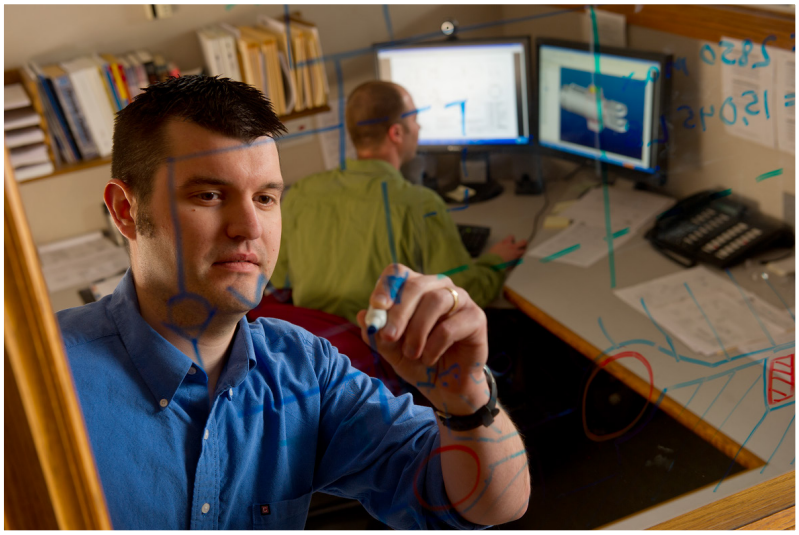
Center for Quick Response Manufacturing
University of Wisconsin-Madison

QRM PROFILES

QRM Helps Rosenboom Meet Growth Challenges



The QRM Center is a university-industry partnership dedicated to improving manufacturing competitiveness through research and implementation of lead time reduction principles.

QRM Cuts Delivery Times for Iowa Hydraulic Cylinder Producer

by Kathleen Watson

Business is booming at Rosenboom, and the Iowa-based OEM of hydraulic cylinders is responding reliably and in record time to its customers, thanks in large part to Quick Response Manufacturing.

Founded as a tool-and-die shop in 1974 by Lary and Viv Rosenboom, the company began producing cylinders in 1977, enhanced its operations with computerized machining and shop control in the 1980s, and added a robotic welding cell for hydraulic cylinders in 1993. It launched a manufacturing cell prototype in 1996 based on Lean principles, and it shifted its focus in the early 2000s to custom-crafted cylinders.

Rosenboom now engineers and crafts over 2,500 cylinders daily among its three plants: corporate headquarters and manufacturing in Sheldon, Iowa; a satellite plant in Spirit Lake, Iowa that is 26,000 square feet smaller than the Sheldon facility; and a plant in Bowling Green, Ohio, that serves the East Coast.

Custom hydraulic cylinders go to users in both the private and public sectors: fire departments, railroads, waste-disposal services, forestry, the military, construction, and agriculture, to name a few.

Custom Rosenboom hydraulic cylinders have a 1- to 12-inch bore diameter and can reach a stroke of up to 30 feet or more. Cutom body styles offer choices of welded, mill style, rod-fed, telescoping, integrated valves and cushions, and position-sensing.

Growth strains company's capabilities

Growth — although welcomed — can strain the capabilities of any enterprise.

When Continuous Improvement Manager Lynn Van Dyke arrived in 2004, Rosenboom was in transition. It had been a relatively small company that was doing well in its niche of supplying equally small customers, but it was on a path to becoming a firm scrambling to keep up with the demands of its expanding market.

"We were struggling to meet our promised delivery dates," Van Dyke says. "Our component job shop required a lot of indirect labor to micromanage the day-to-day fluctuations. Just when we thought we had everything lined up and under control, any number of things could change: customer priority, component-part availability, machine availability, and so on."

It was taking tremendous time and effort to get everything aligned, but it required even more time and effort to get realigned. Inventory was high, but deliveries lagged.

Company leadership realized that the communication required to plan and manage Rosenboom's growing batch processing, long queues, inventory accuracy, and rework had become complicated.

ROSENBOOM
Custom. Crafted. Cylinders.

