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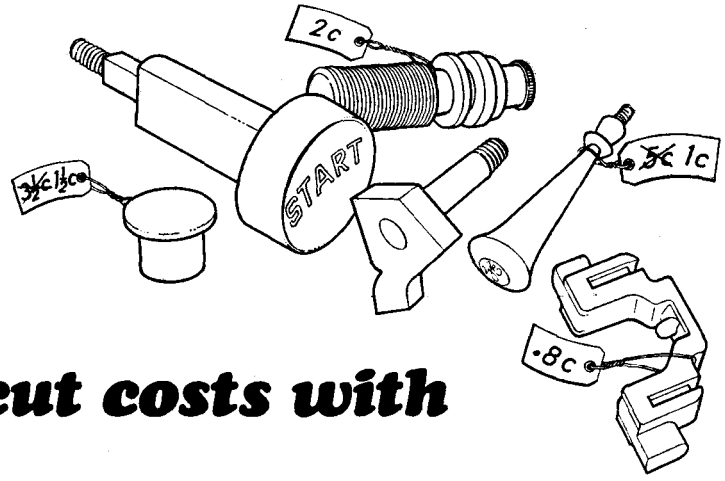

How to cut costs with Value Analysis

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IS IT worth the money?—a timely question, and an important one. Important because the answer to this question can mean the difference between profit and loss for any company. Unless a company's product is worth its cost, it does not represent good value and cannot maintain its position in a competitive market. Timely because a competitive market is here. Management faces a challenge, and at General Electric management is acting. It is taking steps to make certain that G. E. products are worth the money. Specifically dedicated to this task, along with numerous other services and publications offered by the Company for internal use, is the Value Analysis Program.

Value Analysis represents an important concept in modern industrial management. Through Value Analysis, management makes Purchasing a full-time partner in cost reduction, and thus taps a reservoir of skill and knowledge that brings enrichment of value to all General Electric products. In Engineering, Value Analysis brings a new outlook to component parts design. It stimulates the cost-consciousness of every engineer to make certain that new designs include the latest advances in low-cost production techniques. For Manufacturing, to supplement the constant efforts of methods men and planners, Value Analysis represents a valuable new tool, extending the range of those responsible for dollar production and bringing their problems directly into the shops of suppliers. To any group in the company, Value Analysis offers a basic approach to greater value through principles and procedures universally applicable and readily understood.

What these principles are, how they are applied, and the results that have been obtained in representative case histories is the subject of this report.

Its success in General Electric is due not only to its basic soundness but to a large degree to the enthusiastic support of management at all levels in Purchasing, Engineering, and Manufacturing.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

What Is Value Analysis?

THE Value Analysis Program has two main areas in which it operates. One is the study of existing products, the other is the design of new products. In both areas, its major objective is equivalent quality at lower cost.

In the study of existing products, Value Analysis focuses attention on each part in the apparatus. It notes the function of the part, seeking to eliminate or simplify it, combine it with another part, or replace it with a standard item. It considers the material used to determine whether some other material offers better value. For the same reason, processes and manufacturing methods are examined, purchasing arrangements are reviewed, and the wares of specialized vendors and the services of specialized suppliers are scrutinized. The entire procedure is an intensive effort to uncover every possibility for greater value in the product.

Directly affected by these activities are Engineering, Manufacturing, and in fact, any part of the company that influences product cost. But Value Analysis in no way interferes with their normal duties and responsibilities. Value Analysis operates through trained specialists who work in full cooperation with each unit and constantly receive valuable ideas from them. Analysts investigate and uncover possibilities for savings. These are offered as *suggestions* to those who are responsible for making a decision and taking action.

In this way, there is no overlapping of functions, no areas of friction. And nothing is more important in the success of a Value Analysis Program. It is only through this smooth teamwork that it is possible to realize the tremendous savings the program can produce. Furthermore, this setup creates excellent relations with all other parts of the company, and permits Value Analysis to concentrate on its prime function—that of promoting and generating ideas for value improvement.

General Electric is organized with a central purchasing department, which buys certain generally used commodities and which is the "policy group." In addition each operating department has a purchasing group which buys materials peculiar to their operation. The Value Analysis central division assists and supports the activities of the various Value Analysis groups throughout the company.

