

Value Engineering: Bleed Valve Assembly Redesign



Author: Sheila Santiago Rodríguez
 Engineering Management Program
 Advisor: Hector J. Cruzado, PhD
 Graduate School
 Polytechnic University of Puerto Rico

ABSTRACT

The project is about a Value Engineering Event for a Bleed Valve Assembly. This valve's function is to help the pump prime properly and remove any air trapped within the suction line. The project is carried out for the purpose of reducing costs as well as improving the design of the assembly. This event is enhanced with a group of experts in the matter. The respective steps have been made and additive manufacturing has been determined to be a change as well as the coating of the entire piece. The changes would take place after passing the approval phase. The implementation would be a long-term one given the nature of the changes as additive manufacturing is a complete redesign that would change specifications such as material and manufacturing.

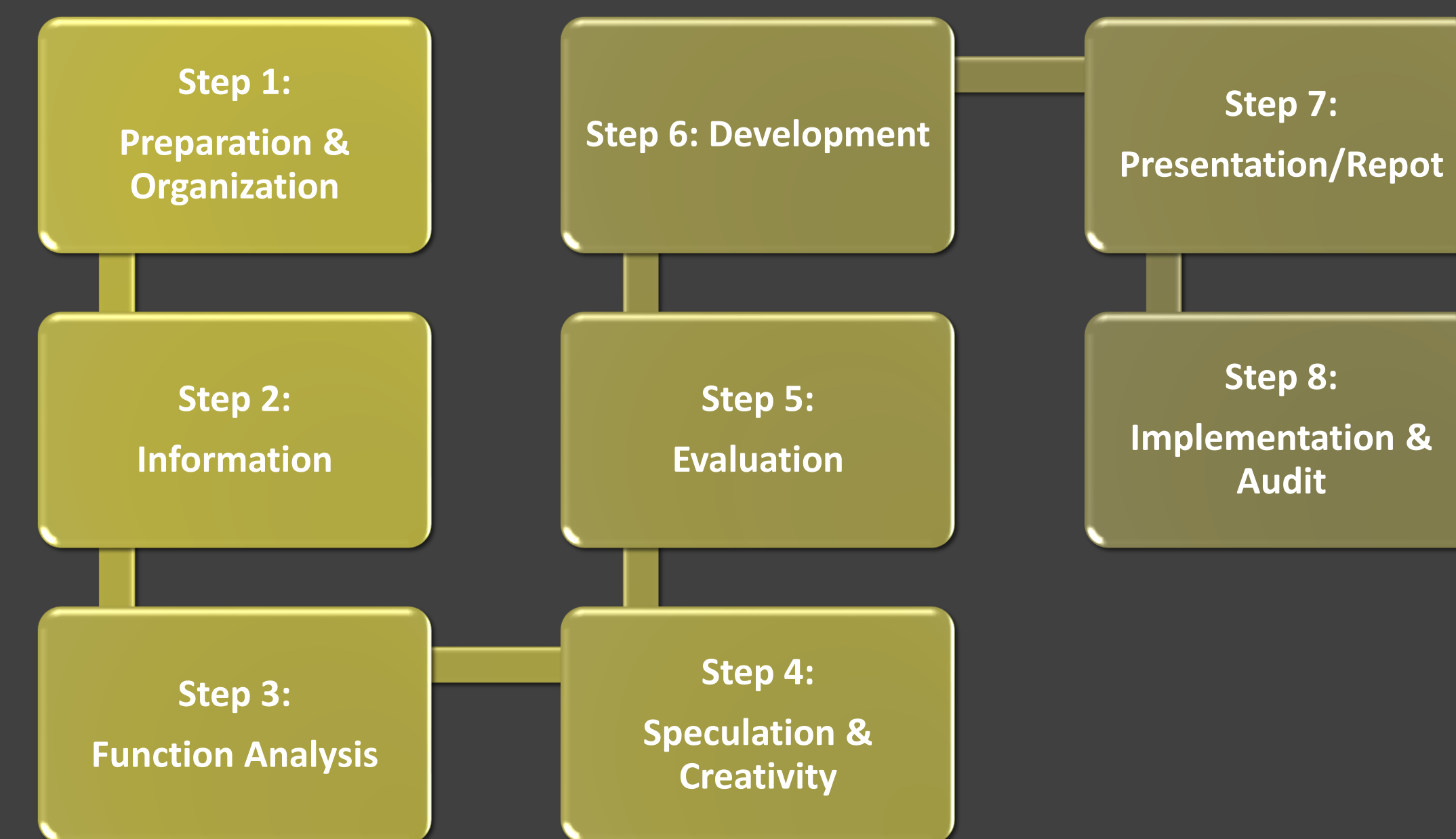
VALUE ENGINEERING

Value engineering (VE) is a systematic method to improve the value of goods or products and services by using an examination of function. The term value, as defined, is the ratio of function to cost. Value can be manipulated by either improving the function or reducing the cost. In this project specifically, the target us to do both. It is a primary tenet of value engineering that basic functions be preserved and not be reduced because of pursuing value improvements. The term value management is sometimes used as a synonym of value engineering, and both promote the planning and delivery of projects with improved performance.

VE applies to everything because every project or process has a function. This can be applied at any point of the design or process design or process. It is a problem-solving technique and can be used as a technique for developing design criteria.

The objectives of the VE Event are performance improvement, significant cost, savings/avoidance, optimization of resources (Time & Money), review (Technical, QA) – optional objective, coordination (In-House & Users) and transfer innovative technologies.

