

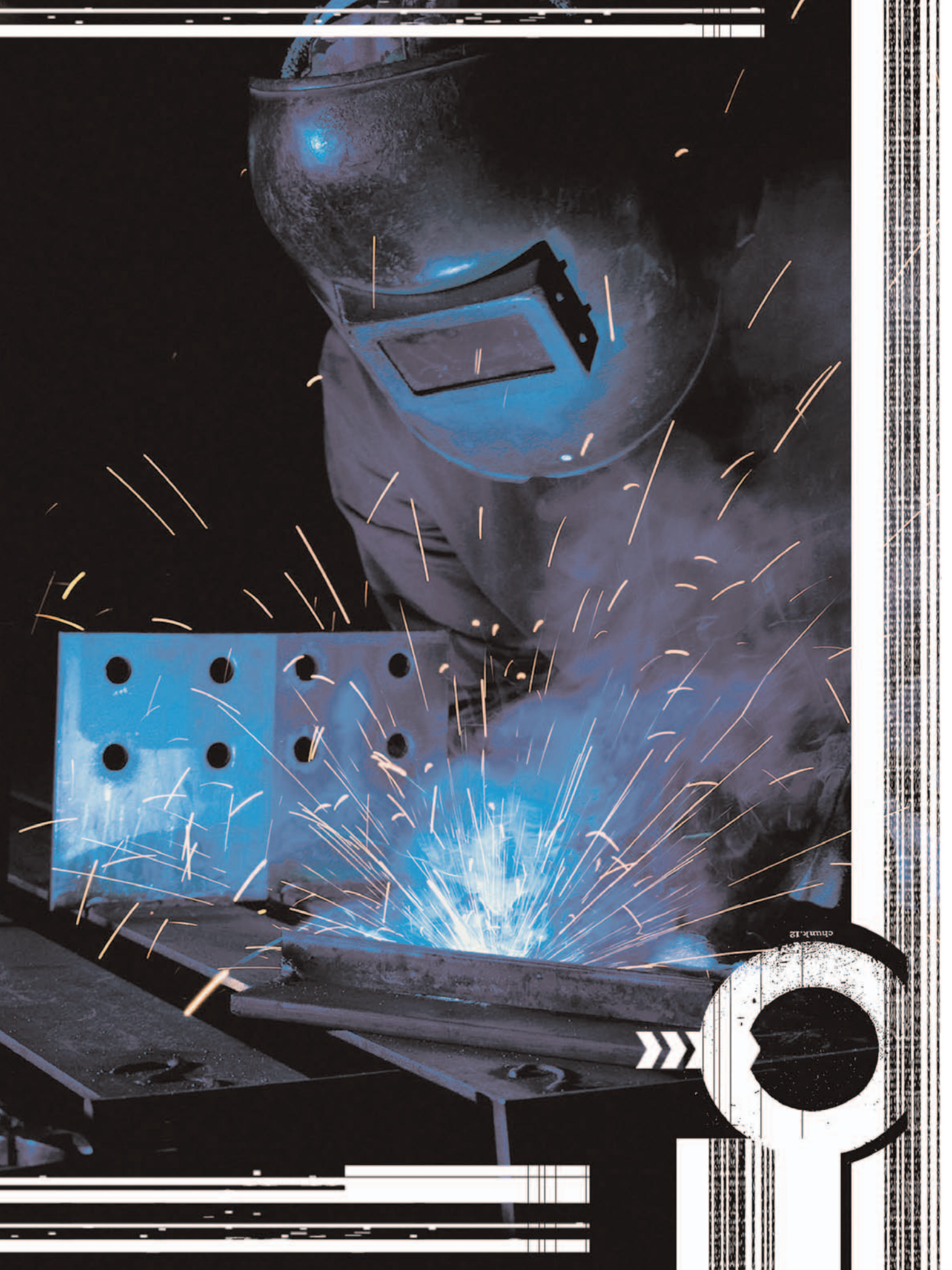
LEAN MANUFACTURING DOES WORK IN TOOL AND DIE MAKING

LEAN MANUFACTURING CAN BE APPLIED TO THE TOOL AND DIE INDUSTRY, HOWEVER, YOU SHOULD FULLY UNDERSTAND THE PHILOSOPHY BEFORE YOU CAN APPLY IT TO YOUR SHOP.