Applies Purchasing Techniques

Noteworthy in Value Analysis is the emphasis on purchasing functions as a means to cost reduction. Stemming directly from this source are the following Value Analysis services: (1) supplying specialized knowledge of markets, materials, standard parts, processes, and costs, (2) extending the drive for increased manufacturing efficiency into supplier's shops, and (3) bringing the engineering skill and ingenuity of specialized suppliers to bear on company problems.

Of particular importance is point three—bringing to the company the best thinking of hundreds of process specialists outside the company. Among these are the specialized suppliers who have highly specialized tools and facilities which are available for contract work. Value Analysis, confronted with a tough problem, calls upon these vendors. Invariably, a solution is found.

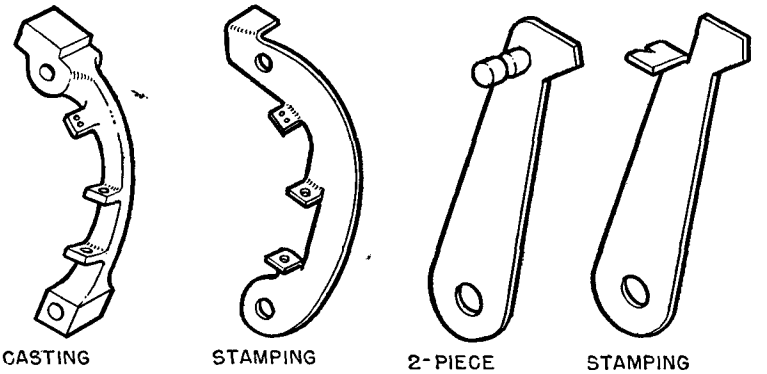
In turn, benefits accrue to suppliers not only in the form of the immediate order but also in establishing goodwill and a favorable reputation for future business. Furthermore, the value analyst oftentimes can offer a helpful suggestion on the internal operation in the supplier's plant.

Works Closely With Suppliers

If the cost of a purchased item appears too high, value analysts and supplier representatives go over the job in detail, discussing every feature that adds to its cost and evaluating changes that can be made to effect easier manufacture. Complete understanding of the job and its function often permits the supplier to effect appreciable sav-

Special Suppliers Enable Low Costs on Small Lots

High tool charges often prevent the application of low-cost manufacturing methods to small-lot, low-quantity production. Yet, there are suppliers with special equipment that enables them to do this class of work with low charges for tooling. Parts below illustrate what can be done through specialty stamping shops.



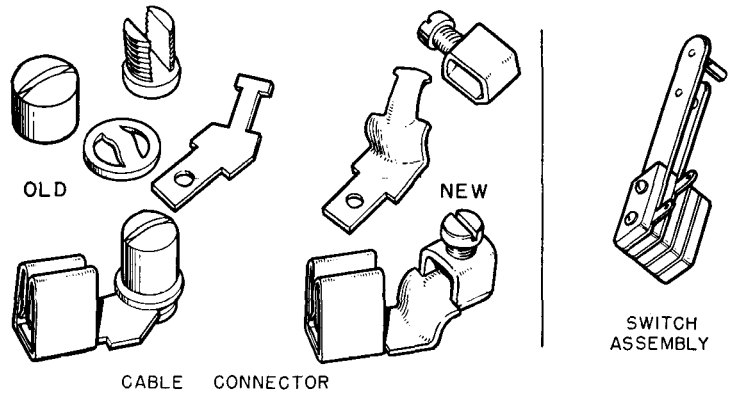
As casting, part required considerable machining and cost $1.76. Part, as stamping, costs 25¢. Tool charge was $100

Made as 2-piece assembly, pawl cost $1. Changed to stamping, cost is now 8¢. Tool charge at specialty shop was $50

ings. Knowledge of the supplier's problems and the reason for the cost of the job, in turn, often suggests what the company can do to make his task easier. In such negotiations not only do value analysts take part but also company engineers and manufacturing men who are responsible for making decisions on each of the possibilities as they turn up during the course of the discussion.

Sound, capable suppliers are an invaluable part of the program. Specialty fabricators, in particular, offer many opportunities for unusual and unexpected cost reductions. A most important task of Value Analysis is to learn of these suppliers and to establish sound working relations of mutual benefit to both parties.

