DFM

Design for manufacturing is the principle rule that suggests that you can improve efficiency by minimizing the number of parts that have to be assembled so that they are cost effective and easy to make. In today's world, in order to keep up with or be ahead of the competition it is necessary to develop, produce and promote products in shorter periods every time. This approach is significantly different from the traditional approach of a project being broken down into a series of steps, which are executed sequentially. These steps are then assigned to different departments that work independently most of the time. The traditional approach enhances the specialization and functional job focus of product development. However, the main drawback of the traditional approach is the market time plus the difficulty in integrating manufacturing activities.

One question that is often asked in quality manufacturing is, "Now that we have the product designed, can we build it?" Ways to design a product is to make sure the product is easy to maintain, it's reliable, is designed in little time, and is simple. A product should be easy to maintain because maintenance is very expensive. Trying to keep a product going for years when it malfunctions is very costly for an organization. Reliability is also a key factor because a product that is not reliable or tends to fails consistently over time makes little sense and is a huge way to waste money for an organization. Speed is a very important aspect in designing a product. If it takes too long to make a product then it will be hinder through competition. Competitors will be able to control the market through getting their products out faster than you. Products must also be simple in design. Using a few parts as possible helps in its simplicity, which saves money and helps in the product to not malfunction through complexity, in other words,

more parts to a product lead to complexity which can lead to malfunctions. The simpler it is the fewer problems that can occur.

Before the DFM process, organizations would use the over-the-wall syndrome. This means that when an idea was generated into a design, it would first have to be approved by the president or manager of the product design. It would then go to the president or manager of the process design to be developed into a product. If any problems should arise with the product, it would be asked to be redesign and then sent to the manager of product design. The resolved problem would then be sent back to the process designers and the work would continue from where it left off. If more problems are raised the design would be sent to the engineers of the product design. As you can see this process would take a long while to get done because maybe not everyone was situated in the same location or maybe when they did the fixing of the problems it would take hours. Worse yet, the process could have taken a year or more. It might also mean that products were built very poorly and functioned badly because there would be more parts. Thus, the reason for the long process. The concept of design for manufacture was used to break these barriers of over-the-wall syndrome and to reduce time spent on designing products.

With every tool in quality comes with disadvantages as well as advantages. Some disadvantages that occur with current DFM tools are they do not take many manufacturing capabilities or tolerance considerations in account. Many of the computer-based DFM tools nearly complete designs but when the design is finally analyzed there are a number of barriers that prevent substantial modification of the design. Current DFM tools give the designer little feedback upon which to base design

modifications. Also combining too many functions in one part can increase manufacturing costs. As there are many disadvantages there are many advantages in using the DFM process. One advantage is that DFM can suggest the optimal assembly and degree of automation. DFM analysis is used to help compare selected materials and manufacturing processes for the component parts of the assembly. DFM is a way to improving quality of design. It helps in the reduction in product development cycle time. It also reduces manufacturing costs, maintainability, and serviceability efforts and warrants costs. DFM can produce higher product yields through manufacturing. It increases product performance and increases greater predictability of product yields. There is an increase in performance and yield tradeoffs by designers and the design engineering cycle time is reduced immensely.

This concept is used throughout the world today in such places as New Jersey Institute of Technology, Berkeley Computer Aided Manufacturing Framework, many universities around the world such as the UCLA CAD laboratory, etc. Another example is through the use of General Motors Company. GM began their DFM process with a detailed plan listing the entire requirement in a plan that included all the DFM tools that would be used in timing relative to the product development life cycle. The DFM plan included all new product content and selected carryover content from previous designs. Potential DFM opportunities were identified and prioritized. These design priorities were established and translated into account program imperatives, customer needs, and development schedules. DFM projects were constantly reviewed and approved by the DFM team, functional area managers and engineering directors. GM major step with DFM was a requirement to assemble parts easily and without defects.

For them to accomplish this their process variation must beheld to a minimum. The dimensional variation management requires a structured process of analysis, variation management in product design, and manufacturing processes to optimize the vehicle quality. However, DFM teams encounter conflicting requirements. GM uses tools such as the Pugh Matrix. This is a method of concepts selection, to identify conflicting requirements and prioritize design tradeoffs. The sooner design conflicts are identified the better. Therefore, the team resolves the conflicts quickly and it does not delay design schedule. The final step with GM in DFM is to verify manufacturability. The designers develop a working prototype to verify that the design has met all predetermined requirements. As the result, the lessons learned from the process are fed into the next vehicle development program to ensure continuous product and process improvements.

What we have learned from the tool of design for manufacturing is that with you can improve product efficiency by minimizing the number of parts there are to make as well as reducing costs. There are many to get more information on design for manufacturing tools. The Internet is a very good way to gather information. The textbook also provides helpful insights to the topic. Other text that can be useful as well as helpful are Product Design for Manufacture and Assembly by Boothroyd and Design for Manufacture: An overview by Stoll.

Bibliography

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