



Cellular manufacturing supports marketing strategy

Diversity, lean manufacturing pay off for Utah fabricator

By David R. Dixon

Richards Sheet Metal (RSM), a 74-year-old, family-owned fabrication business in Ogden, Utah, faced the challenge of taking on new business while meeting an extraordinarily diverse set of customer demands.

Over many years the company had built a reputation on fast turnaround and the capability to produce complex, custom fabrications in medium-gauge materials up to ½ inch thick. When Steve Richards, the current president and CEO and the grandson of the founder, assumed the presidency in 1985, he was determined to modernize and grow the business.

"I saw a clear opportunity to capitalize more fully on RSM's process expertise and diverse customer base," Richards said.

He applied lean manufacturing principles to double the size of the business and weather the recent economic downturn.

Market Characteristics

The company's market breaks down into nine categories:

1. Hard tool design and manufacturing, prototyping, and short-run stamping.
2. Fabricated components for high-rise, automated storage and retrieval systems.
3. Complete fabrication of heavy-duty conveyor systems.



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4. Major fabricated subassemblies for telescoping aircraft boarding bridges.
5. Architectural sheet metal for commercial roofs, gutters, downspouts, and miscellaneous applications.
6. Repetitively fabricated items subcontracted to RSM by steel service centers.
7. On-site facilities maintenance, including the fabrication of repair parts.
8. Heavy fabrications for process equipment (hoppers, chutes, bins, separators).
9. Miscellaneous fabrication.

Within a category, the company has from one to 50 accounts, providing a total of about 200 customers.

Customer expectations range from same-day turnaround on a time and material basis to just-in-time (JIT) deliveries of repetitive items triggered



Richards Sheet Metal, Ogden, Utah, overcame the challenge of taking on new business while meeting diverse customer demands by applying lean manufacturing principles, such as creating this welding cell.

by customer pull signals. Product is assumed to be free of defects, and price competition can be fierce.

"We could have chosen to reduce the complexity by shedding certain customers or entire categories of work," Richards said. "Instead, we chose to apply certain lean principles to retain, grow, and serve the customer base we had built."

Streamlining Manufacturing Concepts

Early in the effort to address these challenges, RSM engaged Technical Change Associates, a manufacturing consulting firm, to provide education, training, and technical support for the application of lean manufacturing techniques.

Figure 1 shows the model used to depict the lean manufacturing tool-

kits RSM's management team used to align the company's capabilities with the demands of its marketplace. Each quadrant of this competition quad represents a specific set of techniques and strategies that contributed to operating improvements.

Total Organization Commitment (TOC). TOC drives human resource initiatives that develop the skills, attitudes, and behaviors necessary to deploy technical aspects of lean practices effectively. The objective is to create a work force committed to doing a first-rate job for customers, where the customer is both the external (end) user and the internal recipient of work done by another person or group. This commitment, coupled with technical know-how, is the foundation for implementing a successful lean program.

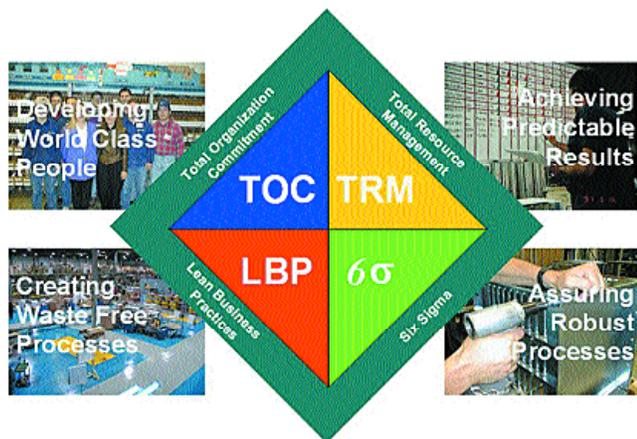


Figure 1

The Competition Quad provides a mental model for learning and working with the many tools required to develop a lean operation by applying lean manufacturing principles.

Total Resource Management (TRM). TRM provides a set of techniques for positioning capacity and inventory in a manner that ensures 100 percent on-time delivery at the lowest possible cost. The tools of TRM provide for realistic delivery commitments based on capacity or inventory available to promise and the means by which production schedules can be executed.

Six Sigma Quality. Six Sigma techniques are used to drive errors and defects out of business processes. These diagnostic and statistical tools have the potential to reduce defects to less than 10 occurrences per million opportunities, according to some experts. A reduction in defects to the Six Sigma level contributes to major reductions in the cost of quality and to near-perfect end-product quality.

Lean Business Practices. Lean practices reduce or eliminate non-value-added work (waste) to increase productivity, reduce inventory and other buffers, speed throughput, and make quality issues more visible. In addition, lean techniques allow production and delivery of small lots of material at frequent intervals—a growing demand in most industries.

Figure 2 details the 12 techniques of lean RSM used most from the lean toolkit in early efforts to support a manufacturing strategy that would:

- Meet the unique requirements of each of the nine market segments being served.

