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Finding lean in simple inspirations

By **Jerry Ward**

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No facet of a metal fabricating operation is too insignificant for lean improvement. If you're looking for ideas on areas to tackle, this article will help.

Instead of turning out millions of identical widgets, most precision fabricators and assemblers of sheet metal components create hundreds of different parts for various customers, often in small lots. These fabricators must be flexible enough to switch out one production order for another in a matter of minutes and adapt to late-breaking design changes without missing a beat.


Metcam's new cellular fabrication approach brings related processes together to yield dramatic benefits.

Achieving lean practices in this type of operation isn't easy, because you can't streamline one long, uninterrupted production process and call it a day. Nevertheless, there are ways to reduce waste and improve quality. The following changes implemented at Alpharetta, Ga.-based Metcam Inc., a precision fabricator of custom sheet metal components and assemblies, may give you the inspiration you need to make changes in your shop.

Space Concerns

In late 2011 Metcam landed a new job while production capacity was already near its peak. To accommodate the growth, the company had already reconfigured the shop floor for maximum efficiency, or so it thought.

At the time it had grouped like equipment, such as its press brakes, near one another and stored unformed parts in racks adjacent to the forming area. Material would stay in the rack anywhere from one to six days. The lead person would run a forklift to feed and relieve parts to the other operators plus his own press brake as needed.

Grouping equipment and storing its raw material nearby was very efficient, in terms of reducing inventory storage and wasted human motion. However, the result was parts staged all over the place and very little extra space.

Cellular Division

The plant manager suggested staging the press brakes, punching machines, and lasers in groups throughout the building. In this particular case, only the press brakes had to be moved to create the production cells.

Of course, cellular manufacturing isn't a new concept; it's a workplace design that many large manufacturers employ. However, it's less common for small-lot fabricators, because so many discrete and/or discontinuous processes are involved. This challenge was solved by designing the cells for flexibility. Equipment could be moved and cells reconfigured as needed to adapt to the requirements of any job.

This shift led to changes that enhanced throughput and process efficiency. For example, in many instances, lasers and turret punches can cut parts much faster than press brakess can bend them. One laser can cut 2,000 parts in the same time it takes one press brake to bend 500.

Previously the company would send those 2,000 cut parts to the press brake storage area where they would wait to be bent before proceeding to the next stage in the process. With multiple jobs going on in the plant, a press brake might not be available to process those parts for days, and they would sit there as work-in-process. The cellular approach now allows parts to flow from laser/punch to bend to hardware insertion in a continuous process.

Maximizing Resources

To ensure the success of its cellular concept and maximize resources, Metcam looks at each job and determines the flow in the cell. High-dollar turret punches and lasers cost too much to run at a slow speed. If the job requires more than one press brake to handle the pace and volume, options are available: Production can be assigned to an idle machine waiting for work, or a designated hand-off machine can be pulled into the cell. The same approach works with the hardware insertion machines, which are on wheels and can be moved easily from one

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cell to another.

As a result of this targeted cell customization, cut pieces no longer stack up, consuming floor space while they wait for the next step. Teams can process orders consecutively, which decreases lead-time.

Cross-training all employees within a cell to run all machines also enhances efficiency.

The company schedules its punches in advance, so material can be prestaged to decrease machine downtime. The operators can go seamlessly from job to job, because the material handlers keep them staged with metal and hardware. Advance staging also helps prevent jobs from being held up because a special punch tool is already being used in another machine.

Scheduling helps the leads plan machine sequencing to make sure jobs flow consistently through the pipeline. The focus is on maximizing the capacity of entire cells and the production floor, rather than on the production capacity of the individual operators and machines.

Lean on Quality

Introducing manufacturing cells also helped the company improve quality. A few years ago it began training operators to become quality inspectors. Now when an operator funs his first part, he inspects his work and then a second qualified operator checks it again and signs off on the first piece with him. As work progresses, each qualified operator remains vigilant for defects, such as burrs, and if he sees a problem, he can notify the previous operator before too many parts have been processed. Essentially, everyone is responsible for quality; you can never have too many sets of eyes on a part.

Before the production floor was restructured, by the time a defective part got to a second operator, quite a few rejects might have been produced at the first station, increasing waste. Now that operators are right next to each other, they can catch any defects much more quickly.

Quality control still performs its required inspections, but the company has been able to reduce the number of inspectors from five to three. Because of the operator inspection concept, these three inspectors still have time to roam the floor and perform random inspections.

