

How a Product Profile Can Accelerate Your Design Process?

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The excitement at the beginning of the product design process brings lots of energy and ideas. The ability to tap into a new market, or solve a lingering problem brings many groups together that must transition this idea into a physical manifestation. Industrial engineers and marketing teams are often tasked with helping define the experience and look of the solution, but many other groups are involved with making the look a reality. These different groups will have different ideas on how to best achieve this nebulous end goal, and to further complicate the task, these groups will be joining and leaving at different stages of the part design process. Taking the time to create a defined end goal can help onboard different people quickly, and ensure the project timeline is not compromised. This defined goal can be established in a document often referred to as a Product Profile. This article will help define what a Product Profile is and what information should be included.

What is a Product Profile?

A Product Profile is a document that defines what functions the component is supposed to perform, and defines the loads and constraints the component is expected to experience while in service.

Requirements about appearance, expected service life, environmental exposure, and regulatory requirements are established in this document. By providing these specifications, the mechanical designer, materials engineer, and quality engineers can start to understand what materials might be compatible with the constraints and what design features might be required to achieve the end look and performance of the part. This definition can also be used to understand what material properties are required in order to move the design forward for tasks such as structural finite element analysis (FEA), injection molding simulation, and prototyping. By creating a product profile, the OEM and designers can move from designing a single sourced material, to starting to develop a “Performance Based Material Specification”, as outlined in this [article](#).

What Should be Included in a Product Profile?

As briefly stated above, the information for creating a useful Product Profile includes:

- **Part Function:** What is the part supposed to do while in operation? Defining the part function early on allows for assessment to be made by the team about the risks involved with the design, and how much time and effort should be placed on it relative to other components in the design/assembly. If this component is deemed critical, then a Failure Modes and Effects Analysis (FMEA) can be performed to design in safety factors to mitigate those identified as most risky.
- **Operating Conditions:** Understanding the temperatures the component will experience while in service, and how long the product is expected to be in service can help define what failure modes should be considered for your design, and can help further select potential materials that might work for the application. A single-use medical device will have a very different set of operating conditions as compared to a water meter connector that is expected to last for decades. Additionally, identifying the loads expected in the assembly can help the engineer understand what structural FEA simulations they may want to perform to understand how the wall thickness or assembly features need to be designed to withstand those loads.

Therefore, this document can be used to better communicate to team and ensure the design and assembly stresses are sustainable, and not just below a short-term yield stress.

- **Environmental Factors:** The designers and engineers need to understand what environmental hazards the product will encounter while over the life. Beyond just temperature, factors such as chemicals the product might encounter in the field should be documented to again mitigate risk and further define what additives will be important to incorporate into the base material to help reduce adverse material alteration. This consideration is particularly important for polymeric materials. While they are often viewed as great materials to avoid oxidation, they are still susceptible to diminished part performance in the presence of chemicals, or without the incorporation of the proper additive packages.
- **Design Requirements:** This section of the product profile helps define what design features might be required to achieve the end performance of the part. Sometimes those performance metrics are defined by a regulatory body, such as UL, ROHS, or CE. However, others are less well defined and help determine what assembly methods are required to mate this component to the other sub-assemblies, and what secondary operations will be required to achieve the end look that your consumer is looking for. This information can be used to help perform design for manufacturing and assembly analyses (DFMA).
- **Performance Testing:** Understanding how you are going to quantify and verify the performance of the part and show the company or regulatory body that the design meets the end functional requirements is critical for the Product Profile. Sometimes this testing is defined by a regulatory body, while other times it is an internal test standard. Regardless, physical testing of components is typically an expensive and time-consuming process. By defining it in the Product Profile, this testing timeline can be integrated early on. Any fixtures or coordination efforts can be completed in parallel while the design is being finalized.

When Should a Product Profile Be Created?

A Product Profile should be created as early as possible in the design process. By having it early on, it can be used as a background document for when new team members or suppliers are brought on board so they understand how their responsibilities and roles may influence the end performance of the part. Additionally, if the document is created early in the design process, all the energy and efforts can be concentrated to ensure any discussion points brought up are relevant to the end performance of the part and if those points merit any change in design direction. The Madison Group has found this last point to be one of the most critical functions of the Product Profile and ensuring the development timeline is maintained as closely as possible.

How Often Should the Product Profile be Reviewed?

The Product Profile is not a stagnant document. It should be reviewed and amended any time a major development milestone has been achieved, or any time a new team member/supplier is brought into the

process. Again, the document can be used as a beacon for discussions if a change in design direction is needed or not to achieve the end goal of the product. This will help minimize any unnecessary design iterations or trials that would delay the release of the product to market. Additionally, the document can be used whenever there is a value-added engineering task performed. By creating the document, the team allows future cost-saving evaluations an avenue into understanding the initial design constraints and what work has been previously performed.

In conclusion, the Product Profile helps designers and OEM's create a clear focus on where they need to head and what questions they need to answer along the way. By creating this document, the time spent on discussion or trial and error methods can be minimized, thereby the confidence that they need to release their product to market!