49-26

PROFESSORS

VALUE ANALYSIS -- ~~ENGINEERING~~ CONFERENCE

Lake George - June 28, 1949

We would like to show you an aspect of dynamic purchasing as we are developing it in General Electric. We call it Value Analysis. Its purpose is to get better value for General Electric and its customers.

How nearly does every product and every process represent value?

For the answer, let's look at some actual products and please do not feel that it is only General Electric parts which lack value, we assure you that it isn't so. We won't be showing you the thousands of parts which do represent good value.

Here is an excellent product--the cold control for our refrigerators. We did make 2,000,000 per year (using half and selling half). We lost the outside sale of 1,000,000--our quality was superb, but the price was too high.

First, we find a cover clip of high tin phosphor bronze at 65¢ to 70¢ per pound. Very seldom is phosphor bronze justified unless it is carrying current. Its function is simply to dependably hold on the cover. Using plated steel or some other materials as much as $4,000 a year can be taken from the part.

We will be talking pennies -- one penny on a production of a million a year means $10,000.

Next, this plastic cover costs 4¢ -- $40,000 for a year's supply. Does it represent value? Does General Electric and its customers get $40,000 worth of value from it? Not if the job can be equally well done with other material. A flat laminated plastic cover costs

about a cent and one-half -- $15,000 a year and does the same job at a saving of $25,000 per year.

This plated copper tubing has a large operating end and a samll connection end to facilitate assembly. At the junction is a 5¢ silver braze, making the tube cost 10¢ or $100,000 per year. By using the large diameter throughout with a swaging operation at the small end costing 1/2¢, the price becomes 5½¢ each with a saving of $45,000 per year. But as so often happens during the experimentation, the engineers found that due to other improvements which have been periodically made in the device, the small size capilary to being the entire length functions equally well so that a cost of 5¢ each with a saving of $50 per year results.

Let's observe this spring. A million a year were costing $10 per thousand -- $10,000 per year. They are made of music wire, have special plating, special length tolerances and ground ends. A reliable supplier was asked to take the drawing and specification also the device and quote not only upon the spring as specified but quote on the lowest price high quality spring which would fit ~~in the place~~ and might do the job - then to progressively quote higher prices as the other specified features were added. The sales engineer said "we can't do that - we can only quote according to the drawing". When asked why he stated "we can only quote according to the drawing because we do not dare get in bad with the engineers'. On being requested to make a ~~charge~~ choice then, and get in bad with either the engineers or purchasing, he stated that he had no choice, he would quote. The quotations ranged from $2.00 per thousand to $10.00 per thousand. He supplied samples of each

of five different grades complete with test data. When all of this information and samples were provided to the engineers what do you suppose were their comments? "My gosh -- I wish we had such complete information on which to base all of our decisions". The engineers decided that they needed special plating because the atmosphere was corrosive and a special quotation was secured of $2.05 per M which covered the spring which the engineers believed right for the job.

Of course, the engineers were not taken by surprise. Value Analysts live hand and glove with them always. For example, on starting this job the two engineers were invited to luncheon, then the afternoon was spent in asking and receiving their suggestions.

What don't you like about the device?

What would you like to change?

Where do you feel are excessive costs?

Part by part, let us listen to your thoughts and plans. Thus, the analysts become full-fledged partners with the engineers lengthening the engineer's reach and increasing their range.

The job of purchasing Value Analysis is to analyze each part, process, and material in light of its function, of other materials, and of new improvements -- and to make certain that maximum value is obtained. This is done only by detailed study of the product with the engineer and continual work with them for him.

Let's look at our oil burner control. This nameplate including its mounting, went into our shop cost at 11¢. Is it worth it? Does it represent value? It contains no information -- just the insignia of General Electric. The question was referred to the stylist. It was determined that the control is mounted under the

hood in the front of the burner and certainly not worth 11¢. Instead it was determined to place a monogram in the plastic mold and save the 11¢.

Next, we find a 1-1/2¢ cover screw. Plated steel would do the job for 1¢. Inside we find 12 terminal screws and none of them standard. They are #8 screws with #6 heads and cost 3 times the price of the standard screw -- adding 5¢ per control. Next it was determined that 10¢ at shop cost is required to put all of these screws in the terminals, yet in most cases they are immediately removed at assembly. Placing the screws in an envelope in the same container would eliminate most of the 10¢.

Possibly this viewpoint is a little different but we are firmly convinced that it makes no difference whether a part is manufactured or purchased -- poor value in our plant loses business just as excessive purchase cost. Each part is analyzed regardless of source. Purchasing's responsibility to management is "Value in every part."

You'll be interested in the oil burner flame detector.

Here again is our old friend, the brass cover screw.