By Gary Gathen

»» The U.S. automotive tool and die industry is weathering a great storm these days, caused by several factors: customers are building more tooling in-house; increased efficiency at die shops and their customers; foreign competition, especially from low labor countries; and fewer, more spread-out new model programs have created a great deal of excess capacity. Many tool and die shops have shuttered their doors — in Michigan alone, 30 percent of them have disappeared since 2000 and the outlook is no better for the rest. Lean manufacturing is one way to turn the tide.

“Lean manufacturing is a good idea, but it doesn’t work in the tool and die industry,” is the opinion of many shop owners and managers in the U.S. today. “We’re already lean — we’ve gotten rid of 20 percent of our workforce. We’re lean and mean.” Many companies believe reducing head count is the



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meaning of going lean. Lean practitioners would strongly disagree.

To begin with, what is lean? The term lean was used by James Womack, et al. in the landmark 1991 book, *The Machine That Changed the World*, which was the result of a five-year global study of the automotive industry. The authors determined that Toyota was not only the world's best automaker, but the world's greatest manufacturer, period.

Over approximately the last 50 years, Toyota developed its TPS, or Toyota Production System. Lean is the Americanized expression for TPS, and "The Machine," of course, is the TPS.

Here's how it works: There are only four things that can be done to a piece of material. 1. Processing, which is defined as adding value in the eyes of the customer. For example, sawing, drilling, milling, heat

treating, plating and so on, activities that make the piece of material more complete. 2. Inspection, to ensure the work has been done correctly. This is a necessary process step, but it adds no value (in the eyes of the customer). 3. Transport, or moving the piece from place to place inside or outside the shop. It is necessary to enable the other value-adding processes, but adds no value itself. 4. The only remaining thing you can do to the material is to store it. This is called delay or standby, a step that can consume as much as 90 percent of the calendar time in manufacturing.

The Japanese word *muda* means waste. Simply eliminate the waste in processes and the lead time and cost shrink greatly. It is easier said than done, however. *Muda* is everywhere, but it's not often visible, so it must be discovered, exposed and eliminated wherever it is found. Taiichi Ohno and Shigeo Shingo, co-inventors of the Toyota Production System, identified seven types of *muda*: overproduction; time on hand (waiting); transportation; the waste of processing itself; stock on hand (inventory); worker movement; and making defective parts. Other forms of waste exist, such as the waste of excess product complexity and rework, but elimination of the seven types will improve operations to the extent that delivery times can be slashed to one-half or one-quarter of the current time by just focusing on waste reduction. It has taken Toyota 50 years to achieve the current level of productivity. Don't expect to achieve measurable results easily or quickly; it won't happen.

How do we discover the waste? The first step in what is called the lean journey is to apply the practice of the five s. In other words, clean up the place. The five s represent Japanese words, which translate to: sort, shine, sanitize, stack and sustain. Doing this eliminates the wasteful activity of searching for things: tools, materials, people, instructions, and so on. Many shops today have done some form of housekeeping already, so how do you define the process?

The recommended method to observe and analyze your

manufacturing process is called value stream mapping, or VSM, which is usually done with pencil and paper, and will show the current state of the production process. Created to simply and clearly represent the flow of materials and information in the plant, VSMs are drawn for each product or family of products and for the plant as a whole. Other lean practices include standardization, the five whys (asking why five times to get at the root cause of your problems), Six Sigma, and so on. This information focuses on VSM.

WILL IT WORK FOR TOOL AND DIE?

Will value stream mapping and the whole lean journey work for the tool and die shop? The answer is yes, but we must remember that the solution is simple, but not easy. It won't be fast, either. Manufacturing is manufacturing, whether the end product is a million widgets or a single die or mold. The common misconception in the tool and die industry is that because we only make one of anything, lean principles won't work for us. In reality lean principles can be successfully adapted to this or any industry, albeit in a different manner.