Vendor's Standards Often Save Over Shop Parts



Cable connector was made of 4 parts produced within the company. Change to specialty vendor's standard cable connector parts saved 3¢ on each, amounting to $25,000 yearly

Switch assembly with parts made in the plant cost 90¢. Vendor was found who carried usable components as standard. New cost is 20¢

Improves New Product Design

The second phase of Value Analysis is its application in the design of new products. This is accomplished by the engineers supported by their draftsmen.

The engineers use Value Analysis as an additional tool to provide useful cost comparisons between usable products and processes, available specialized materials, applicable new products, and last-minute relationships of cost as their designs are jelled.

A well-organized program in their drafting divisions puts draftsmen on the team as dozens of decisions affecting cost—what tolerance to specify, what bushing to use, what fastener to use, etc.—can be properly made by a strong, highly qualified drafting group.

Major objectives in this program are: (1) to develop the cost-consciousness of all drafting personnel, (2) to acquaint all draftsmen with the principles of Value Analysis and the tremendous savings that result from their application, and (3) to encourage each draftsman to examine new designs as critically as the value analyst reviews existing products—with the ultimate objective that all new product designs include the latest advances in cost-saving practices. The Value Analysis group concerned with existing products lends full support to this program and contributes all helpful information at their command.

How to Analyze Existing Products

To be fully effective, Value Analysis requires a logical, systematic procedure. It is true that startling results sometimes come from spur-of-the-moment ideas. But for consistent results a definite pattern should be developed. In this way, no possibility is overlooked and the value analyst applies his efforts in the manner that is most likely to bear fruit.

Get All the Facts

The first step is to obtain full information on the job under consideration. This includes:

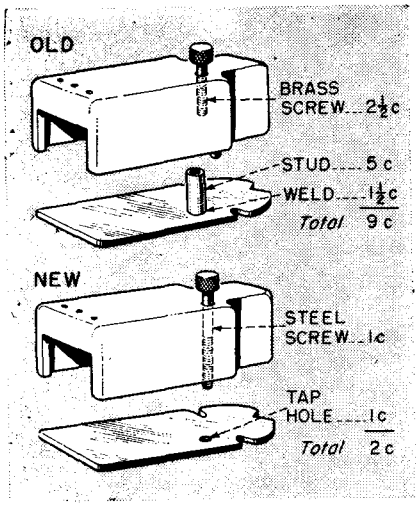
1. Annual production and ordering quantities.
2. Drawings and complete specifications.
3. Breakdown of costs on each part, including material, labor, and overhead, or if purchased part, name of vendor.
4. Breakdown of assembly and sub-assembly costs.
5. Copy of planning cards or general description of the process.
6. Actual samples of the individual parts and the assembly using the parts, where practicable.

This information is basic and essential for a thorough job. Complete data are the only sound basis for intelligent analysis.

See the Engineer

Next, the value analyst goes to the engineer directly responsible for the design of the product. Here is the man most intimately acquainted with the apparatus. With him the analyst discusses all aspects of the product: What the engineer likes or dislikes about it. Whether he has definite plans for redesign in the near future. Whether shortages may have dictated some of the material specifications. Whether there are changes the engineer contemplates but hasn't had time to check. Together they discuss the function and essential features of each part in the product.

In effect, the value analyst becomes a partner of the engineer, joining with him in the all-important effort to obtain a better



1 Does its use contribute to value?

In the assembly at top a brass thumb screw and screw machine part held the cover to the base. The stud, tapped on one end to receive the screw, was welded to the base. In new assembly the same purpose is accomplished by using a plated steel screw long enough to engage a tapped hole in the base and the stud is eliminated. Thus, the stud made no contribution to the value of the product

product at lower cost. The partnership in no way effects the engineer's authority or responsibility. It simply gives him another tool, extending his range and making it easy for him to obtain detailed information that was not so readily available previously.

This meeting is a most important step. Good value can be obtained in any product only if there is full cooperation among all who have a part in its manufacture. Value Analysis is not a means of checking on other sections of the organization, nor is it a fault-finding group. It is a service group that helps other sections with their problems.