VALUE ENGINEERING EVENT PROCESS



PREPARATION & ORGANIZATION PHASE

In this phase the event is organized. The person in charge of the event should select a day to do the event, select the experts to be invited and organized the agenda to complete all the objectives.

INFORMATION PHASE

The purpose of this phase is to determine user needs to build team knowledge and understanding of the project. On this project the team were working a redesign of a Bleed Valve Assembly in order to get a cost reduction. Figure 1 shows the Bleed Valve Assembly.



Figure 1
Bleed Valve Assembly

The Bleed Valve Assembly attaches to the discharge fitting on the head of the metering pump and the discharge tubing then attaches to the top of the bleed valve assembly.

FUNCTION ANALYSIS PHASE

In this phase are defined the user's needs through verb-noun pairings as shown in Figure 2.

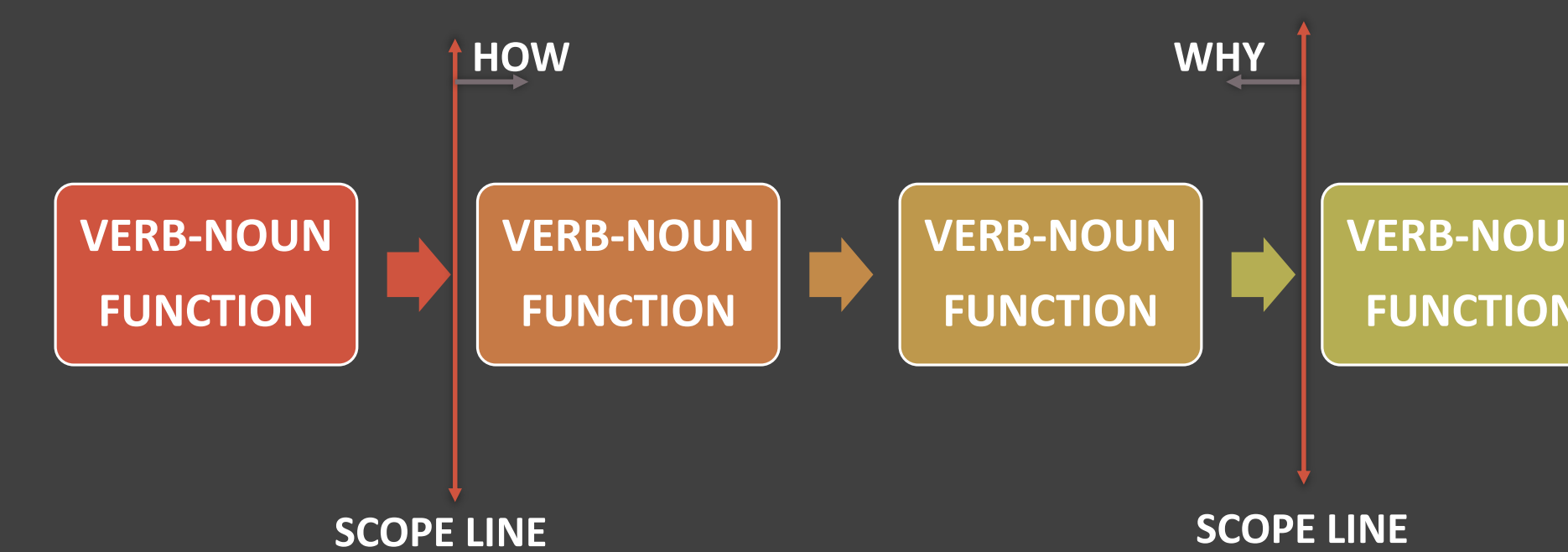


Figure 2
FAST Diagram

Function Analysis System Technique

Bleed Valve Assembly helps the pump prime properly and removes any air trapped within the suction line.

SPECULATION & CREATIVITY PHASE

Speculation and creativity phase generate many alternatives that provide the item's basic function without considering their practicality. Criticism evaluation is prohibited at this time. Freewheeling is welcomed and encouraged. Be uninhibited and think as a child. Be spontaneous, rapid fire 'gut feels'. Quantity is desired over quality, cover the walls. Combine and add to ideas. Build upon another person's ideas. How do others solve similar problems? Record all ideas.

Among the ideas collected in the event were change the assembly material, use standard parts in the whole assembly, change dimensions, coating the entire part, and redesign for additive manufacturing.

EVALUATION PHASE

Evaluation phase techniques include prior experience, use cost references, evaluate alternatives and consult experts. Use the own judgment and good human relations.

DEVELOPMENT PHASE

This phase selects the best alternative(s). To develops complete written and oral proposals. Recommend specifics, not generalities. Gather convincing facts. Sells the idea through the justification.

The team has decided to use additive manufacturing for the Bleed Valve Assembly and coating the entire part as well. The other ideas were not selected for implementation due to part function nature.

Also known as 3D printing, additive manufacturing (AM) is a production that enables the creation of lighter, stronger parts and systems. This technology builds 3D objects by adding layer-upon-layer of material, whether the material is plastic, metal or concrete [3].

Once a CAD sketch is produced, the AM equipment reads in data from the CAD file and lays down or adds successive layers of liquid, powder, sheet material or other, in a layer-upon-layer fashion to fabricate a 3D object.

PRESENTATION & REPORT PHASE

This phase wants to present value engineering study proposal to the decision makers/stake holders. To obtain approval/support and enhance potential implementation.

IMPLEMENTATION PHASE

The implementation of this project is a long term one. It takes about 2 years while the design development, final design and manufacturing are complete. With this implementation the objective were meet. The team get a cost saving and the redesign that was seeking. Below is the savings timing for this project.

TIMMING VALUE ENGINEERING EFFORT

