DOMAILLE ENGINEERING

E2M

Taking Engineering to Manufacturing for the Aerospace & Defense Industry

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What are the biggest challenges aerospace & defense organizations face when taking a concept from engineering to manufacturing?

Many organizations face challenges associated with resource constraints. They may have engineering teams that are overstretched due to work on multiple programs simultaneously, while new programs rely heavily on recent graduates who don't have especially strong industry manufacturing experience. They also have limited resources and budget available for IRAD (Internal Research and Development).

When it comes to bringing their products to market, many organizations find it challenging to identify a suitable manufacturer that understands engineering concepts as well as demonstrates problem-solving skills to help resolve issues. It can also be difficult to find manufacturing companies that can take projects from initial concept sketches to prototype, test verification, and through to full production quantities. Some smaller companies may be quick to react with a few samples, but are unable to supply product with stable manufacturing processes. While large suppliers typically are unable to offer flexibility required by many organizations.

Development time often takes a few years before production launch. In the meantime, the organization's team may change, which emphasizes the importance of continued stability at the supplier level.

What steps can be taken to overcome these challenges?

Organizations should leverage supply chain resources by tapping into their manufacturing expertise. Suppliers should stay abreast of new technologies and best practices, even more so than their customers. Companies such as Domaille Engineering are able to use their real-time knowledge to offer ideas that are relevant, leveraging technology and process knowledge. Specializing in short-run, repeat jobs allows Domaille Engineering to be flexible with setups and with mixed technologies, such as raw material, material machining and assembly, giving them the ability to meet higher volume requirements.

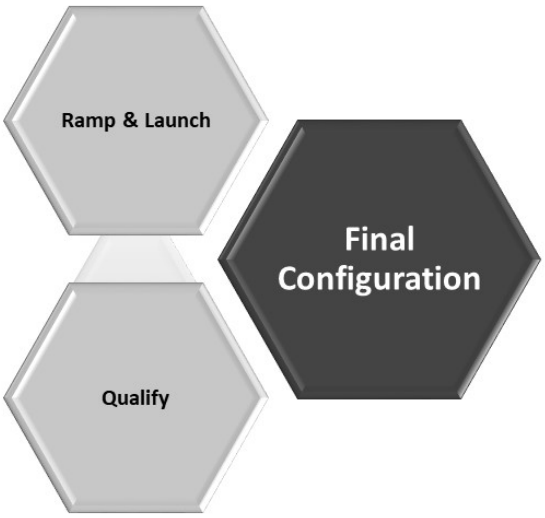
What is E2M and how does it differ from DFM?

THE E2M PROCESS

1. Client company comes up with initial **design**; nothing has been concepted or prototyped yet.
2. Engineering company is engaged.
3. Engineering company is given a set of **parameters** to work with. For example, "it needs to be roughly this size and weight, it needs to perform these six functions, and it needs to be able to withstand frequent salt spray." From there, the engineering firm starts the process with the client, discussing what they need or want to avoid, as well as understanding budget constraints.
4. Based on these discussions, the engineering company will begin brainstorming sessions to come up with **3-5 different concepts.** Each concept will be illustrated with a rough sketch or 3D model to convey basic information, which is then shared with the client to spark ideas and creative discussion.
5. The client will know much more about the overall system, whereas the engineering company only has information on the sub-system they are working on. The sub-system must support the overall mission, so once the engineering company goes through the rough concepts with the client, a number of ideas may be eliminated based on lack of fit with the overall system.
6. The result is usually to down select to 2 ideas. Each of these is concepted using 3D printing or simple machined parts
7. The best concept is then turned into a **Prototype**- About 70% of the way to the final design.
8. The **DFM Stage** - engineering firm will provide input to design for manufacturability.
9. Customer finalizes design and releases final configuration.
10. The **final product** is produced.

Engineering to Manufacturing (E2M) Process

Traditional DFM Approach



When a customer has not gone through the E2M process, Design for Manufacturing (DFM) basically means the client will have done 99% of the work prior to involving the engineering company. However, when they reach the manufacturing stage there are typically features that are not manufacturable, because it is either physically impossible or cost prohibitive. An engineering company like Domaille will then come in and look at the design, offer DFM suggestions that tweak the design to make it possible.

What criteria should an organization consider when assessing suppliers to help take their product from engineering to manufacturing?

Some key considerations when assessing a supplier include:

- Supplier should take into account overall program/ project value as opposed to lowest unit cost. This approach considers all costs associated with concept design, prototype build, and through production build, as well as post production support.
- Supplier should leverage diversified technologies.
- Supplier should minimize manufacturability revisions.
- Supplier should employ functional performance testing as needed.
- Supplier should be focused on speed to market/production – speed to prove out ideas so all risks can be eliminated prior to expending large dollars.
- Suppliers must be nimble, while at the same time demonstrate the ability to implement changes in a controlled manner.
- Supplier's engineering team can be an extension of customers engineering group – leveraging strengths from both teams, which can be a force multiplier.
- Supplier should have a robust risk mitigation plan in place for new product designs.

Domaille leverages the latest technologies, such as Friction Stir Welding

Case Studies: E2M in Action

Case 1

The Problem:

The customer had limited space for a particular application and a challenge in that the equipment generated a lot of heat. Domaille was engaged to come up with a method to stay within the space constraint and remove most of the heat, in a given period of time.

The Solution:

Domaille came up with an approach to transfer the heat away from the source, where the same assemblies that were doing the thermal transfer were also strong enough to carry the structural load path. By combining the structural element and thermal transfer properties, they solved the space constraint.

Case 2

The Problem:

The client, who was producing a critical air-to-air refueling assembly used as a safety counter measure, came to Domaille at the DFM stage. They had a technically challenging assembly as well as compacted schedule.

The Solution:

Domaille was able to be flexible and help this client meet their timelines. They leveraged their supply chain to meet the high bill material count, and were able to build the prototype concurrently as the customer was finalizing the design, which helped minimize the lead time impact. Domaille also immediately transitioned into providing production hardware, which maintained overall OEM critical path schedule.

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