Don't Miss the Pennies

The value analyst doesn't overlook pennies—1¢ each on 1,000,000 means $10,000; 10¢ each on 50,000 means $5,000.

Apply 10 Measures of Value

Having gathered all pertinent information concerning the apparatus under study, the analyst is now ready to weigh the value content of each piece in the product. This is the most critical step in the procedure for a wrong decision at this point may cause the loss of hundreds of dollars in unrealized savings. To minimize the danger of cursory analysis and snap judgments, the analyst follows a definite procedure for measuring value. This procedure is outlined in ten questions that have been crystallized from experience gained in the analysis of hundreds of jobs.

1. Does its use contribute to value?
2. Is its cost proportionate to its usefulness?
3. Does it need all its features?
4. Is there anything better for the intended use?
5. Can a standard or a vendor's standard be found which will be useable?
6. Can a useable part be made by a lower cost method?
7. Is it made on the proper tooling, considering volume?
8. Do material, reasonable labor, reasonable overhead, and reasonable profit total its costs?
9. Will another dependable supplier provide it for less?
10. Can anyone buy it for less?

Note the Function of the Part

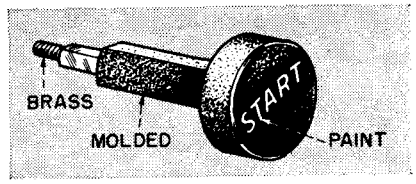
The first three questions are primarily concerned with the function of the part—its purpose in the apparatus. These are basic and should be considered first. There is little point in arranging to buy or make a part for less if it may be possible to save more by accomplishing the purpose some other way. Essentially these questions suggest the possibility of eliminating the part, combining it with another part, or simplifying it.

Consider Materials and Processes

Lack of material at the time of design may force specifications of something that gives less value than that which is now available. Further, new processes are developed and others improved such that over a period of years processes that once were best known for the job now represent less value than others currently available. Thus, question 4 refers specifically to other materials and processes.

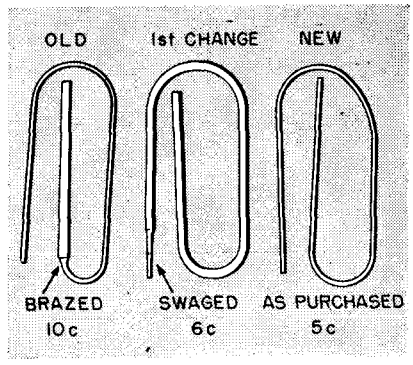
Check Manufacturing Methods

The fifth question focuses attention on the manufacture of the part, whether within the company or in a supplier's factory. As the analysis includes every piece in the product, many items will be made within the company. For these, the analyst has full information on labor as well as material cost. Careful analysis may show that the possibility for greatest



2 Is its cost proportionate to its usefulness?

On start button shown, the brass is obtained, machined and handled, the compound is provided, and the button is molded, packed and shipped to the using department for 3¢. Thus far, this is an excellent example of value. But when, in the using department, it was found that it cost an additional 3¢ to fill in the letters by wiping white paint on and off the face, this operation was pointed out as being unproportionately costly and worthy of further study

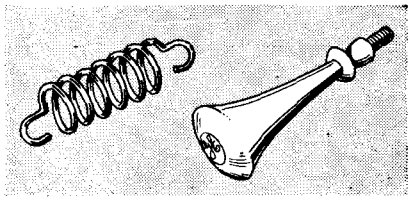


3 Does it need all its features?

At left, is a control device made of copper tubing costing 10¢. The operating function required a large section at one end, but for assembly purposes a tube of smaller diameter was needed at the other. Hence, a large and small diameter tube were brazed together. At center is the first improvement costing 6¢. The same device was made entirely of large diameter tube with one end swaged to the proper size for assembly. Performance was the same. At right is the latest method. Tests proved that recent improvements in the instrument eliminated the need for the large diameter tubing. Small tubing throughout costs 5¢

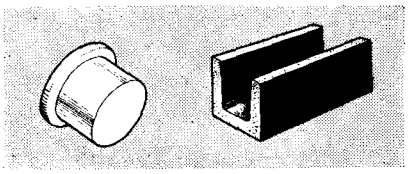
savings lies in changing the method of manufacturing the part.

