

# Quick-Response Manufacturing For Custom Product

Mike Collins, Author of Saving American Manufacturing



Lean manufacturing methodology has been around for many years and successfully used by many manufacturers to eliminate waste and lower costs. But in the 21st Century, there has also been a trend in manufacturing toward high-variety, low-volume products with options configured for individual customers, and even custom-engineered per client or plant.

A good example is packaging machinery that is built to plant specifications and has a good deal of one-off engineering for each order. This is an industry where I spent most of my career, and I think that a methodology that is focused on reducing lead times may be a better answer than Lean. There are two compelling reasons:

First, lead times and customer delivery dates are a big problem for custom product manufacturers. These products — depending on the amount of custom engineering — can take anywhere from two to 12 months to complete. Customers who buy these products often have contractual obligations with other contractors on the project that dictate when product must arrive at the plant. Other times, the delivery is based on payback formulas approved by the board, which are written in stone. OEMs cannot guarantee all of these dates, and consequently, lose orders and market share.

Second, custom-engineered products have a lot more labor hours than standard products. A good example is a company I will call Arrow Machine. The company

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builds custom material-handling systems for a variety of markets and applications. Its engineering costs are 10 percent of total cost, but fabrication is 20 percent and assembly is 30 percent of cost. The company found that saving 5 percent on assembly labor hours would increase its gross margin by 1.5 percent, and the savings of 5 percent of the hours would also translate into more production and shorter lead times to take more orders and increase market share.

For these kinds of manufacturers, there is another methodology that focuses on reducing lead times that may be a better answer. It is called quick-response manufacturing (QRM). It was invented by Rajan Suri, who is the founder of the Quick Response Manufacturing Center at the University of Wisconsin. Suri says that more than 200 manufacturers have used his QRM methods in the last 15 years.

This does not mean that QRM is an alternative methodology that replaces Lean. Every manufacturer needs a good continuous improvement program regardless of the type of manufacturing. QRM simply complements Lean, Six Sigma and other popular methodologies. I just think that the QRM system is a better approach for custom product manufacturers who need to reduce lead times and labor hours.

### QRM vs. Lean Manufacturing

*Origin:* Lean is a methodology that was derived from the Toyota Production System, which was designed for high-volume, repetitive production like automobiles. QRM was designed from the ground up for low-volume and custom-engineered products.

*Driver:* The driver for Lean is the elimination of waste based on seven types of waste. The driver of QRM is the reduction of lead times, identified by the critical path of an order.

*Variability:* In Lean methods, tools like takt time, standard work and level scheduling target the elimination of variability. QRM acknowledges that variability can be a competitive advantage to exploit using QRM tools. For example, Columbia Machine is a manufacturer of palletizer machines, which are custom engineered and built to the customer's specifications. Every model is manufactured with options and there are no two machines alike. Offering hundreds of different options and special engineering, as well as supplying the purchased parts, the brands that each customer uses is a big competitive advantage. They don't need a methodology that limits variability, but one that supports it.

*Material Control:* Lean uses the Kanban system for material control. It works well for high-volume parts, but is not the best answer for custom or one-off parts. QRM uses a system called paired-cell overlapping loops of cards with authorization (POLCA). Kanban uses a card system as a replenish inventory signal, while POLCA uses a card as a capacity signal. For example, P&H Manufacturing builds large, custom mining shovels and dragline machines with annual sales of over \$1 billion. According to Bob Mueller, the factory manager, "Kanban was simply not an effective option for us. POLCA has been a good fit for our shop. Our process is complex: Parts move from cell to cell and sometimes to non-cell areas as well. POLCA keeps all of these areas working together." During the first year that POLCA was used by P&H, it reduced

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costs by \$3 million.

*Customer/Market Focus:* Lean is dedicated to shop floor processes. Instead of addressing the entire process, QRM focuses on the products that have the best chance of benefiting from lead-time reductions. This is called the target market segment. For instance, Charles Casings is a manufacturer of aluminum castings, but was losing business due to its spiraling lead times. The company noticed that because of rising fuels costs, there had been a surge in demand for aluminum casings because of their weight advantage over steel. The vice president of sales thought that they could gain a significant share of the growing market if they could provide specialized casings with short lead times. The company's final target market segment was defined as medium-sized custom aluminum casings that did not require precision machining.

