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PW Principles of value analysis

The story of the little pin

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Lawrence D. Miles has been practicing and refining value analysis since he originated the techniques as a member of GE's corporate purchasing department almost thirty years ago. He has written and lectured extensively on VA, and has published two books on the subject: "Cutting Costs by Analyzing Values," and "Techniques of Value Analysis and Engineering." He is a Fellow of the Society of American Value Engineers (SAVE), and served as its first president. And he is a holder of the Distinguished Public Service Award—the highest military honor awardable to a civilian—given him for benefits accrued to the U.S. Navy from the use of VA techniques.

"I can't use value analysis principles on all of my buying," said a buyer who had just received training and returned to his plant. "Why not?" I asked. "Because some important items are tricky. The job is to get something that works, then we don't dare touch it." I said, "Pick one, let's talk about it." He did.

The problem

A purchased item—tiny stainless steel pins—were at the heart of their product. Tolerances on length, diameter, chamfer, and end flats were microscopic. Cost was $182,000/yr. Annual cost was enough so that even a "hard" problem was worth looking into. He said he would try it. I asked him exactly which principles he would try to use, and he ticked them off:

- Pay out no money that didn't bring useful function.
- Determine the functions needed and those being bought.
- Learn the amount of cost that went into each function.
- Try to end costs that don't buy useful functions, and minimize costs that do.

I'll tell you what he did. He told the management committee that he expected to use his newly learned purchase value analysis principles in many areas, one of which was a study of the pins. He was told that more work on buying the pins was ill advised, that the pins were an infinitessimal part of the total product cost, that the present supplier was reliable and adequate, and that, considering the hardening and the extremely tight tolerances required, $3.65/M was a very suitable price. Without the encouragement of anyone, but with their understanding of what he was doing, he proceeded.

He told the supplying company's sales manager about the function buying principles of value analysis, and asked him to have his technical and manufacturing people review the pin to determine if improvements in materials or procedures now could be made that would allow a lower price. A two-page answer said "no," and that perhaps they soon would request a price increase.

Questions and answers

So he set to work gaining information and knowledge—always from people who knew the answers to the specific questions he asked. To illustrate the type of questions he asked, and the type of knowledge he secured, some of the questions and answers are listed here.

(1) What purpose does the pin serve? It is the pivot used to support gears in an electric clock.

(2) How is the gear put on the pin? Pressed on.

(3) Why is stainless used? To avoid corrosion.

(4) Why use No. 440 stainless, which is twice as hard to machine as the others? Because it has 100 points of carbon and can be satisfactorily hardened.

(5) Why harden it? In pressing on the tight gears, the surface of the pin is sometimes slightly scored, and as this surface serves as a bearing surface, the scoring would result in erratic and short life. The sole function of the hardening is to avoid damage to the pin surface.

(6) If the gears are carbon steel and do not corrode or rust, why should the pins? We tried carbon steel for the pins and it does corrode. The gears are made of a very thin cold-rolled steel, and it seems probable that the supplier uses some rust inhibitor in his process that is good enough. If we thoroughly clean the gear steel by acid or other method, it too will rust.

(7) Why the chamfer? To provide entry into the gear.

(8) Why chamfer both ends? To save labor. Otherwise each pin must be picked up and examined before it is located with the proper end up.

(9) Why the flat? The flat presses against the end plate and locates the pin axially. It is desirable for the flat surface to be at a minimum in order to reduce end friction.

(10) Why the radius? The radius is for the purpose of connecting the chamfer to the flat.

(11) Why have both the chamfer and the radius when the combined length of both is 0.010 inch and may, within tolerances, be as little as 0.005 inch? A chamfer or suitable radius is necessary to provide entry into the gear, and a small end bearing surface is necessary to limit end friction.

(12) How much does the stainless wire cost? 45¢/M.

(13) How much would carbon steel cost? 10¢/M.

(14) What operations increase that cost to $3.00/M? The ±0.001-in. length tolerance, the 0.00025-in. OD tolerance, the chamfer-radius end construction, the No. 440 stainless steel, and the hardening.

(15) How is it made now? It is made of material in excess of the desired diameter and cut off too long. Then, after hardening, the ends are ground to length and the outside diameter is ground to size. There are 12 operations involved.

(16) Can wire be purchased to the diameter tolerance required? Yes.

(17) Will automatic screw machines cut it off to the ±0.001-in. length tolerance? Probably not. We would expect ±0.003 in. from them.

(18) How close will wire-forming equipment shear it to length? Good equipment will hold it to ±0.002-in.

(19) Why not cut it off on a form cutter that will provide, in one operation, the necessary chamfer, radius, and end flat? It might work. The problem would be to cut it off to the tolerance of ±0.001-in.

(20) Some cutoff methods normally would leave a small tip in the center. Wouldn't it be desirable to do so? We would expect so, providing the tip size was closely enough controlled.

Next month Miles will reveal the happy ending to the story of the little steel pin.