Methods are determined by such factors as drawing details and specifications, inspection requirements, production quantities, tooling and equipment available. The method may be fixed and production may begin without final exploration of an alternate method



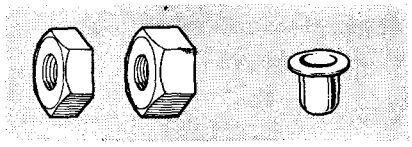
4 Is there anything better for the intended use?

Special alloy springs for one job cost $15,000 for a year's supply, and the springs were not too stable. The equivalent spring in stainless steel is stable and costs only $9,000 for a one-year supply. Switch handle as a brass screw machine part cost 5¢ each. Same design as a miniature zinc die casting, brass-plated, is purchased for 1¢, including tool cost. On yearly requirement of 1,000,000 pieces, saving is $40,000, yet quality is equivalent



5 Can a useable part be made by a lower cost method?

Machined part at left cost 3½¢. With 0.005 in. additional tolerance on length, part is upset and Blanchard ground for 1½¢. Rubber part, right, formerly molded is cut from extruded stock at a saving equal to 2/3 former cost



6 Can standards be found which will be useable?

Nut on left is less than standard across the flats to avoid interference at the corners in assembly. Made in the plant, its cost was 15¢. Analyst found a suitable special as a vendor's standard. Cost 1¢. Added thickness of nut was no disadvantage. Brass eyelet cost $1.45 per M. Shoe industry uses standard eyelet which would do the job equally well. Cost for this vendor's standard is $0.89 per M

for producing a particular part. Such an investigation may reveal that slightly modifying the design will permit a much faster manufacturing method. The analyst, having complete information on the specific item and on the other items with which it is assembled, is in an excellent position to uncover such possibilities.

When parts are made by outside suppliers, the problem is somewhat more complex, as complete details are oftentimes lacking. But the "value approach"—asking, "Is it worth the money?"—will indicate those items on which the analyst should establish close contact with the supplier, study his detailed costs and methods, and jointly determine what can be done to improve his manufacturing methods.

Seek Vendor's Standards

Another big possibility for savings lies in the use of vendor's standards. Items that are not recognized national standards may yet be manufactured in large quantities and carried in stock at low cost by some vendors. Likewise, that which is a special in one industry may be found in slightly different form as a standard in another industry. Full knowledge of vendors and their standard items is essential to the value analyst. No one is in a better position than he to know the possibilities in this field. Question 6 insures that this opportunity will not be overlooked.

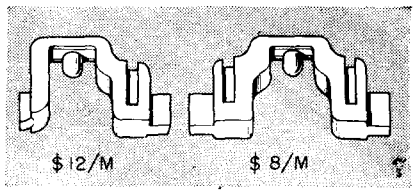
Note Tooling

Quantities change. Methods change. Available materials change. Still, too frequently tooling is not re-examined. As in question 5, whether a part is manufactured or purchased, its tooling must be examined. Thus, question 7 is asked.

In addition to individual cost elements, Value Analysis considers total part cost. To insure that all costs are fair and reasonable the eighth question is essential.

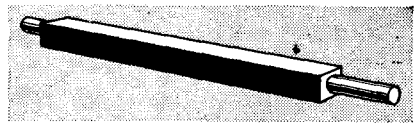
Select the Right Supplier

The ninth question focuses on vendor selection. Knowledge of



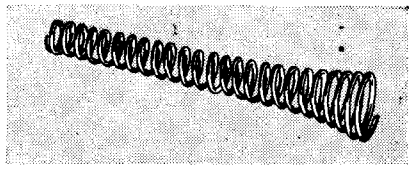
7 Is it made on proper tooling considering volume?

With lot-sizes in the millions, plastic part at left cost $12 per M, while that at right, in lower quantities cost $8 per M. Why? $12 one was first and was tooled with best known molds. Other part, tooled later, utilized an interim advance in the science of mold design. It was found that new molds would save their cost each in 4 weeks



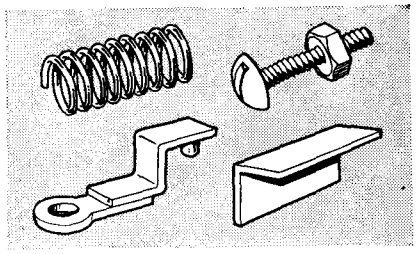
8 Do material, and reasonable labor, overhead, and profit total its cost?