One of the members of the Society of Manufacturing Engineers' Lean Tool and Die Making Tech Group is already achieving unheard of results in the manufacture of complicated progressive dies. Normally these multiple station dies, up to 60 inches long, require lead times of 16 weeks. The member shop, RCM, in Romeo, Mich., is designing these dies in two weeks and building them in two additional weeks, a reduction of 75 percent. Not resting on its laurels, RCM, with a mere five employees, is designing and building its own robotic pallet loader and unloader devices specifically for its CNC equipment. The owner has developed a CAD/CAM software package that uses feature recognition that enables all die geometry to be contained in the design file without visible dimensions and tolerances cluttering up the drawings. The CNC milling machine or wire EDM operator sets up and programs the machine in 25 to 30 seconds. Two operators currently are

able to run a total of seven machines with ease. The next target is running unattended overnight and on weekends. This will reduce the total time to about 2.5 weeks, or a time savings of 84 percent.

The purpose of the recently launched SME Lean Tool and Die Making Tech Group is to provide a forum for collaboration between stampers, die shop owners, die shop managers, and die designers and builders for the purpose of developing and sharing a body of knowledge supporting the die-making industry's need for increasing productivity, reducing lead time, adding value for the customer, and increasing profitability.

The initial focus is mostly the definition of the major process steps in tool and die making. The group has agreed that the baseline for calendar time will use the starting point of contract award and the end point of shipment to the customer.

The next steps are to overlay a value stream map onto the defined process steps. Then the team can really start to look, and measure, the impact of lean techniques on the die-making process. The same real-time conferencing collaboration will be used to build up the value stream map.

Because we are discussing how lean can work in a tool and die shop, we'll use examples that are found in die making. Figure 1, below, shows some of the basic symbols used.

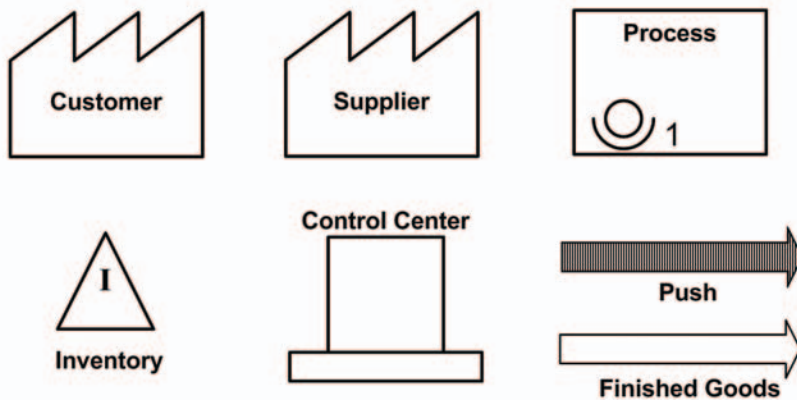


FIGURE 1 - SOME VSM SYMBOLS

FIGURE 2 - SIMPLE DIE BUILD PROCESS

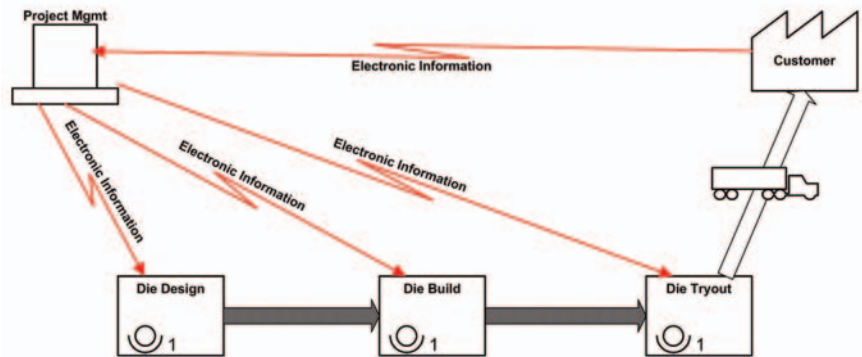


Figure 2, above, is a simple VSM for a typical die job — customer gives a purchase order; shop receives materials from suppliers; then design and build occurs; the die is tried out; and finally, it is shipped to the customer, completing the job.

What can be done with the map? The map components can be broken into sub-processes, in ever finer detail, until we see what makes up the parts of our process. The deeper we examine at each level, the more waste is found. We can call this “*manufacturing*,” or breaking it down. Figure 3, on the next page, shows a more detailed map. After analyzing the current-state map, a future-state or ideal-state map can be developed and a plan can be devised to implement the new VSM on the shop

floor. It's worth noting that VSM can and should be used for any process, even the paperwork and IT activities in the office, estimating and scheduling and so on.

