



A MANUFACTURING ENGINEER'S PERSPECTIVE ON STAYING COMPETITIVE IN TODAY'S GLOBAL MARKET

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Being a manufacturing engineer in the micro manufacturing arena is in many ways no different from being a manufacturing engineer in any other arena. The same business imperatives apply, and the necessary focus that needs to be given to best manufacturing practices are the same. In this article, the author, a specialist in micro silicone rubber moulding technologies looks at the current imperatives to remain competitive and efficient. Many of the lessons to be learned are simple, logical, and just as easy to miss. Looking at the basics should ensure that despite the vagaries of the current global marketplace, opportunities and ultimate business success is attainable.



Outsourcing, in-sourcing, co-sourcing: these are familiar industry buzzwords that we hear on a daily basis. They are all legitimate tools that drive business decisions in modern companies. These sourcing decisions drive the need to stay competitive in today's global market. I am a manufacturing engineer and enjoy the many diverse aspects of engineering. When necessary I poke my nose into the business world, but I tend to let the experts run the business aspects of the company. I am not a business major, and don't pretend to be one. I would much rather focus on how to improve the company through best-in-class manufacturing systems and technologies.

I work in the moulding industry, and even though I am in the biomedical arena, the business cases for manufacturing are no different. The moulding industry — which once was a dominant force throughout the United States and many other Western economies — has been moving to remote locations throughout the world. Here in the US, companies that once made their entire living moulding parts for industries are now defunct. The factories sit dormant, and millions of dollars worth of equipment have been relegated to the auction block and sold for pennies in the dollar. As these factories in America shut down, we see the rise of moulding companies in places like Vietnam, China, and other Asian locations. These companies are not amateur operations either. They are state-of-the-art, and produce very high quality parts. Many of them also offer value-added activities including design engineering.

There needs to be a mind shift in the industry in the West. As large segments of the business head for countries with cheaper labour rates, those of us left behind need to pick up the pieces and rethink our manufacturing strategy. As I mentioned earlier, the business decisions have been made. As engineers we need to understand how to drive forward.

I recently had a tour of the company which provided me with my first engineering job. It is a small company that manufactures hand-held instruments. Although the products are complex, I was amazed to see that they are still manufacturing them here in the United States. I left the company eight years ago, and I thought that by now the majority of their manufacturing would be done outside the US. Many products such as theirs are made overseas where cheaper labour rates abound.

As I toured the manufacturing operation, I began to understand how they managed to keep the work here. All the manufacturing lines were set up for single piece flow, and SPC charts were hanging on boards at the end of each production line. My tour guide touted their 5S



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programme, which was quite evident by just looking at the organisation of the production areas. They have little margin for error. The manufacturing systems must be streamlined. Excess inventory is unacceptable. Every employee worked together to produce a true Lean Manufacturing System. If these strict controls were not in place, the manufacturing would have moved overseas long ago.

I was impressed that this company, against all the odds, was able to keep a profitable manufacturing system here in the US, providing local jobs for its employees as well as those of its suppliers.

This is a fine story, but how does it apply to my industry of micro biomedical moulding? The biomedical industry inside the United States has governmental controls that will keep some of the manufacturing here regardless of the business climate. Nevertheless, my goal as a manufacturing engineer is to keep as much of it here as I can. Herein lays the mind shift I spoke about. I do understand that the reality of the situation is that we cannot keep all moulding. Some components are just simply better to produce using overseas labour. As engineers, we must work with the business folks to insure that the correct decisions are made. This is the place where engineers can show great value to the business organisation. Someone must decide what stays, and someone what goes. Here are some of my thoughts as a manufacturing engineer as to how I see these decisions being made in my industry — silicone rubber moulding.

OVERVIEW

Manufacturing in today's global environment requires engineers to think strategically. As a moulding engineer I need to get a broader picture of the entire moulding arena. Over the last couple of years, rather than just focusing on the "moulding", I have spent a large amount of time increasing my knowledge in the peripheral areas that support my moulding operation. It has been a fun journey, and I must admit that I have learned a lot. Many of you may already be doing this, but here are some of my thoughts.

Understand Your Business. What is your mission statement? What are the core competencies of your operation? It is critical to be able to answer these questions. If you are a high volume low mix moulder, you have different reasons for moulding parts than if you have a low volume high mix moulding operation. Utilisation, whether it is machines, production or engineering, needs to be maximised. As moulded parts become commodity items, we need to rethink the reason for even producing them. There are viable business reasons to have either of these types of operations, but we need to be careful because in the business climate today, it may not be possible to be all things to all customers.

Understand the Products. In my area, we mostly mould component parts, and I imagine that many other operations are similar. It is easy to focus on the parts we mould every day. As manufacturing engineers we can do everything in our power to make the moulding operation as efficient as possible and get cost down.