Shaft has material cost of 3¢, no close tolerances, and total cost of 50¢. Obviously the cost is not reasonable. Job is now bought outside for 15¢ complete



9 Will another dependable supplier provide it for less?

Springs formerly cost $4.50 per M. Careful ordering and the right vendor selection reduced the cost to $2.50 per M. The saving on this one small item is $100 per week

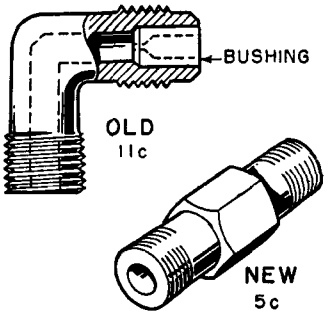


10 Can anyone buy it for less?

Except for proprietary processes, the analyst must satisfy himself that the answer here is always "No"

vendors and their particular abilities is of the utmost importance to the value analyst. It is his duty to determine who is best equipped to render the service that is being bought. And in what quantities

Suppliers Help In Solving Problems



Conferences with suppliers often turn up helpful suggestions for greater value. For example, fitting originally was an elbow, made of 2 pieces at a cost of 11¢. First attempt was to make the part in one piece, but cost then went to 12¢. Next, value analyst and supplier set 5¢ as their bogey and found that only way to meet bogey was to make part straight. Investigation showed that bend readily could be made in part, to which fitting is connected. Countless jobs have been improved through the planned conference method

and on what terms the best price can be obtained. It is not enough to know dependable suppliers, the analyst must know how to stimulate their thinking—how to help them obtain greatest efficiency in their shop. It is not the purpose of the value analyst to put unreasonable pressure on suppliers, but it is his purpose to make them think.

And, finally, in question 10, comes a very important point—"Can anyone buy it for less?" Except for proprietary processes, the analyst must satisfy himself that the answer here is always "No."

Basic Questions Lead to Others

These are the ten basic questions in Value Analysis. On a given part, they may open no avenues to greater value,—but if not, the part is worth the money. On the other hand, they frequently lead to several suggestions for lower cost at equivalent quality.

Examples for each of the ten basic questions are intended to clarify the intent of the question and to illustrate the type of action that may result.

Likewise, questions are not independent of one another. For example, question 3, suggesting simplification of a part, may involve use of a vendor's standard as suggested by question 6.

Requires Persistent Questioning

The analysis at this stage is simply persistent digging for results—considering every possibility — talking with Engineering, Manufacturing, associates in Purchasing, and Sales—contacting suppliers—negotiating with specialized contractors—speculating—and questioning.

When the analyst has completed this phase of the project he must apply good judgment in sifting the various ideas for each part and in deciding those that offer real possibilities for improvement. These are presented in a brief status summary listing: complete identification, sketch, present and proposed costs (often several proposals are listed), suggestions for reaching proposed costs, and space for entering data such as: actual results obtained, effective date of changes, and reasons for refusal to adopt suggestions. These items are usually not new to the engineer, the manufacturing man, or the buyer, for they have been working with the analyst—but the summary does bring the attention of each to unfinished items in his category.

A summary is made for each individual part on which improvement in value is possible, and parts which already represent value are also listed. Thus, at the end of the study, the value analyst reports on every item in the apparatus.

In these reports *anticipated yearly savings* are not shown. Value analysts indicate only per piece or per lot-size savings. The operating department that adopts the Value Analysis suggestion and follows through on it reports to management the *actual yearly savings* that were realized. This practice is another important factor in maintaining the good relations and co-operative spirit that is absolutely essential to the success of the Value Analysis Program.

Value Analysis Aids New Product Design

THE USE by the design engineer of Value Analysis techniques and services is well understood by all. It will be worth-while, however, to review the contribution being made by the drafting organization.