MAKING YOUR SHOP LEAN

Lean thinking is changing manufacturing industries and die shops must adopt this change if they are going to survive in today's competitive environment. There is no other available means of getting out of the tool and die industry doldrums. It is either cut costs and lead times drastically or fold up the tent. Going lean should be your focus.

The first step is to learn as much as possible about lean. Joining the SME Lean Tool and Die Making Tech Group, along with studying the abundant lean resources SME offers will get your shop started in a new direction. Second, find a knowledgeable expert to help create value stream maps specifically for your way of doing things, the current state, and devise a workable future-state map. Third, come up with a plan to implement it. The many other lean methodologies can then be applied later to enhance the improvements you've made. ☒

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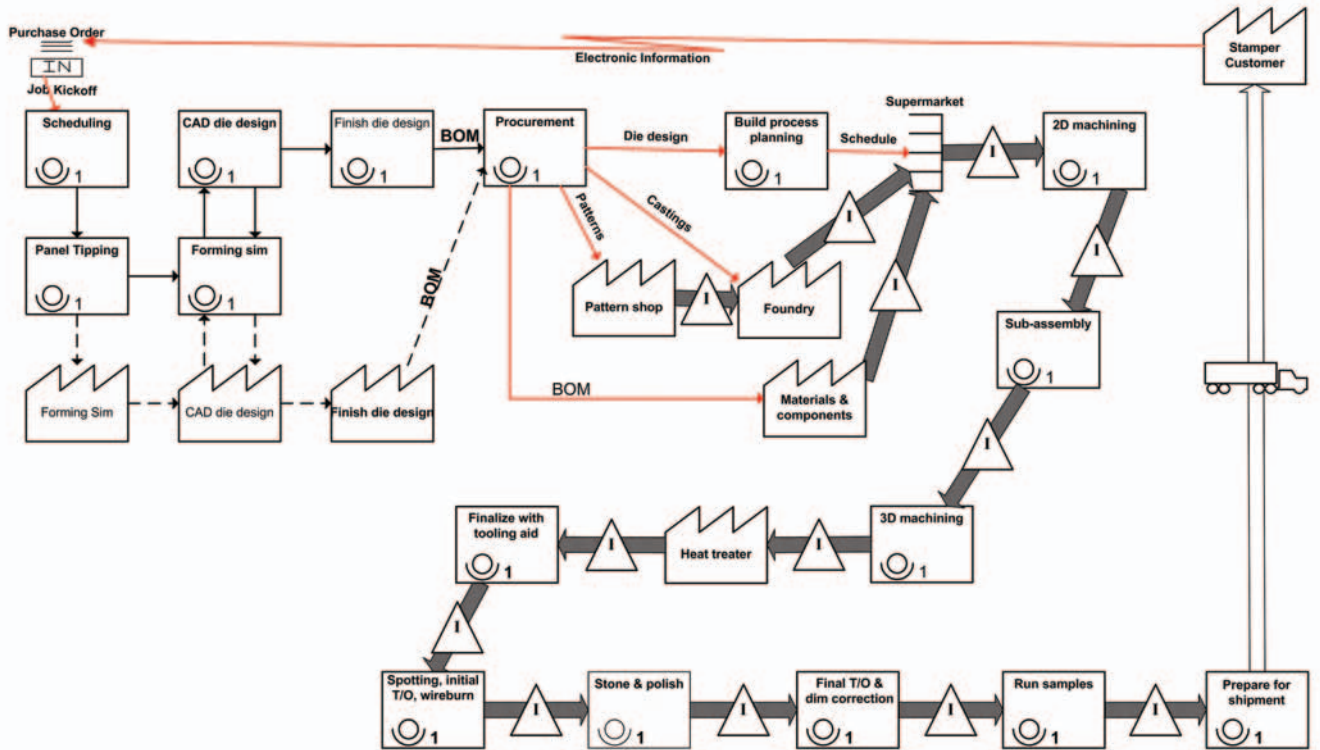


FIGURE 3 - EXPANDED VSM OF DIE-MAKING PROCESS