Company Profile
Founded 1974 in Sheldon, Iowa
Privately held
Corporate Headquarters:
Sheldon Iowa

Production
Sheldon, Iowa: 286,000 sq. ft.
300 employees

Spirit Lake, Iowa: 260,000 sq. ft.
340 employees

Bowling Green, Ohio: 190,000 sq. ft.
220 employees

Products
Custom hydraulic cylinders

Markets Served
Aerial
Construction
Refuse & Waste Handling
Transportation
Agriculture
Commercial
Utility
Military
Material Handling
Renewable Energy
Fire Rescue
Forestry

Certifications, Associations
ISO 9001 2015
Member National Fluid Power Association

www.rosenboom.com

Lynn Van Dyke, Continuous Improvement Manager

> "We were struggling to meet our promised delivery dates. Our component job shop required a lot of indirect labor to micromanage the day-to-day fluctuations." — Lynn Van Dyke

Despite years of Lean and earlier experiments with cells, it was apparent that cells and Lean alone were not meeting the needs of the company's existing and new customers, many with custom needs.

Enter QRM

According to Corporate Vice President Brian Rosenboom, some in the company were aware of QRM and had read QRM founder and Professor Emeritus Rajan Suri's book, *It's About Time: The Competitive Advantage of Quick Response Manufacturing*.

Then John Deere management invited Rosenboom, along with other Deere suppliers, to attend an event to learn how to define, measure, and improve MCT, Manufacturing Critical-Path Time.* Deere had been an early adopter of Quick Response Manufacturing, and for Deere to continue to reduce its lead times, its suppliers needed to reduce theirs as well.

When Oshkosh Corporation (formerly Oshkosh Truck), another major Rosenboom customer and QRM enthusiast, encouraged the cylinder manufacturer to take steps to reduce its lead times, Rosenboom management began to look seriously at QRM.

"We reread the QRM book, and I attended a two-day introductory QRM event in Madison," Brian Rosenboom said. "Our management got together and decided we wanted to pursue QRM, so we developed a strategic plan and launched a pilot project."

QRM founder initiates training

To introduce QRM, Rosenboom management invited Suri to conduct on-site training in 2012 for about 100 employees who volunteered from the two Iowa facilities. Current QRM Center Director Professor Ananth Krishnamurthy presented two more workshops at Rosenboom. Those who attended in turn trained others.

"Our approach was to grow QRM from the operator up, with coaching and consulting from leadership," Van Dyke explains.

Because so much of QRM can seem contrary to traditional manufacturing concepts and practices, there can be pushback. Plus any kind of change can be difficult for some people. Van Dyke admits that "pockets of resistance and pockets of excellence" developed, and the orientation approach "probably took longer than mandating it from the top down."

** MCT: The typical amount of calendar time from when a customer submits an order, through the critical path, until the first end-item of that order is delivered to the customer.*

But management was confident that the bottom-up approach would help with buy-in and sustainment. The slower pace yielded steady progress: Following the 2012 introduction, self-directed QRM cells followed in 2013; production supervisors and some production-control staff collocated to join operators in cells on the production floor in 2014; the first cells to produce components were organized in 2015; and POLCA, a card-based material-control system that manages the flow of jobs through the production process, was introduced in 2016.

Creating more cells, implementing POLCA Transforms Production Floor

Pre-QRM, production at Rosenboom fell into two primary segments:

- CNC component manufacturing and subassemblies (95% batch processed)
- CNC, weld, assemble, final assembly, test (85% cell processed)

"Our original cells worked well for our more-standardized mix, but we were still batching a significant portion of our business," Van Dyke says. "We hadn't even considered trying the cellular concept for step one, component processing, or for our nonstandard work until we found out about QRM. We learned that it was a better fit than traditional Lean thinking."

Fine-tuning the first QRM cells brought two more implementation phases. The first was identifying what QRM calls a Focused Target Market Segment, or FTMS, the basis for designing cells. "In hindsight, we already had FTMS teams, but we didn't use QRM terminology for them," Lynn says.

The second was integrating POLCA.

POLCA is an acronym for **P**aired-cell **O**verlapping **L**oops of **C**ards with **A**uthorization. It is especially helpful for manufacturers that specialize in highly customized or short runs of some products.