Elimination and *simplification* are two of the basic principles of Value Analysis. These apply to the design of new products equally as well as to the analysis of existing apparatus. Further, although it is essential to examine products periodically to take advantage of the latest developments for low-cost production, it is likewise essential to apply these new ideas to products presently on the board.

One who can do this successfully is the individual draftsman. Supervision may generate ideas, suggest, plan—but the man on the board is the one who actually puts the plan into action. To effect real savings in design, therefore, Value Analysis must also be beamed directly to the draftsmen.

Best for this purpose is a planned program that utilizes every medium to stimulate the cost-consciousness of draftsmen and to enlist their support in searching every drawing for every possible saving. Flyers, posters, group meetings, and reading matter all are used.

The program is a continuing one to provide the benefits of constant emphasis and repetition. Information is furnished in small, easy-to-take doses. And above all, the program is a draftsman's program,

with participation and contributions by draftsmen encouraged.

Draftsmen are sold on the Value Analysis objective — equivalent quality at lower cost—and are sold, too, on pertinent Value Analysis procedures, such as: elimination, simplification, use of standard parts, survey of materials and processes. They are given useful ideas and factual data.

In turn, they generate ideas and contribute to the program. When they do, their suggestions are rewarded. In this way, an additional incentive is provided over and above natural enthusiasm the program is bound to create.

Factual data provided for guidance in designing for low cost include checklists stating the points to consider in castings, moldings, punchings, formed parts, and so on. In addition, up-to-date figures on the cost per unit of weight, volume, and strength of commonly used materials is provided by the Value Analysis Division of the purchasing department.

The program pays its cost many times over. A properly informed, alert draftsman can save his weight in gold. Today more than ever before the challenge to modern industry is to produce more with less effort. Drafting is meeting this challenge—and one of its most powerful weapons is Value Analysis.

What Specific Questions Are Asked?

VALUE ANALYSIS is a way of thinking, a way of acting. Its basic philosophy is, "There is a better way to obtain equivalent quality at lower cost, only it has not as yet been found." Each of the ten basic measures of value suggests innumerable possibilities that may improve the product. A partial list follows:

Note the Function of the Part

Try to do the following:

1. *Eliminate the part:* (a) Change another part to perform the function. (b) Check accessory items and features—possibly the need for them no longer exists.

2. *Simplify the part:* (a) Put all tapped holes into one part—eliminate them from others. (b) Use available fastening devices and eliminate tapping entirely. (c) Challenge requirements that mean secondary operations, such as spring end grinding. (d) Make parts straight instead of curved—straight fittings cost less than elbows. (e) Use self-flaring fittings to eliminate operations and parts. (f) Don't plate copper parts which are later painted. (g) When blind holes are needed, show minimum depth with notation, "Don't Drill Through," rather than specifying depth limits. (h) Use squared ends —ground ends double the cost of the spring. (i) Don't knurl a rod that is pressed into a hardened hole. (j) Instead of two tapped holes for setscrews at 90°—put setscrews one on top of the other in the same hole.

Consider Materials and Processes

Check the following possibilities:

1. *Lower cost material:* (a) Use music wire instead of spring steel only when excessive loading demands it. (b) There are many tempers of copper and many types of bronze. Remember that half the weight of copper will carry the same current as equivalent bronze. (c) Remember also that ½ to ¼ the weight of spring brass carries equivalent current to phosphor bronze and the price per pound is also less. (d) Use lithographed in-

What Are the Qualifications for a Value Analyst?

I. REQUIRED QUALIFICATIONS

1. **A thorough understanding of materials together with experience applying materials.**
2. **Creative imagination along mechanical lines.**
3. **Engineering experience.**
4. **A basic appreciation of the importance of value.**
5. **A desire to work with others and a general knowledge of how to accomplish it successfully.**

II. DESIRABLE QUALIFICATIONS

1. **A general knowledge of vendors and methods for receiving valuable assistance from them.**
2. **Planning department experience.**
3. **Apprentice training.**
4. **Factory engineering experience.**

Added to these is the need for a man with an aggressive, inquiring mind. He must not accept customary solutions. He must be alert to new ideas and ever anxious to explore the possibilities of a new process. He must not be discouraged by opposition and the unwillingness of some suppliers to try out suggestions. He must be persistent.