Why would we continue to mould this part? Is it considered heresy to ask this question? Depending on your organisation it may be. As engineers, we need to think "big picture" and ask the hard questions. We need to understand where the moulded part is used. Even though we are able to mould the part, maybe we shouldn't. Maybe it is better to send the part to an outside vendor rather than using resources to continue to produce it inside (See Understand Your Business). A detailed cost/benefit analysis for all parts needs to be performed. Rather than focusing on commodity parts it may be better utilisation of engineering and manufacturing resources to produce complex high-tech moulded parts.

Understand Tool Making Technology. I am a mechanical engineer by degree, so I feel right at home down in the tool room. I spent four years during my undergraduate studies working in a small machine shop on campus. I am fortunate enough that my company has an extensive tool room. We design and build all of our own moulds. Even though I enjoy spending time in the tool room chatting with the toolmakers, the machines they use to build my moulds are far beyond anything I ever used in the small on-campus machine shop. Even if your moulds are made by a contractor outside your company, give them a visit. My experience has shown that they will be more than happy to show you their operation. The cost of even a simple mould runs into the thousands of dollars, why shouldn't you see the details of how and where they are made?

The capabilities available to modern toolmakers are nothing short of amazing. I challenge you to spend some time with the people who build your tools. As moulding engineers, we spend a lot of time in the design process of the parts and the tools that make them, but once the tool design is done we walk away and let the toolmaker do the "magic". Increasing your knowledge of the way in which the toolmaker takes the tool design drawing and turns it into a functional mould is very important.

If you spend time in the tool room, you will quickly become familiar with the myriad of machines that are used to create the features in the metal which will become your mould. Even before you ask for a tour, I suggest you do some research on the internet. Look at methods such as Wire EDM, High Speed Machining, Precision Surface Grinding and Micro Erosion. This is a short list, upon your return you will have much more to research. Now get out there and tour!

Know the Methods and Materials. I was not sure if I should add this section, as this is what we really spend our time doing. As engineers we know and understand our processes and methods, or at least we better had. Forget about the materials and methods you are currently using. You already know the current state. Imagine the future state of your operation. Silicone rubber moulding, for example, has evolved quite a bit over the last few years. The materials are changing.

Just because you have been using a material for years doesn't mean it is the best for your application. I realise that changing the material used to produce a product is not a simple task, but understanding the latest materials available is immensely helpful when working on new design projects. I recommend subscribing to all the trade magazines you can find that pertain to your area of work. The magazines are free, and about the best source for the latest and greatest. Most of them are delivered digitally anyway, and you can start your own library.

Embrace Modern Tools (Lean, Six Sigma, 5S). An efficient manufacturing system is the only way to stay competitive. As my earlier story illustrated, lean concepts such as single piece flow and 5S must be implemented in your organisation. Information on these concepts abound. Even though there seems to be a lack of formal classroom instruction in my area, the tools and resources are available on the internet. We need to look beyond the classic — or should I say simple — implementation of the lean principles.

One of the most valuable tools is value-stream mapping. Upon first glance, the concept seems pretty simple. Understand your process flow. Right? Well actually, the concept is just that simple. Value Stream Mapping can be applied to so many areas. An important one I suggest is to value stream map your tool-

making process. I found this exercise to be quite eye-opening. Just sketching out a simple flow chart on paper from tool concept to completion helped me understand the process bottlenecks. Tool and mould makers are a great lot to work with. They are very traditional in their methods. It turns out they already use many lean concepts; they just don't know all the "fancy" terminology.

Using these tools in the production area is a no-brainer. If you haven't implemented lean concepts yet, you are probably already in trouble. My example above shows that to maintain the competitive edge we need to look for applications outside the traditional manufacturing areas.

CONCLUSION

I love being an engineer, and in the modern global manufacturing economy it is more interesting than ever. The days of just worrying about troubleshooting moulds and setting up new equipment are gone. As engineers we must broaden our expertise to areas that are not traditionally within our domain. We must now understand even more aspects of the business, with many of them not even engineering related. Staying competitive in today's global market is a new challenge. It is a long and arduous journey, and I hope you are enjoying it as much as I am.

Loren Evers is a Senior Manufacturing Engineer at Medtronic. His area of expertise is silicone rubber moulding, with an emphasis on micro moulding and tool design. He supports the commercial side of the silicone moulding operation as well as being highly involved in moulding R&D throughout the company. He has a Bachelors Degree in Mechanical Engineering and a Masters Degree in Manufacturing Systems. Loren is a certified Post Secondary Teacher, and is a regular contributor at technology conferences.

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