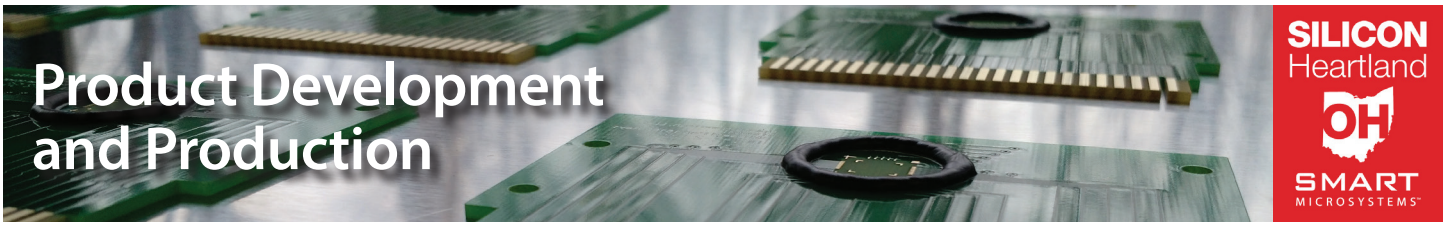

Development vs. Production, a Paradigm Shift in Thinking

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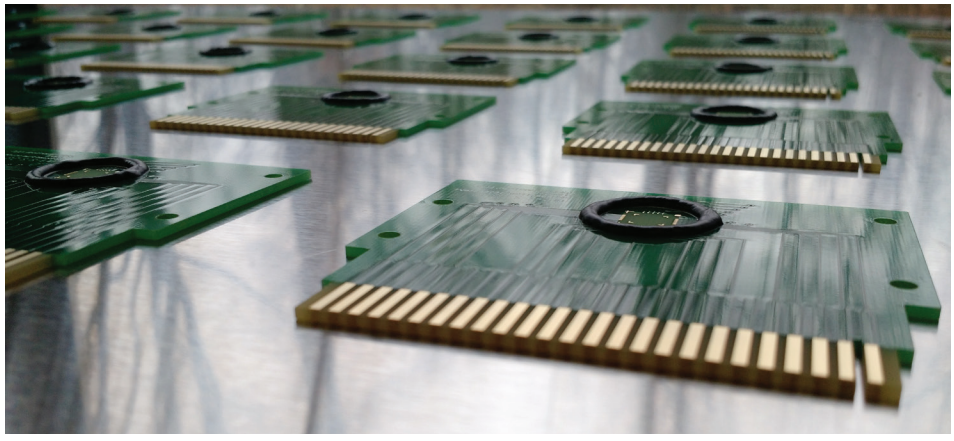
FOR MOST NEW PRODUCT DEVELOPMENT organizations, development and production should go hand in hand. Products should move seamlessly from concept to prototype, to production representative, and finally to production. At least that is the goal. The challenge is in making sure that the transition is seamless, and that is often the biggest hurdle. During the product development cycle, the focus is primarily on ensuring the product meets or exceeds the minimum customer design requirements and that the design is also manufacturable. At some point, the product needs to be released for production, and this is the transition point at which we sometimes stumble as an organization if we are not properly prepared.

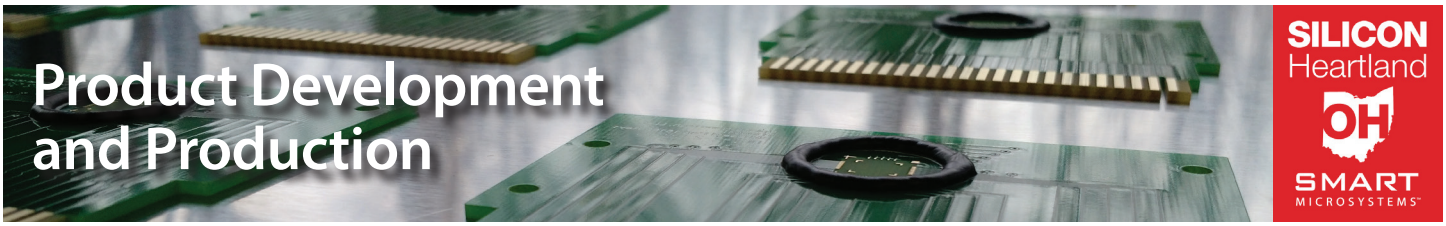
In previous articles, we discussed the concept of concurrent engineering, but we did not discuss the actual product development transitions within that process. The concept of concurrent engineering assumes that the teams are working together to ensure that the transition points are managed effectively, but certain factors can aggravate that transition. For example, when the process development engineer is in the development phase, minor changes are both normal and expected. New drawing revisions, lifecycle changes, and changes in incoming material quality are all par for the course. Process development engineers become accustomed to accepting things like the incoming material variation and learn how to work around it. Rework loops become a way of life in process and product development. Let's face it, without rework loops in development, most products would never make into production. But, when we shift from the development phase into pre-production or production, we need to have these issues resolved the best we can.

