

How Lean Focused Factories Enabled Daman to Regain Responsiveness and Become More Agile

Everyone had to forget what they knew about old processes.

Duane Grahovec, Bernie Ducat, Jerry Stevenson, and Colin Noone

Daman Products is an industry leader in the design and manufacture of hydraulic valve manifolds. Primarily a CNC-based manufacturing facility, this 22-year-old company in Mishawaka, IN has grown from two employees to 100 by providing quality parts and services to its distributors and end users. In 1997, recognizing that the company was losing its “small company” responsiveness and flexibility, Daman transformed itself from a departmentalized, vertically-structured organization into four focused factories¹ using cellular layout, pull scheduling, Kanban systems/JIT, visual management tools, and employee empowerment over a six-month period.

All manufacturing support functions were reassigned to the shop floor during this transition. Each focused factory is responsible for every aspect of their products, from purchasing to shipment. Daman’s defining statement about focused factories is, “performance to plan within spec.” The results have been a 97 percent reduction in cycle time, a 50 percent reduction in setup time, leadtimes reduced from four-eight weeks to five-ten days, and product travel distance decreased 90 percent. Performance is measurable, rework declined, and employees are empowered and accountable for performance, as discussed during a recent workshop at the facility.

The Mission Begins

Mike Davis, vice president of manufacturing for Daman Products, talked about the reasons behind the changes during a recent “Focused Factories” workshop. They included

a move to a new, larger facility, which Davis at first thought would be the same layout as the old facility. He had the layout all set three months before the machine foundations were to be poured. Then he had Doug Atkin, a senior industrial specialist at Crowe Chizek & Company, review the design and give comments. Atkin gave Daman insight on different concepts of focused factory layout and operation. With this information, Daman began a mission to learn and apply the concepts, with the time constraint of the impending move. Davis put together a team of the top managers from all departments, who worked on the transition and in turn became the plant layout designers.

The Focused Factory² Team set goals for the design and reorganization of Daman Products. The mission statement they developed,

*The Focused Factory Team
set goals for the design and
reorganization of Daman Products.*

reflecting the philosophy that built the company is, “*It is our duty to provide outstanding technological and service leadership beyond our customers’ expectations so as to promote their interests, thereby ensuring continuous opportunities for our people.*” They did not want to lose sight of their most important goal, which is serving the customer.

High priorities for this development included cutting leadtimes, which had grown

during the previous years. They also aimed to get the supervisors away from the firefighter mode, through quicker response to the customer, allow time to develop new products, and grow the business in an orderly fashion.

The company’s processes had become cumbersome through its growth stages and needed to be simplified. The project design team and Daman management sought to become a quick, responsive organization again -- to think of the corporation as small business units instead of one large entity.

Davis and his team decided focused factories were the best way to continue. This approach gave them the following work environment characteristics:³

1. Improved communications
2. Managers on the shop floor
3. Support staff close to each operation
4. Managers involved in more facets of the operation
5. Support of the factory coming from the operators
6. A smaller office staff with a better understanding of the operation
7. Everyone involved with all aspects of the operation
8. Economical use of resources (a necessity because of limited funds).

A Scary Situation: Everything Changed

Here’s how the transition happened. First, everyone had to forget what they knew of the old process. Everything changed in the new

scheme. Previously run from the top down, the factory now ran through the teams. (Figure 1 shows the traditional and revised management models.) Reversing roles was a scary situation for both teams and management. Their mind sets had to be altered.

The focused factories were broken out according to group technology (identifying the key characteristics of products that make them similar or different). In Daman's case, these characteristics were: stocked/build to order (some standards are not stocked), aluminum/ductile iron (raw material), small/large (physical size of parts, standard/custom, and small quantity/large quantity -- special products). While Daman used manufacturing characteristics as the key identifiers, their analysis included suppliers through customers

and every process in between, according to Davis. Through this process the focused shifted to building lots of one if needed instead of batch manufacturing.