The Power of Pictures

Another lean improvement the company credits with reducing defect and waste rates is its “video-visual work instructions.” Until late 2010 traditional written work instructions with photographs were used. These often had multiple pages and sometimes were difficult to follow. Additionally, every time an item’s production process changed, the instructions had to be updated and replaced.

Metcam discovered that line personnel were not conforming to the written instructions as well as hoped. They would be trained and then think they no longer needed to reference the instructions. Plus, since some lines produced more than 30 different items, changing over to new instructions was difficult and time-consuming.

To compensate for these shortcomings, the company created video-visualwork instructions—pictures of each step in the production process appear on a large, flat-screen monitor placed directly in front of the employee performing the step. Full-color, digitized images of each station's operation, with critical points clearly marked, are stored as a group on a computer dedicated to the specific fabrication cell. The instructions not only help train workers in the process through repetitive exposure, they remind them of the correct procedure if they need a refresher.

On the management side, it requires only a few clicks of a mouse for supervisors to ensure the most current procedures are displayed and that they appear in the correct sequence. Late-breaking change requests from customers are incorporated much more rapidly than they were with documents, diagrams, and training sessions.

Furthermore, it's easy to switch gears to display a different set of instructions when the assembly or fabrication line begins a new order. When the supervisor changes the instruction set at the PC, the new pictures show up on all the appropriate monitors simultaneously.

Another benefit of this system is that pictures transcend language barriers in a way no other learning aid does, and a human can grasp their meaning almost immediately. Compared to the time involved with finding the right information in a written work instruction, reading it, and processing it, plus the time for interpretation, if necessary, video-visual work instructions reduce comprehension time exponentially.

A system such as this does come with considerable start-up costs, including monitors, network cabling, and setup, but it can increase production quality and improve plant efficiency by minimizing setup time and facilitating the staff’s flexibility.

Get It Right

A simpler but equally effective program, implemented for processes where video-visual work instructions are not ready or appropriate, involves in-house drawings. Traditionally, customer drawings have always been the gold standard of manufacturing drawings. However, some customers’ drawings are easy to interpret and some are not. Some use inside dimensioning; others use outside. Origins might be in various places, and some drawings are just cluttered and confusing. They also lack consistency, because they have been prepared using different drawing standards.

Metcam noticed a correlation between defects and confusing customer drawings, so it began augmenting customer drawings with its own, simpler, more standardized versions. These versions generally contain the least amount of information needed to avoid overburdening operators with too much information.

For example, punch operators are given a drawing of the part, flat and unbent, with all the hole sizes and overall dimensions (ODs) for them to check. Working with a diagram of a flat part (as opposed to a customer drawing of the formed part) requires less time and interpretation and makes it easier for the operator to determine whether the flat part being produced at this particular stage of the process conforms to specifications.

Press brake operators are given only the information they need to orient and form the part correctly—in other words, to not bend it backwards. They are given the required bending dimensions with standardized views. All dimensions are given as an ODs, so they are consistent.

Even hole sizes are not provided on the form drawing. However, important information that the customer might not have included, such as the fact that a part is not symmetrical and must be oriented in a specific position prior to forming, is provided.

To ensure these drawings accurately transfer the customer's instructions to the production process, quality inspectors must use only the customer-supplied drawings to inspect the product.

According to Metcam, before it began to produce its more standardized and simplified drawings, it was bottlenecked at the press brake. After the drawings, employees no longer had to convert metric dimensions or look at inconsistent documents and try to figure out what the customer wanted. Operators experienced fewer problems, and production moved smoother and more quickly.

No Facet too Small for Improvement

No facet of an operation is too minor for improvement. For example, hardware bags, which contain multiple instruction sheets, plastic items, screws, round pieces of plastic, and other assembly components, usually contain items purchased from a vendor. If any of these components are defective, it causes problems for the fabricator. Metcam found that by using extremely accurate scales to weigh the hardware bags, it could identify and eliminate defective pieces before they were shipped to customers.

A Journey, Not a Project

Along the way, you may discover many other improvements to reduce waste, energy, and other cost factors. Resolving a bottleneck in one area often can create another one. In Metcam's case, because of improved production, it couldn't paint products fast enough, which led to the purchase of a second paint line.

Lean manufacturing is a journey, not a single project. Changing conditions and environments necessitate ongoing improvements and adaptations if you are to continue down the right path.

Additional Information

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