This time it screws into a 5¢ mounting stud. By lengthening the stud it could attach into a drilled and tapped hole in the base and the drilling and tapping could be done for less than the present cost of welding on the stud saving the entire 5¢ cost. The screw could be made longer and made of steel for less than its present cost. In this case it was advised that the purpose of the stud was so that the collar on the plastic cover could rest upon it and prevent someone from screwing the screw down too tightly

and cracking the cover. One of the younger engineers, however, sawed open a mounted assembly and found that the boss did not come in contact with the stud. Since the stud did not make a contribution to the value of the product it is judged that it has no value.

The function of this controller is to extend into the fire chamber and in case of fire failure to shut off the flow of fuel. Its operating elements are a quartz inner rod surrounded by a nichrome tube. The quartz rod is interesting. It has cost 32¢ and was an important portion of the cost of this highly competitive device. Accordingly, the supplier's engineers were invited in to discuss what steps could be taken to provide lower cost. For two hours it was studied. Such suggestions as a smaller diameter material, which were quickly discarded because it would become more fragile, and many others were made. Finally after two hours one of the engineers suggested that if a quartz tube were taken instead of a quartz rod the cost would be reduced 11¢. The group was astounded. None would have guessed that a 1/4" fused quartz tube was lower cost to make than a 1/4" fused quartz rod.

But as often happens, this opened up new possibilities. On the end of the rod was cemented a pin assembly totaling 17¢ in cost. The engineers shortly brought over a pin which could be inserted in the whole in the tube and asked for its price. It cost 5¢ instead of 17¢. But the Value Analysis boys didn't like the pin because of the waste metal near the top of it and asked the engineers to redesign it like a nail with the head in the center. On receiving the drawing quotations showed that it would cost 2¢. The result

was 15¢ saving on the pin assembly. We were delighted.

But the end was not yet. During the thorough study of this quartz member, reconstructed quartz was considered. As most of you know reconstructed quartz is made by highly pulverizing glass which is essentially all silica anyway, then treating the powder successively with acids or other materials which should dissolve out all impurities. Later, on heating up the powder it should fuse into quartz. And that is just about what happens. It is made by Corning Glass Company and called Hy-cor glass. It has properties almost identical with fused quartz excepting at the very extremes of temperature. The engineers had these Hy-cor tubes on accelerated tests. ~~and here~~ A couple of months ago they advised that they had found identical performance. Accordingly another 5¢ was removed from the cost of the tube. The final surprising result was—instead of the original 49¢ assembly,—a simpler 18¢ assembly -- and identical performance.

In all of our materials -- and all of our parts -- if the value isn't there, its someone's job to do something about it -- engineering, manufacturing, or purchasing -- and its purchasing's job to start the process.

But let's look at a low volume item -- does it still pay?

We make two thousand traffic controllers a year -- you know that's the green box that hangs at the corner and turns the light red as you approach the crossing. Each page or two of this report covers suggestions on a part. Let's look at a few. This spacer costs $1.26 and its function is to hold these two discs apart so the cop can plug up ~~his~~ the light sequences. It is made of solid steel

and is undercut to make it lighter. After much thought and discussion, the best suggestion was to buy an aluminum blank which is a commodity on the market sold by the Aluminum Company by the millions to extrusion houses -- for 4¢, flatten it for 1¢, drill it for 8¢ and arrive at a spacer cost of 13¢. This spacer has the improvement of lightness over the former $1.26 one.

This small collar was costing 36¢ and used only 1/3¢ worth of steel. Possibly in bygone years purchasing would have considered its function to attempt to reduce this steel cost of 1/3¢ by perhaps 1/10th of a cent. But, -- no more. It is not the 1/3¢ but the 36¢ that is losing the business for us. In this case, it so much resembles a ground rod clamp that a ground rod clamp supplier was solicited on it and he provided this square collar similar to his standard design for 2¢.

This hinge bracket was costing 46¢. A study of the planning disclosed 14¢ of it was for a final sizing operation between the two ends of the U so that the assemblying casting would always fit properly on the assembly line. One of the younger planning men disappeared and reappeared with a large mallet. Brandishing it he advised that this mallet is located at that point on the assembly line and that they are always hammered for a fit. This element of cost and some others were quickly disposed of.

This steel index plate was formerly copper plated then chemically oxidized black, then clear lacquered for a finishing cost of 17¢. The zinc plated part now costs 6¢.

To make a high percentage of good suggestions, Purchasing Value Analysis men must be trained materials men -- experienced

engineers and methods men who know how to talk the engineering language -- how to give and take. They must have creative imagination.

We should do our job well enough so that 80% of the suggestions made will be realized. We are pleased to quote from a letter recently received on this traffic controller job as follows: "The cost reduction to date is $26 each -- (that is $52,000 per year) -- the realization percentage so far has been 79%!

Now for a high volume item, let's review this pin. Each of the Telechron or General Electric clock motors with which you are all so familiar has five small pins such as this which you can hardly see. Pass these around.