At Rosenboom, an order can arrive for cylinders for a fleet of 24 garbage trucks for a large city one day, and a set of cylinders for a single fire engine for a small town the next day. POLCA helps stage and complete phases of the work so that both orders meet their requested delivery dates.

Because it would not be possible to include in a single cell all operations to complete a cylinder, POLCA facilitates the smooth flow of components and their assembly between pairs of cells on their way to final assembly.

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> — Brian Rosenboom

Unlike kanban, a pull system that triggers replenishment of something that has been used up, POLCA is a capacity signal that communicates to the downstream cell that it's ready for another job. By programming the company's ERP system to denote quantities and ship dates for a product, components for an order due the next week will not be authorized for release, but components for an order due to ship sooner — in the next day or two, for example — will be authorized.

Color-coded cards and cells identify loops

Most firms that implement POLCA use highly visible large colored cards with prominent markings to indicate which cart or bin of components pairs with — in other words, forms a loop with — which cell or cells.

At Rosenboom, cell color is denoted by boundary lines painted on the floor. The cell color matches cards affixed to carts that contain components for assembly in that cell. "Swim lanes" between cells — again, markings painted on the floor — help clarify the appropriate flow.

POLCA was a dramatic change for supervisors, material handlers, and cell team members. Colored cards that show available capacity in the POLCA loops, combined with authorization lists of key information displayed on a huge electronic screen that updates every 10–15 minutes or on demand, have eliminated paper and the need for production-planning meetings.

Brian Rosenboom, Corporate Vice President

Gradually converting CNC component manufacturing and subassembly from batch processing to the POLCA system, with its visual approach to managing inventory, reduced MCT from 15 days to 3 days; reduced production control overhead by 80% in areas where it was implemented and cut daily supervision time, all the while heightening operators' satisfaction in their self-directed cells.

Rosenboom now has about 40 independent POLCA loops generating savings on multiple fronts:

- Less time spent in production-control meetings saves time and labor.

Quantifiable metrics

- Lead times/MCT reduced from 30%–75% where POLCA is being used
- Production-control staff labor reduced by 50%.
- Majority of components now built for a specific job, substantially reducing component inventory.
- Production-planning meetings reduced from nearly 20 hours to just 2 labor hours per day.

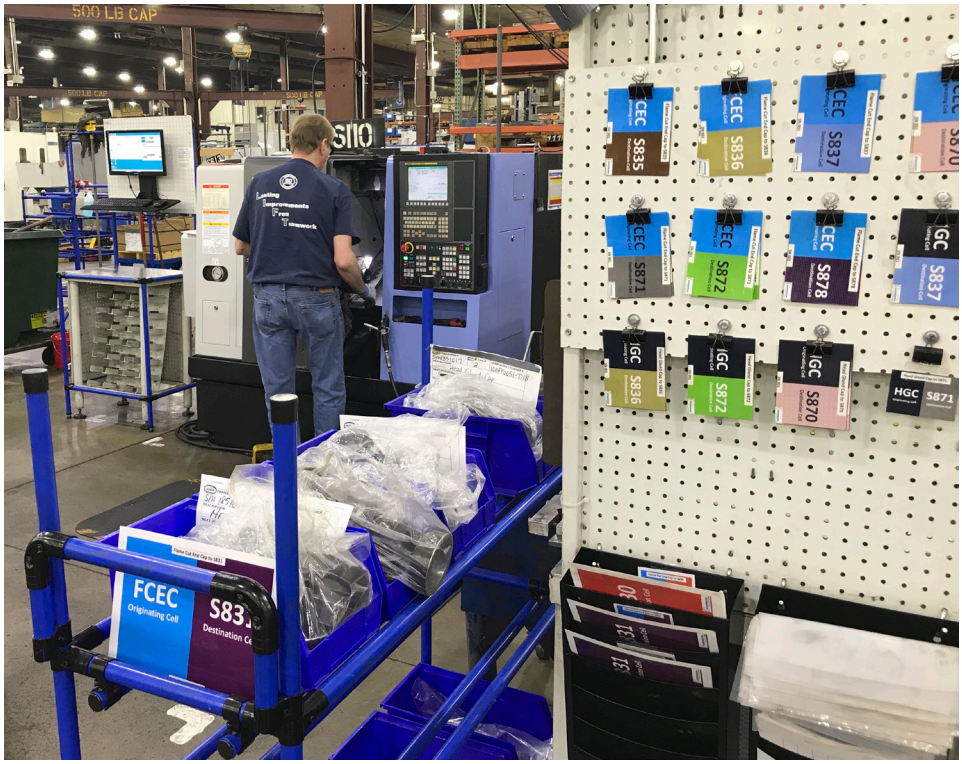
- Less time spent handling material saves time, labor, and potential damage or loss of stored parts.
- Less stored inventory saves space and investment dollars in parts not yet needed.
- Less supervision for self-directed teams saves time and labor.