Maximizing throughput of the new factory was a top priority for the team. To accomplish this goal, they reevaluated how part numbers were going through the cells. Using a methodology developed by Crowe Chizek, they put each significant characteristic of each item on a spreadsheet; after an in-depth review, all the part numbers were assigned to a cell. This process allows for minimum setups, common tooling, and common gaging. It also eases operator training because the parts repeat frequently. Other positive results were the ability to easily identify staffing requirements and to allow the cell

team's ownership of its entire process.

Better Cycle Time, Setups, and On-Time Delivery

As each Daman team moved to the new building, they applied focused factory concepts. The day that a focused factory went "live," leadtimes dropped from four weeks to two weeks. Within three months, it was five working days (and has been as low as three working days).

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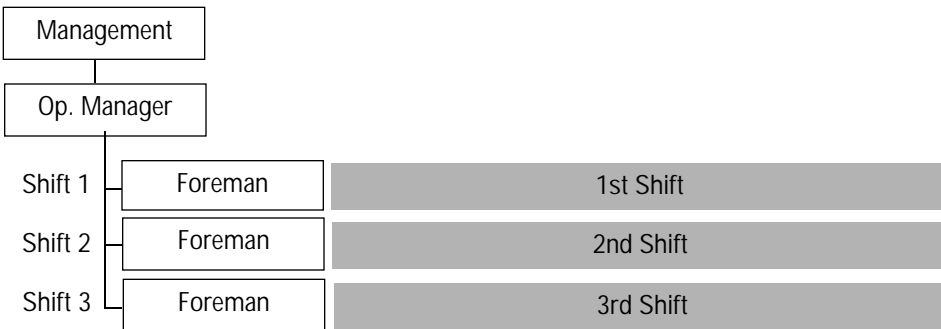
"Our definition of leadtime is measured from when the need to run a product is identified until it is available to ship," Davis said. "This used to include forecasting, scheduling, purchasing, shipping of raw materials, sorting incoming materials, routing, manufacturing, etc. Today Kanban is the trigger. A purchase order (p.o.) is triggered automatically, material is cut at the supplier site, and it is shipped within 24 hours. It arrives at our site, pre-sorted by cell and ready to be loaded in the machines. Our cycle time is how long the process time is from when the material arrives until it is ready for shipment. This used to be 13 days, on average. Today it is less than one shift, on average."

A 50 percent reduction in setup times was one of the byproducts of cell manufacturing and the way cells were set up (families of product). The new arrangement made it easy to reduce setups at first. Daman took it further by enabling teams to adjust their schedules when they see that value-added changes can be made to machine like parts at the same time as other orders that need to be filled.

The teams each have tool storage with the tooling for any job to be run in the cell. Each cell is self-sufficient, with maintenance personnel and tooling as well as storage of raw materials and finished parts in the cell. Each cell also picks its orders to ship.

Teams were made responsible for on-time shipping. They use an Excel spreadsheet

Traditional Management Model



Cell Management

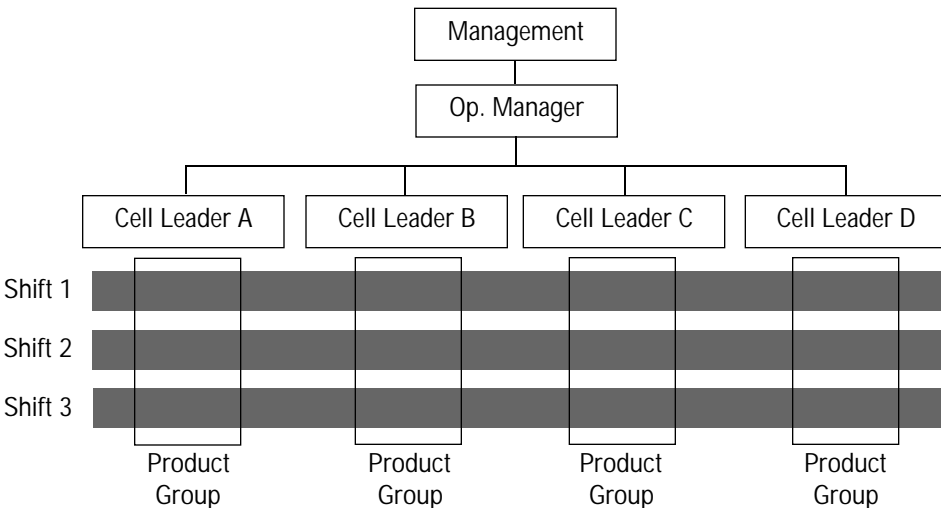


Figure 1. Teams assumed new roles in Daman's reorganization.