Our analysis showed that 4/10ths cent each was too much to pay for these pins. We use 50 million per year and each 1/10th cent is $50,000 per year. The supplier received our request and in due time reported that because of close tolerances and a number of other things, no price adjustment could be made. Arrangements were made for a meeting with our buyer in the Telechron Factory, the Product Engineer, the Supplier's Salesmanager and his factory Superintendent to study each detail of the manufacture of the pins. A number of things were found. First, there were three sepearate centerless grinding operations to bring them to size -- entirely too many. Second, the supplier was holding them to half of our very close specified tolerance -- he was playing extra safe -- with our money. The result was that shortly the part was requoted at $2.00 per M. The savings amounted to $100,000 per year.

And here is another high production item, a bracket used in our conduit products. One would expect this to be the essence of value but it was found that 8,000,000 could be made for $3.00 per thousand instead of $5.00 per thousand, showing a saving of $16,000 per year. Here the most important factor was the use of pre-zinc plated steel which incidently does a remarkably good job and has Underwriters' approval for this type of application.

And here is an unusual case. After showing you the selected examples of bad value we certainly should show you at least one outstanding value. We use 1/4 million per year of this radio chassis and, less plating, as you see it, it costs 6¢ each -- and it has 5¢ worth of steel in it. In other words 1¢ covers all of the labor and overhead and other additions to go into shop cost. An excellent example of General Electric value. However, this small switch support is used in quantities of 3,000,000 a year and costs 1.8¢ each. Deducting 1/2¢ for material, that leaves 1.3¢ each for labor. Why? It has two tapped holes and modern machinery has not been provided to transfer it from the punch press to suitable tapping devices so that it could drop complete without intermediate handling. A saving of over $20,000 per year is possible on this part.

In value analysis the emphasis is on lower cost with equivalent or improved performance. There is always a way to do the job at lower cost with equivalent performance.

You logically ask -"how is it done?"

By questioning every cost.

By searching out specialized materials and products.

By isolating specific problems and referring them to competent vendor specialists.

By using most modern specialized machines.

By living with the Manufacturing and Engineering people and helping them with minor changes which make important cost differences.

By searching out what is new and what is applicable and assisting to get it used on the product.

But you probably question, "How do the engineers feel about this questioning by Purchasing?"

We are pleased to report that engineering is one of our strongest supporters. Mr. Winne, our engineering vice-president, in his meeting with his committee of top engineers said that while Purchasing Departments are training people who can insist on value and who will raise these questions with the engineers, it is equally important that the engineering organizations train their people to expect such questions and to help work them through so that the savings can be realized.

Again a few months ago, the following is reported from his meeting, "Value Analysis as promoted by the Purchasing Department -- was pointed to as a procedure that has proved most effective to show up unnecessary cost in material, parts, products and processes".

But we cannot obtain value unless we know value. To assist buyers, engineers, manufacturing men, methods men, etc. to know value, a shop cost slide rule is being provided which in a few seconds would give approximate value to a wide range of mechanical parts. On the top scale we read the operations per minute. On

the top of the slide the hourly rate of the operator, on the bottom of the slide, the desired overhead rate and immediately opposite the cost per thousand. We then turn to the back and quickly approximate the material cost which gives us the total shop cost and with surprising accuracy.

For example this part drops from the machine at a rate of about one per minute and we use $1.50 an hour man so we set the $1.50 an hour against one per minute and, using an overhead of about 200% we read a shop cost of $75 per thousand. Turning to the back we see that carbon steel 2" long and an 1" in diameter costs about $25.00/M--which gives a reasonable shop cost of $100 per thousand. As another example this small brass part would drop from the machine at a rate of about 4 per minute. Since a $1.50 an hour operator will run two machines, we set 75¢ an hour on 4 per minute. Then on 200% overhead we read the cost at $9.50 per thousand. We see that it is brass and a little over 1/4" diameter and a little longer than an inch, so the material will be about $5.00 per thousand, giving an approximate cost of $14.50 or $15.00 a thousand, 1½¢ each.

Our goal is to learn to measure value. We would like to put a yardstick on it and at once know the extent of value with the same accuracy that you engineers use in measuring all manner of things such as odors, taste, thought, etc. We haven't gone that far yet but from several hundred cases where value improvement has been found possible, we have isolated 10 measurements which give us a good start. We will show and illustrate each one in a 6 minute program of projection slides.

(Show projection slides.)

(Just before the last slide state)

In conclusion --

If it contributes to value

If its cost is proportionate to its usefulness

If it needs all of its features

If there is nothing better for the intended use

If a usable part cannot be made by a lower cost method

If a standard product cannot be found which will be usable

If it is made on proper tooling considering quantities

If material, reasonable labor, overhead, and profit total its cost

If another dependable supplier will not provide it for less

If no one can buy it for less

Then it is worth the money and we in Purchasing believe it represents value.

L. D. Miles

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