The Stages of Engineering Design

I. Recognition of the Need

A new generation of motor cycle with engines capable of high speeds began to out-class the old Harley style of motorcycles. People wanted the style of Harley Davidson, but didn't want to compromise their desire for a faster ride. In order to do this, the design team at Harley needed to start from ground zero on a new bike that had the power and image of a Harley, but with barebones mechanical underbelly to compete with the new generation's speed.

II. Definition of the Problem

The problem became that the characteristics of a classic Harley, greatly clashed with the traditional makeup of a racing motorcycle. The bulky engine of a racing motorcycle is the main feature, with look as a side note. For a Harley, look is everything. When people think of Harley's they think of small town parades, the "growling" of the engines, and the high customization that can be put into the bike. These characteristics are impossibly incompatible with the current design of the new generation of bikes. In order to maintain the loyalty of the Harley-Davidson owner base, a brand new vehicle had to be designed that could encompass all of these characteristics within a chassis that would be instantly recognizable as a Harley.

III. Gathering Information

During the early stages of research, Harley looked at their own racing bike with its VR-1000 engine, which already possessed the ability to attain the desired speeds to compete with the competition. They studied the aerodynamic design of dragster vehicles, focusing on making the new design long, minimal, and very fast. The stylization department inventoried all previous Harley-Davidson designs, boiling down the basic necessary features to be implemented into the new bike. Throughout the design process, Harley had to continually return to the drawing board and commit to research concerning the V-Twin Engine, the enormous exhaust system, and the radiator among other components in order to gain the necessary information to formulate new ideas.

IV. Conceptualization

The conceptualization process began with Willy G and the styling department, where they attempted to fit the VR-1000 engine into a signature Harley-type body. Many 2-D physical drawings, CAD drawings, and 3-D models of early style concepts were created in the attempt to fit the vehicle around the engine. Eventually, it was realized that brand new concepts had to be designed such as the V-Twin engine, the exhaust system, and the front-end radiator. Each idea started as nothing more than a concept at this stage, simple and lacking criticism until the next stage.

V. Comparison and selection of ideas

The comparison and selection of ideas refers to when the design team decides on which one of the ideas from the brainstorm would work best to create their ideal product. This refers to examples such as when the design team had to decide how to create the frame of the bike, choosing to prototype a double-bar frame, which offered a classic-looking frame complete with the durability required to handle the vehicle at high speeds.

VI. Analysis and design

Analysis is when the design team takes an idea and figures out how it will look, and drafts it out on paper. This refers to creating cad drawings and sketching concepts of what the motorcycle will look like. During this stage, the engineers consolidate all of their ideas and attempt to mesh them with others in a systems-engineering approach. Every component will evolve as various instances of compromise occur between the competing engineering disciplines.

VII. Fabrication and testing of prototypes

Fabrication and testing of prototypes refers to the creating of a physical example of what their ideas will look like, and then they test these physical prototypes to figure out which will perform the best. This refers to when the design team use things like modeling clay to help decide how the bike should look. Another example is when the design team is confronted with the issue of the radiator, where they had to fabricate then test multiple different ideas.

VIII. Communication of design

Communication of design is a very broad concept which is very self-explanatory. This concept at its core is quite simply telling other people what sort of product they have produced, or want to produce. This can be communicated in many ways such as verbally, graphically, or written.

Verbally-An example of this would be when the design team unveiled the bike; they verbally communicated to the audience many of the aspects of the motorcycles design.

Graphically- This more or less means communicating the idea through visual means. An example of this is when Willy G. drew up some ideas of how he wanted the bike to look, and how it should be styled.

Written- An example of this is when the Harley design team communicated with the Porsche design team, when they did this they probably communicated through e-mail, and written text.

Often times the communication of design can cause people to look at the designs that they currently have created and re-analyze them, or even go back and change them completely. This can cause the design teams to go back and look over any one of the steps in the stages of engineering design.