to call out the exact time that an order should be complete. Each cell's customized schedule is posted in their area (Figure 2). The teams track what orders are complete and at what time (a sample cell report is shown in Figure 3). They also indicate what might have caused a delay if an order is not completed on time. This procedure seemed to work for Daman because it showed how critical the on-time performance was to customer satisfaction. Leadtimes decreased from four-eight weeks to five-ten days.

Additional Improvements

Product travel distance decreased 90 percent as a result of the transition. Each cell is equipped with the right tooling to complete each product it runs. Raw material, tooling, and finished goods inventory are stored in the cell. Wash equipment was purchased for each cell to minimize delays previously experienced in transporting parts to a common area. This change also helped increase the quality control of the product because the team has the ability to inspect the product after the cleaning process. "This usually occurs while part of the production run is still on the machine, which further eliminates waste by immediate communication of potential problems in the process," Davis said.

Push Versus Scheduling

Daman decided that with their new factory they needed a modern way of scheduling their new cells. They selected pull scheduling as the method, aiming to eliminate waste (excess inventories, delays, etc.) of the previous push scheduling concept.

Pull scheduling characteristics include: build what ships, buy for today, small lot sizes, and rapid response to customer needs. Daman stored all finished goods within each cell. Each item has a reorder point and when it is reached, a "run card" (Figure 4) is a Kanban trigger to produce more manifolds. It contains all of the specifications and process information for each piece. The transaction goes into the planning/scheduling system that is regenerated weekly.

The run card is scanned in the cell

when the last piece of the lot is pulled. The scanned product is placed at the bottom of the cell's schedule. This way, products are being replenished in the order they were consumed. The schedule is maintained on an Excel spreadsheet that is "read only" for the rest of the company.

The p.o. for raw material is automatically generated and p.o.s are faxed to the supplier/supply center every day based upon the schedule. A small amount of raw material is kept in central stores for emergencies. Items from stock represent 60 percent of annual sales.

New orders are placed on the schedule, and then everything is driven by the due date. Starting in engineering, all departments refer to the same schedule with the final due date as their guide. Prints and paperwork go directly to the cell and raw material is ordered from the service center.



Figure 2. Team members keep schedule status current and document their performance to plan measure and scrap percentage; John Petzold of Cell A is shown.

Daman Products Cell A Schedule Report — Work Completed

Item	Product Qty.	Product Hours	Planned Completion	Actual Completion	Qty. Comp.	Qty. Scrap	\$ Scrap %
76-9395978	16	2.24	6/27/99 23:56	6/28/99 1:22	16	0	0.00%
633-190828	12	2.88	6/28/99 0:53	6/28/99 2:52	12	0	0.00%
47-3216399	24	4.56	6/28/99 3:45	6/28/99 4:14	24	0	0.00%
334-7447685	4	0.92	6/28/99 1:11	6/28/99 4:45	4	0	0.00%
689-2703745	4	1.08	6/28/99 1:32	6/28/99 4:54	4	0	0.00%
119-1872428	8	1.52	6/28/99 2:02	6/28/99 6:07	8	0	0.00%
127-5012405	10	1.8	6/28/99 4:21	6/28/99 6:08	10	0	0.00%
635-4225288	4	1.68	6/28/99 4:54	6/28/99 8:35	3	1	2.64%
352-5848646	24	4.56	6/28/99 9:52	6/28/99 10:07	24	0	2.12%
478-9842123	4	1.88	6/28/99 7:07	6/28/99 11:14	4	0	1.93%
940-5982735	10	1.7	6/28/99 12:47	6/28/99 11:51	7	3	3.70%
114-137085	20	1.2	6/28/99 19:51	6/28/99 13:00	20	0	3.56%
238-102208	2	0.62	6/28/99 20:23	6/28/99 13:10	2	0	3.50%
583-4074202	2	0.62	6/28/99 23:06	6/28/99 13:11	2	0	3.44%
277-7028984	12	4.8	6/28/99 6:30	6/28/99 14:49	12	0	2.82%
301-9042218	12	2.28	6/28/99 23:51	6/28/99 21:15	12	0	2.65%
376-814557	24	2.16	6/28/99 22:00	6/28/99 21:16	24	0	2.52%
473-8197561	100	20	6/28/99 19:27	6/29/99 20:28	84	16	7.68%
164-2455446	112	17.92	6/29/99 5:49	6/29/99 21:34	111	1	5.97%
862-9007716	4	0.76	6/29/99 7:52	6/29/99 22:20	4	0	5.93%