- Avoid excessive indirect and administrative costs associated with managing the complexity imposed by market diversity.

Applications

Focused layouts, one lean technique, has been a key to implementing the strategy. In conjunction with a 25,000-square-foot plant expansion in 1998, the company reorganized the facility into nine cells, each of which focused on a target market segment (see **Figure 3**).

CNC punching, laser cutting, plasma cutting, and sawing are treated as shared resources, providing blanks for the downstream cells. Receiving, shipping, and painting are also shared resources. With these exceptions, the cells can perform most of the work necessary to meet the expectations of their respective customers.

“Our next step was to assign a working team leader to each cell,” Richards said. “Drawing from the principles embodied in the TOC quadrant, we trained team leaders and team members in lean manufacturing principles and team-working skills. As a result, they work quite independently. They report directly to the plant manager with no intervening layer of supervision, a significant factor in keeping our costs low.”

The cells are subsets of the business, or shops within the shop, that enable specialization of equipment, tooling, methods, and skills. This

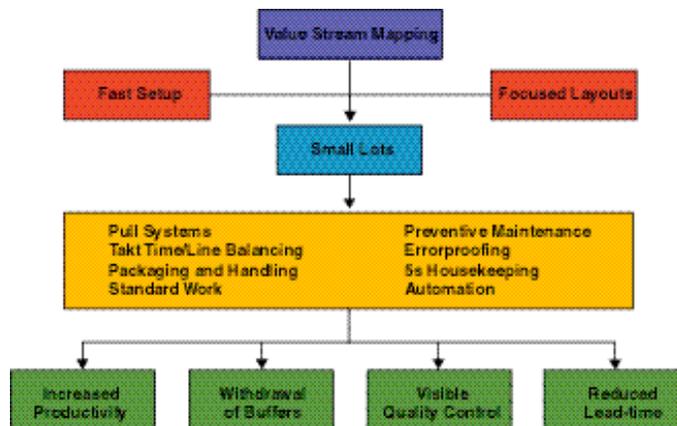


Figure 2

Lean business practices (upper part of the diagram) are mixed and matched to address the opportunities and challenges in a given operating environment. The bottom part of the diagram illustrates the benefits of the lean approach.

specialization allows the team to perform exceptionally well for a limited number of customers with similar needs for cost, quality, delivery, and other services.

The shop model shown in **Figure 3** defines both the physical and organizational arrangement of the plant and the business. This model reflects a number of TRM elements. Run rates are derived from a frequently updated forecast for the overall business. Cells and shared resource centers are then populated with the labor-hours necessary to produce at the forecast rate.

Labor defines the cell’s capacity, and delivery promises are made according to the uncommitted time in a given time slot—usually a workday.

As delivery promises are made, RSM’s manufacturing system back-schedules through the routing for each order to establish a start date. Orders are then ranked by start date, and the list is sorted into a single day’s work for each cell and shared resource center. This process ensures that each team leader knows exactly what is expected in terms of daily output and specific job deliveries.

After required capacity and schedules are known, a daily production meeting is held to monitor performance relative to the plan. This meeting revolves around the open order report (or schedule), which is updated daily and broken out by cell or shared resource center. The other critical tool is the daily production

board shown in **Figure 4**.

The board is designed around the same business subsets that are reflected in the physical plant layout and the organization structure. The top of the board is laid out in days of the week, with subheadings for the daily plan (P), daily actual (A), cumulative plan (CP), and cumulative actual (CA). The “plan” is the run rate in required earned hours fixed by the forecast.

Richards described the daily meeting this way: “Team leaders, along with representatives from engineering and sales, attend, and each person speaks to two basic questions: Did you hit the run rate? And did you run to the rank-ordered schedule?”

The run rate question is answered when each attendee posts the previous day’s performance on the board under “actual.” It is marked in green if the run rate was met and in red if it wasn’t.

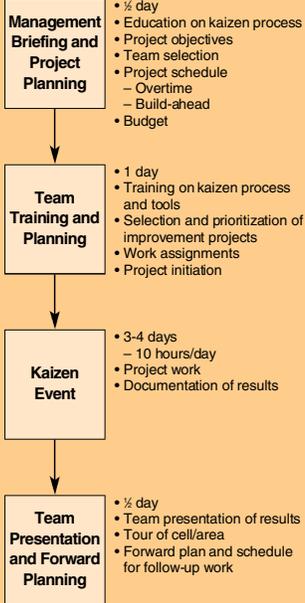
“Discussion focuses on how to recover lost capacity and to reschedule items that were missed,” Richards said. “A common outcome of the meeting is to swap jobs or manpower between cells, a means of fine-tuning capacity in the short term.”

The meetings seldom last more than 15 to 20 minutes, yet provide a comprehensive review of the performance of the entire business. They have the advantage of involving every leader in the company in decision-making and problem-solving related to on-time delivery and other customer service issues (see **Figure 5**).

case study

Kaizen Events

A kaizen event is a highly structured, short-term improvement effort carried out by workers in a particular work area. It usually lasts three to five days. The process, illustrated below, is straightforward, but it does require a great deal of management support and commitment.