When Projects Are Stalled, Try These Suggestions

1. Select a well-qualified vendor—get new information and a new idea from him. Put the problem up to him and press him to produce.

2. Break the problem down into two or three specific but smaller problems and assign each to a qualified specialized vendor for solution.

3. Talk it over with the project engineer again. Jointly agree that a hypothetical 20% of the cost must be removed and study with him how to start.

4. Talk about it to a man in one of the laboratories, someone in manufacturing, one in Standards. Tell them the problem—get some ideas from them.

5. As the part is studied—imagine that you are forbidden to use it. How then would the job be done?

6. Make a quick list of a dozen or a hundred suggestions—no matter how impractical some of them seem—then study the list.

7. Mentally review all new processes and products in trade magazines for applicability.

8. Determine how similar jobs are done by others—within and outside the company.

9. Find in the company a proponent of the idea and foster it through him.

10. Don't accept first effort—challenge further endeavor. Value Analysis only begins after the answer is "no."

11. If it is big enough, talk it over with the boss. He will probably have some good ideas.

stead of etched nameplates. (e) Use Terratex instead of mica for high-temperature, low-voltage applications. (f) Buy an aluminum or other disc instead of sheet or strip stock. (g) Use more magnesium extrusions. Magnesium tubing is lower in cost foot for foot than either aluminum or copper. (h) Don't use drill rod if steel rod will do the job.

2. *Higher-cost material:* At times, a more expensive material, by its nature and properties, will afford a simplified part and lower-cost assembly.

3. *Unusual but available raw materials:* (a) preplated steel; (b) expanded metal; (c) embossed metal; (d) rubberclad metal; (e) fiberclad or metalclad metals.

4. *Other methods of fabrication:* (a) diecasting; (b) extrusion; (c) permanent mold casting; (d) lost-wax casting; (e) miniature casting; (f) electro-forming; (g) powder metallurgy; (h) fabrication from copper or brass tubing; (i) low-cost, low-quantity stampings; (j) miniature casting on wire, cord, tape, or rod; (k) miniature casting automatically with inserts.

Check Manufacturing Methods

For parts:

1. *Alter the part so a high-speed method can be used:* (a) Perhaps it can go on a header or upsetter. (b) Make it of round or flattened wire on a wire-forming machine rather than a complicated terminal. (c) Strike the slot in the screw instead of sawing it. (d) Design parts for die-cast threads. A small flat in the parting line eliminates flash difficulty. (e) Drill and tap small parts in the strip before cutting apart. (f) When cross-drilled screws or bolts are needed, design so random drilling is permissible. (g) Make irregularly shaped parts of assembled laminations thin enough for stamping to avoid costly machining jobs.

For assemblies:

1. *Alter for automatic assembly:* (a) Don't use a complicated terminal when simple flattened wire applied by an automatic stapler would do as well. (b) To eliminate much adjusting labor, use prefired beryllium copper instead of phosphor bronze. (c) Don't have springs pressing against all of the assembly parts. (d) Don't assemble concealed parts between plates. Make up some subassemblies which are made openly and snapped together.

Seek Vendor's Standards

Alter so standards may be used:

1. Nails, washers, eyelets, spacers, bushings, similar parts
2. Classes of material supplied by specialty vendors as their standard: terminal boards, contact blades, spacers, similar units.

Select the Right Supplier

1. *Survey the purchasing with the buyer:* (a) Are the available highly specialized, low-cost suppliers being used? (b) Have the suppliers' engineers been given sufficient facts and pressed for suggestions which would produce equivalent performance at lower cost? (c) Has the buyer taken advantage of the know-how of other purchasing units using larger quantities of similar material? (d) Should some minor changes suggested by the supplier which afford lower cost material, be considered further? (e) Has the buyer found the basic source—the manufacturer who may be in a position to extend minimum prices?

2. *Miscellaneous:* (a) Use a good sampling method instead of 100% inspection. (b) Make an entire subassembly smaller, reducing amounts of material accordingly. (c) When buying adjacent parts from a vendor, have them preassembled if practicable. (d) Don't spend money for sizing if supplementary operations are necessary anyhow. (e) Make as many parts as practicable on a particular job of identical raw material.