Figure 3. Teams track what orders are complete and at what time (a partial cell report is shown); they also note what might have caused a delay if an order is not completed on time.

The overall result of the change from push to pull scheduling has been significant reductions in leadtime, finished goods, and raw material inventory, plus a large increase in customer satisfaction, according to Davis.

Changes and How to Prepare

Change must become a driving force in your company, as Daman discovered. It is what makes you expand your horizons. Everyone must participate in the development and

implementation of new concepts and have a clear understanding of the changes.

Among the additional “lessons learned” at Daman:

- Training in quality techniques must be ongoing for the teams to improve their knowledge
- Networking with other manufacturers helps you to bring other ideas to your teams; there is always another way to look at a problem

- Listen to every team member’s ideas, no matter how outrageous they may seem; it will help to keep the team in sync and united in thinking in the right direction

Networking with other manufacturers helps you to bring other ideas to your teams . . .

- Make change incrementally until you have a successful method
- Kaizen blitz methods work well because the team sees results quickly and they can measure changes in real time soon after the project is accomplished; clear improvement concepts and a budgeted time frame are helpful for these projects
- Cooperatively accept change as a way to improve your company; this is particularly critical if you have one person pull you back or react negatively
- Benchmark as much as it is practical; you need to demonstrate improvements as having a positive effect on the process
- Trust your team; this has the biggest influence on how well your improvement process works; the team must be empowered to feel ownership of the improvement efforts.

Pitfalls


Mike Davis described various pitfalls of the transition to focused factories and other changes at Daman. Insufficient training on team concepts for teams as well as team leaders initially caused communication problems. This problem is being addressed with facilitator training. Daman started a pilot cell a couple of months before moving to the new facility, which helped the company determine cell design and training issues. Since then, a training matrix (an example is shown in Figure 5) has been developed. It ensures that training is complete and accurate. Emphasizing the importance of communication in these efforts, Davis said cell members meet daily at the beginning of their shift to review the status of the schedule and chart key measures. Cell leaders meet weekly with management,

Sample Run Card

Daman Products Company, Inc.