*Time-Based Thinking:* Lean manufacturing is primarily focused on cost-based thinking. QRM focuses on time-based thinking, which extends beyond the shop floor. It is important that people in all areas of the organization engage in time-based thinking and reducing time during the critical path of the order. For example, Industrial Valves had a component that needed to have a special plating process; they had to send the part from the Midwest to the East Coast, which took four weeks in the process. Design engineering came up with a new alloy that would allow the component to be made in-house without any plating. This reduced the lead time by 67 percent.

*Organizational Structure:* Organizational structure is not a primary objective of Lean. Organizational structure, however, is a primary concern of the QRM process. QRM requires rethinking the organizational structure. Many manufacturers stick to their original functional organizations because they think they are gaining economies of scale, when in fact, a different type of organization can substantially reduce lead times.

In his book, *Quick Response Manufacturing*, Suri emphasizes that manufacturers must: Change the organization of tasks, procedures, equipment and processes from a functional to a product-oriented basis. In addition, he says that this requires transforming the structure of the organization from hierarchical with many levels to flat with cells and teams.

For example, Minster Machine manufactures large metal press machines and has been in business since 1896. Despite Minster's dominance in domestic and international markets with press products, management decided the company needed to diversify into other markets and products to continue to grow in the 21st Century. Minster Machine decided to try the methods of QRM, so the company had to change from a functional organization with centralized control to an organization with multiple divisions organized around products.

Minster's new type of organization works well in a dynamic environment and in new markets. I call this new organization a prospector organization — organizations are flat, have many business units or divisions, and are decentralized. The new organization utilizes commercially focused, multi-functional groups with the ability

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to find and exploit new product and market opportunities.

By focusing on new products and markets, the logical extension of this approach is the product organization in which all resources needed to research, develop, produce, market and sell related products are placed in self-contained organizational divisions.

Minster has now organized itself into seven divisions with their own responsibilities. These are: Minster Machinery, Minster Automation, Minster Services, Midwest Industrial Castings, Midwest Machining & Fabrication, Midwest Assembly & Logistics and Minster Wind.

This decentralized organizational structure is a flat organization with multiple focused teams tasked with commercial goals. Over time, its QRM approach, specifically the implementation of the divisional structure that mimics QRM's quick-response office cells (Q-ROCs), has created new business opportunities, enhanced relationships with customers, and resulted in improved volume and profit.

### Other Factors that Define the QRM Approach

*Cross Training vs. Specialist Employees:* In a functional organization, most employees are specialists who know how to do specific jobs very well. They may be experts in setting up a milling machine, but unable to work on different equipment. Or they may be maintenance technicians who can only work on wiring the machine, rather than have skills in hydraulics, pneumatics, welding, etc. What is needed in QRM are people who have continuous training in all of the skills with the primary goal of being a generalist who has the skills to work on any machine or even in other departments.

*Purchasing:* Another example is Arrow Machine. Arrow's customers want to specify every material in every process. This means working with new vendors all of the time and often running into lead time problems. This is a serious problem because many materials would not be available when needed, thus causing expediting and increases in labor hours. Arrow Machine solved this problem by moving a buyer from corporate purchasing into the division, so that the long lead-time materials could be purchased during the engineering process to gain valuable lead time

QRM is a process that focuses on reducing lead times. The essence of this process is to get rid of the restraints of the old functional organization where the focus was on economies of scale and specialist employees. It requires a new type of organization that is integrated, uses cross-trained workers and pushes decision-making down to the people doing the work. In the area of one-offs, QRM can lead to shorter lead times, lower labor hours, increased profits, and the capacity to accept more orders and increase market share.

*Michael P. Collins is the author of the book Saving American Manufacturing. You can find more related articles on his website via [www.mpcmgt.com](http://www.mpcmgt.com) [1].*

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