Rosenboom is experimenting with RF-POLCA, or Release-and-Flow POLCA, where the authorization date is used only at the first cell in the POLCA chain. Each job flows through the sets of paired cells in a first-come, first-served order, without having to consult the authorization list.

RF-POLCA's single authorization step can work after a predictable and fairly consistent flow of jobs has been established. Other criteria include a limited number of POLCA loops, minimal variability from job to job, and a track record that reflects few schedule changes after jobs are released into the system.

A business uptick in 2017 required outsourcing some components. Just as Rosenboom experienced pressure from Deere and Oshkosh to cut its own lead times, the company now is working with its own supply chain to achieve similar goals.

Tom Eggers, Director of Sales and Marketing



The blue and maroon cards (foreground on cart) indicate the pairing of two POLCA cells. A highly visual system, POLCA makes clear the flow of cylinder parts, ensures that operators are working on the right parts, and saves on paperwork and time that used to be spent in production-planning meetings. The pegboard displays other cell pairings.

Lessons Learned

"It took us from 2012, the beginning of our QRM implementation, to 2016 for QRM to really take hold and for us to become comfortable with our progress," Van Dyke says. "Rather than managing by reacting, we began to manage by planning. We started to see results right away, but we got caught up in trying to be perfect, wanting to do things precisely by the book. As time went on, we realized we were moving in the right direction and didn't have to be all-encompassing perfect."

Rosenboom staff have appreciated opportunities to learn from other QRM companies through conferences, training events, and visits to facilities.

"Not all implementations look alike," Brian Rosenboom says. "Each company has to decide what works best. What's good for one might not apply to another."

"Our customers find that our focus on greater efficiency through QRM, combined with our unending commitment to meet their production requirements, helps them achieve their own corporate goals and aspirations." — Tom Eggers

Van Dyke agrees. "We saw that some companies are good with Q-ROCs in the quoting stage, other companies embrace cells and POLCA, and others have worked hard to develop their suppliers. QRM is a roadmap that creates structure and guidelines. Its principles work at different paces and in different stages for different companies."

Director of Sales and Marketing Tom Eggers considers QRM a helpful sales tool. "Our customers find that our focus on greater efficiency through QRM, combined with our unending commitment to meet their production requirements, helps them achieve their own corporate goals and aspirations," he says.

Van Dyke, Eggers, and Brian Rosenboom are among the many who are grateful for QRM. It has reduced stress while shortening delivery times, making them predictable and reliable, and keeping the company competitive on every front.

Two generations involved in the family business are, from left and seated, Co-founders Lary and Viv Rosenboom, and sons Brandon, Strategic Sourcing Manager; Darin, Director of Research & Development/Chief Engineer; Brian, Corporate Vice President; and Justin, Director of Business Development.

Center for Quick Response Manufacturing (QRM)

Established in 1993, the Center for Quick Response Manufacturing at the University of Wisconsin-Madison is a partnership between industry, faculty and students, dedicated to the developement and implementation of lead time reduction principles.

For over two decades, the QRM Center has helped more than 300 companies of varying sizes from a wide array of industries reduce lead times in all aspects of their operations to become more competetive in the global marketplace. **For more information, check www.qrmcenter.org, join our QRM LinkedIn group or contact us directly at 608-262-4709.**

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