For most product development teams there are specific phases that we identify with. For us at SMART, we have come to view a "concept" phase as that stage in the process at the very beginning, where we attempt to determine whether or not the idea or concept is viable. Is the fundamental concept sound, does it work, and can it be built? The development phase begins at concept, and continues through production representative, with test and inspection data collected along the way. The prototype portion is the point in the development cycle where we determine if we can actually produce working prototype sample parts that will function in the environment and application for which the product was intended. This is the point at which the process engineering team gets more heavily involved and begins to refine the proposed production process. Production representative phase should include production representative tools, processes, and components. These production representative sample parts should in every way represent a finished product with the exception that they are not produced on production qualified tools. Production parts are production qualified and meet or exceed the customer engineered drawing requirements in every way. These last two phases are where we see most of the transition paradigm misalignment issues.

It is at that point of transition between development and production release where the thinking needs to change. This is particularly an issue because we want to keep the same individual engineers from concept through release, and these development engineers are no longer in a development program, they are now in production. So there needs to be a paradigm shift in how we think about the process going forward. Since the product is no longer in development, processes must be adapted and refined to reflect production needs. One example of a refinement point is tolerance of variation in incoming material – we need to be far less tolerant of incoming material issues and those issues need to be documented, categorized, and flagged to the teams. The teams need to increasingly refine the documented processes, and be more observant of change, which can be achieved using statistical process control (SPC) and other methods. This is how we ensure that

Dispense process development for production representative samples.





every product leaving the production process meets or exceeds the customer requirements. This is the big challenge that teams face as they move the process into production. There are however some actions that can be taken to minimize or eliminate this risk of this common stumbling point.

Many times we are asked, "When is it a good time to start planning for product launch?" If you have read some of my previous articles, you will recall that we like to begin with the end in mind. That means that planning for product launch should start on day one of the product concept. There are a lot of things we can do to properly prepare, far too many to list here, so I will mention just a few critical but simple things we can do to increase our prospect of success and reduce the chance of launch issues.

First of all, the development team should be documenting all of the issues that have been noticed along the way. This includes any incoming material issues, process issues, process data, etc. This valuable, irreplaceable information and data should effectively and completely find its way into all of the manufacturing process documentation. At SMART we use work order travelers for every job that contain all of the discrete steps in the process. Each discrete process step has a discrete process step number that translates to a discrete work instruction card (WIC), and all of the WICs have individual visual aids attached. These documents are all revision controlled and they all have been developed during the product development cycle to include "lessons learned" from both process and material considerations. Secondly, in addition to extensive data aggregations, all root cause analysis and failure mode analysis results should be stored and referenced in a single location and be reflected in the process documentation. Any source of incoming or outgoing unacceptable material conditions, for example, should be in the library of visual aids for production. And thirdly, let's not forget failure analysis. After all, we know it will happen. At SMART we use a tool called the "FA Process Checklist". We capture all of the lessons learned along the way from all of the failures that we investigated and root caused, including going back into early development data, to develop a process of how we will deal with a return, if and when it comes in from the customer. We actually take the time to develop and document a procedure checklist that will have the greatest likelihood of finding the root cause of the failure, in the shortest time, with the least amount of damage to the evidence. I plan to write a future article on the genesis and application of this very useful tool, but for now I leave you with this final thought: With planning, documentation, and communication a seamless transition from the development cycle into the production is attainable.

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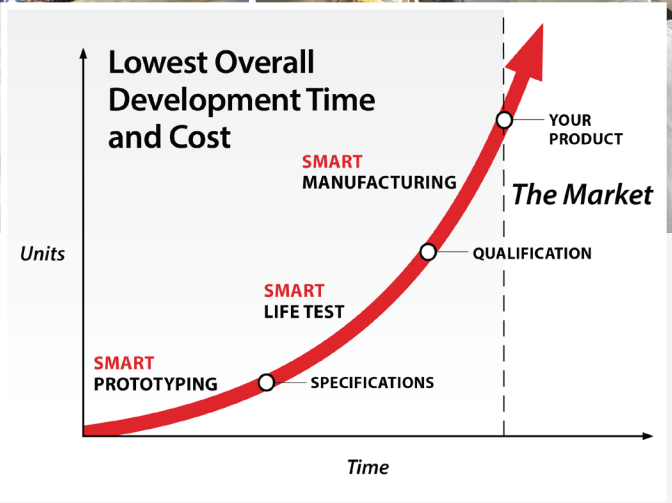

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