quality products for several reasons: Purchased parts are no longer sitting outside, exposed to weather erosion; and the reduction in material handling during fabrication, assembly, painting, and washing means fewer dropped or damaged parts.

- Delivery-cycle times have not been lengthened despite an increase in overseas sales. The new plant has two shipping-and-receiving docks instead of one (which was at the old plant). Power Curbers is using the second dock to segregate international shipping. This is significant because international shipments take longer to process at the dock, and without a dedicated dock, the increased processing time would lengthen delivery cycles for domestic customers.

Another important asset for responsive customer service is the ability to quickly increase production as demand increases. Companies that can't respond quickly lose sales and market position. This isn't likely to happen at Power Curbers.

According to Neuhardt, the company can easily double production without adding a second shift.

"Because it's a single-piece-flow, the only thing we need to add to increase production is labor," he said. "Instead of having three days takt time, we just run 1.5 days takt time. And we've already run 1.5 days takt time here smoother than we could run three-day takt time at the old building."

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