In shop and administrative processes, kaizen events provide a mechanism for implementing lean manufacturing techniques quickly and effectively. When done well, these techniques can produce stunning improvements in productivity, schedule attainment, lead-time, and quality.

Other Improvements

As the layout and organizational approach took shape, RSM also was replacing an archaic, manual materials management and production control approach with a modern, computer-based system. Initial efforts to provide the new system with necessary data revealed some serious inadequacies.

RSM goes to market through a group of five account managers. These managers perform sales, estimating, engineering, and project management functions. Any one of the account managers might bring work to any one of the nine cells; however, they tend to be focused on two or three. Given his range of duties, each account manager is required to enter quotes and sales orders and create shop orders in the system.

Problems developed early with the accuracy and the completeness of the data being input. The challenge of getting the right data into the order was compounded by the range of requirements imposed by customers.

These problems were tackled with techniques from both the lean

and Six Sigma quadrants. A kaizen event was chosen as the planning and implementation vehicle (see sidebar). Application of selected lean and Six Sigma tools resulted in:

- Cleaner work orders for the shop.
- Reduced time and cost for generating a quote.
- Improved accuracy and consistency of quoted prices with respect to profit goals.
- A standard process for quoting, order entry, and job packet preparation.
- Improved success rate on quotes.

Improvement in these areas is ongoing, but current performance is good enough to support a high level of customer service and budgeted levels of profitability.

Results

RSM fashioned a manufacturing strategy that enabled it to secure a strong market niche and position itself for future growth within that niche. The diversity in the customer base provided a welcome cushion as the economy turned sharply down in 2002—this owing to the fact that some of RSM's customers were impacted much less than others.

RSM plans to run a series of kaizen events at the cell level to improve productivity and expand shop capacity. In addition, it initiated a marketing and sales campaign in which geographic expansion and added penetration are expected to double the size of the company in three to five years.

For fabricators emerging from economic doldrums made worse by having too many eggs in one basket, the RSM model indicates that a balance between strategic focus and diversity is important, and lean manufacturing concepts can help to forge competencies that allow a company to deal with a wider range of customer demands. ■

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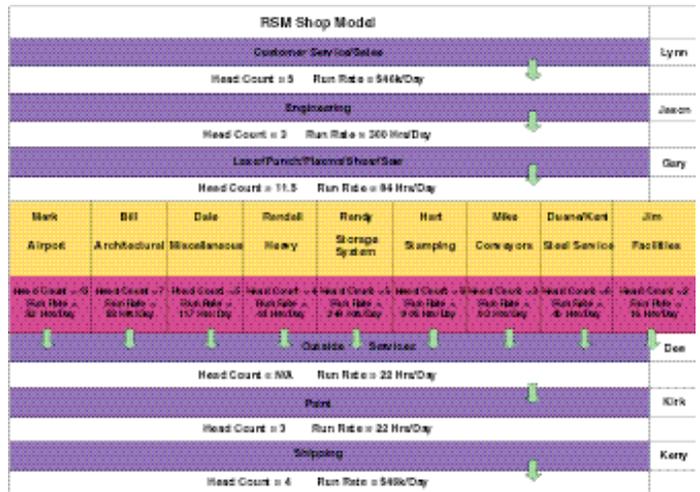


Figure 3

Focused layouts were a key to implementing RSM's lean strategy. In conjunction with a 25,000-square-foot plant expansion in 1998, the company reorganized its facility into nine cells, each of which targeted a market segment. This shop model defines accountability for results and documents capacity (in labor-hours) by cell or work center.

Work Center	Employee	Mon				Tues			
		P	A	CP	CA	P	A	CP	CA
Customer Service/Sales	Dave	\$46	\$52	\$46	\$52	\$46	\$43	\$52	\$95
Engineering	Gloria	300	280	300	280	300	295	600	575
Blank Generation	Tina	22	21	22	24	22	23	44	45
Airport	Barry	52	51	52	51	52	50	104	101
Architectural	Scott	88	85	88	85	88	90	176	175
Miscellaneous	Amy	117	125	117	125	117	115	234	240
Heavy	Dana	44	44	44	44	44	46	88	90
Storage Systems	Glenn	249	254	249	254	249	251	498	505
Stamping	John	900	910	900	910	900	880	1,800	1,790
Conveyors	Elton	90	91	90	91	90	90	180	181
Steel Service	Jeremy	46	48	46	48	46	47	92	95
Facilities	Rick	16	16	16	16	16	20	32	38
Outside Services	Mark	22	23	22	23	22	16	44	39
Paint	Dick	22	20	22	20	22	18	44	38
Shipping	Jack	\$46	\$46	\$46	\$46	\$46	\$45	\$92	\$91

Figure 4

This production board is the focal point for a daily production meeting that monitors performance to plan. Labor adjustments, overtime, and other corrective actions ensure that schedules are always met.



Figure 5

Daily production meetings bring the company leaders together to support on-time delivery and superb customer service.