RUN CARD
AD03P032P

11/01/97
Qty 32
Cell A



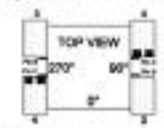

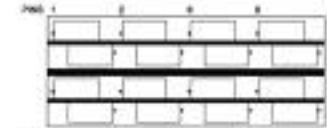
<p>Trigger Routing</p> <p>Operation Receive Material <i>Note: Inspect 4 pcs.</i> Fill Order from R/M Make Kits</p> <p>Horizontal/ Fixtures Load Program Load Tools Run First Piece Load / Flip</p> <p>Vertical/ Fixtures Load Program Load Tools Run First Piece Load / Flip</p> <p>Deburr Wash Pack Stock</p>	<p>Setup Information</p> <p>Ends (horizontal) Program name: AD03P032P Comments: Ends, both pallets Program location: NC-7 directory Fixture no: H23234K6DLC & H23234K6DLD Fixture configuration: "A" Vises used: 1, 2, 3, and 4 Pin Stops used: Pin B for face 3; pin C for face 4</p> <div style="display: flex; justify-content: space-around;">   </div> <p>Sides (vertical) Program name: AD03P032P Comments: Sides, both pallets Program location: NC-5 directory Fixture no: V4821CM335A & V4821CM335B Fixture configuration: "A" Pin Stops used: 1, 2, 6 and 9 for all four rows</p>  <p>Expertview drawing: /engineering/runcards/lwm/AD03P032P.R0</p>																															
<p>Bill of Materials</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Inventory no.</th> <th>Description</th> <th>Qty</th> </tr> </thead> <tbody> <tr> <td>000-B0000600650</td> <td>B-00008 x 008.500 6061-T6 Aluminum</td> <td>32</td> </tr> <tr> <td>185-300MKP</td> <td>Manifold Mounting Kit</td> <td>32</td> </tr> <tr> <td>500-03W</td> <td>D3W Corrugated Wrap (x 12.63 long)</td> <td>32</td> </tr> <tr> <td>501-03C</td> <td>O3C End Cap</td> <td>95</td> </tr> </tbody> </table>	Inventory no.	Description	Qty	000-B0000600650	B-00008 x 008.500 6061-T6 Aluminum	32	185-300MKP	Manifold Mounting Kit	32	500-03W	D3W Corrugated Wrap (x 12.63 long)	32	501-03C	O3C End Cap	95	<p>Stock Fill stack 4 x 4, 2 deep</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </table>																
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Figure 4.

human resources, quality assurance, maintenance, and shipping to discuss performance measures and communicate on corrective actions, standard operating procedures, and goal setting. (See Figures 5 and 6).

Another pitfall was the challenge of having all the tooling that was needed for each cell for the focused factory changeover. Daman realized early that there wasn't enough tooling to completely stock all the cells to run jobs without taking from the other cells. Davis

reported that two of the cells were fully tooled at implementation. The other two are 80 percent tooled, with the remaining tooling being shared from a central tooling area which is gradually being phased out.

What's Next?

"Our goals for the next year emphasize the development of our people," Davis said. "Training the task-oriented skills is the first step for cross-functional teams. We have been focusing on the documentation and training

of those skills. Now we need to move towards the soft skills that will move us into self-directed work teams. We are currently developing a

"We turned our manufacturing process upside down and the employees have risen to the challenge."

Mike Davis



Figure 5. Cell members meet regularly to discuss progress and potential problems; shown are Cell C members during a shift meeting — clockwise from the right of the board are Sean Compton, Ryan Riddle, Mike Boots, Rich McIntyre (shift leader), Jim Tobolski (cell leader), and Kevin Billsborough (shift leader).



Figure 6. Cell leaders meet weekly to chart key measures; shown are Matt Giloth design manager, and Dan Van Deventer, operations manager.

skills-based pay system that promotes employee growth and the development of team skills.

"We are very proud of the accomplishments made by the employees of Daman Products," Davis continued. "We turned our manufacturing process upside down and the employees have risen to the challenge. The credit for our success goes to them."

1. Four focused factories include: 1. Aluminum, build to stock, standard parts; 2. Aluminum, build to stock, standard parts and aluminum, build to order, volume specials; 3. One off, build to order, and build to order standards; 4. Ductile, build to stock, standard parts.
2. The Focused Factory Team included Larry Davis, executive vice president; Dave Mishler, CFO; Mike Davis, vice president of manufacturing; Dave Van Deventer, operations manager; Dave Thomas, quality assurance manager; Matt Giloth, design manager; Gordon Weiler, sales/marketing; Tom Weinkauff, project manager; Bob Spychalski, assistant operations manager; and Doug Atkin of Crowe-Chizek.
3. The list of eight characteristics is based on material in the book, *Reinventing the Factory*, by Roy Harmon and Leroy Peterson, The Free Press, 1990.

Duane Grahovec is the executive vice president at American Lock in Crete, IL; also of American Lock are Bernie Ducat, vice president of manufacturing; Jerry Stevenson, plant manager; and Colin Noone, a supervisor.

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