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VALUE ANALYSIS

What is it?

How does it work?

Byer

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I N D E X

PREFACE

It is the job of Value Analysis to help members of all functions -- manufacturing methods, engineering, purchasing, and others -- to "grow" better habits, attitudes, and value-abilities sufficient to eliminate an additional 25 per cent of cost from products without in the slightest diminishing quality.

To accomplish this, we need...

...."Better Attitudes and Habits"
...."Better Information"
...."Better Techniques"
...."Value Specialists As Needed"

WHAT IS VALUE ANALYSIS?

Value Analysis is by no means a search for new materials and processes--the Laboratories, and Engineering and Manufacturing organizations are constantly doing that.

Nor is it a substitute for the effective cost reduction committees which daily are increasing our Value.

Value Analysis is a well-informed creative study of every item of cost in every part or material--in view of other possible materials, newer processes, abilities of specialty suppliers and possibilities for engineering re-evaluation focusing Engineering, Manufacturing and Purchasing on one objective--equivalent performance at lower cost.

Value Analysis must bring new information into the project from new areas within the company and from specialist suppliers outside of the company--new possibilities and new Value opportunities each with its definite cost for proper evaluation--and refer this new information into its proper normal channel--the manufacturing man, the engineer or the buyer--for decision.

Value Analysis relates cost to the function or service or operation purchased by that cost. Specialists in the company, and to a large degree outside, are assigned specific functional areas. Their engineering is put to work on our job instead of our competitor's. Their suggestions are provided with a dollar sign for our evaluation.

WHAT IS THE FUNCTION OF VALUE ANALYSIS?

To make certain that, viewing every usable idea, process, material and supplier, each part individually and each group of parts when considered as a unit, represents Value.

TESTS FOR VALUE

1. Does its use contribute Value?
2. Is its cost proportionate to its usefulness?
3. Does it need all of its features?
4. Is there anything better for the intended use?
5. Can a usable part be made by a lower cost method?
6. Can a standard product be found which will be usable?
7. Is it made on proper tooling - considering quantities used?
8. Do material, reasonable labor, overhead and profit total its cost?
9. Will another dependable supplier provide it for less?
10. Is anyone buying it for less?

HOW IS VALUE ANALYZED?

The analyst working with the engineer, the manufacturing man, and the buyer makes an intensive study endeavoring to lower material and parts cost by substituting, eliminating, combining, simplifying or otherwise altering parts or materials through the application of a knowledge of materials and prices, the use of vendor's specialized skills, new ideas and purchasing negotiation.

The function, the construction, the manufacturing methods, the sources of supply and the purchasing arrangements for each part and each material are reviewed.

Each item of cost is severely questioned. While studying the part or service the answers to these questions are developed...

...What is it?
...What does it cost per year?
...What does it do?
...What else would do the job and what would that cost?

Then each item of cost is seriously questioned unless it clearly buys definite function.

Function is simply defined as....

...something that makes the product work better...
...or sell better.

WHAT ARE THE QUALIFICATIONS FOR A VALUE ANALYST ENGINEER?

We have learned the qualifications for men to successfully accomplish this type of work. They are:

1. Engineering or methods and planning experience supported by a general understanding of the properties of materials and their uses.

2. A good creative imagination.

3. Enough initiative, self-organization, and self-drive to start and complete their projects with little if any supervision.

4. A feeling of the importance of value.

5. A mature personality, stable, not easily discouraged.

6. The desire to work and deal with others and the general knowledge of how to do it.

TO EFFECTIVELY START A PROJECT, WHAT DOES THE VALUE ANALYST REQUIRE?

1. Annual production and ordering quantities.

2. Six copies of all drawings including:

   a. Each part showing the material
   b. Assembly drawings
   c. Wiring diagrams, if any
   d. Test and Adjusting specifications
   e. Other supplementary specifications and data if necessary to completely define the product.

3. Breakdown showing detailed shop cost build-up including:

   a. Material
   b. Labor
   c. I. M. E.
   d. If other than basic raw material is used--the name of the vendor and price.
   e. A memorandum concerning special labor accounting--whether adjusted or unadjusted, variances, etc.

4. A breakdown of assembly and sub-assembly shop costs.

5. Copy of planning cards or general description of the type of process.

6. Actual samples of the individual parts and the assembly using the parts, where practicable.

SPECIFICALLY HOW DOES THE VALUE ANALYST PROCEED WITH A PROJECT?

VALUE ANALYSIS JOB PLAN

1. Information Phase

   a. Secure all pertinent facts--actual samples of parts and assembly where practicable. Costs, quantities, vendors, drawings, specifications, planning cards and manufacturing methods information.
   b. Learn the basic engineering, with the engineer, ask questions, listen develop with him a thorough understanding of the product.
   c. Learn the basic manufacturing--observe manufacturing, ask questions, listen, study.
   d. Decide the amount of effort that should reasonably be expended on each item of cost.

2. Speculative Phase

   a. Generate every possible solution to the problem.
   b. Consult others who may help you.
   c. Systematically explore various materials, machine processes, rearrangement of parts, etc.
   d. Encourage free use of the imagination.
   e. Record every suggestion that seems remotely possible.
   f. Establish two man teams for creation of additional ideas.

3. Analytical Phase

   a. Estimate the dollar value of each idea.
   b. Develop all ideas with emphasis placed in proportion to their value and probability of accomplishment.
   c. Investigate those ideas with an "obvious" reason why "it won't work." List the good points and the bad points. Eliminate or overcome the objections.
   d. Set up a program to vigorously pursue ideas with most promise.

4. Program Planning Phase

   a. Break the job down into a progression of functional areas; i.e., a fastening job, an electrical contact job, a support job, a dust protection job, etc.
   b. Select the top specialist in the General Electric Company to consult on each.
   c. Select from one to three of the best suppliers in the country for each functional area of the product.

5. Program Execution Phase

a. Pointing out the top function desired--discuss the problems and solicit specific suggestions with both in-company and out-of-company specialists.
b. Constantly pursue thoroughly and intensely until suggestions of all specialists are in. Work with vendor companies until they can provide alternate practical suggestions and quotations.
c. Periodically support the work of the specialists by speculative or idea study and evaluation pertaining to the individual functional areas.
d. Stick to each promising suggestion. Thrash it out and reach definite tangible usable conclusion.

6. Status Summary and Conclusion

a. Issue a concise suggestion sheet covering each part which shows possibilities.
b. The sheet shows pertinent information, such as...
   ...before and after sketch of the part.
   ...quantities used per year.
   ...material, labor, and shop cost.
   ...suggested cost, and tool cost, if any.
   ...statement describing function of part.
   ...suggestions in condensed form.
c. Send copies to the man designated by the manager to receive and follow up, also to others who should receive them.
d. Send all quotations to the Purchasing group concerned. Attach all specific engineering data, engineering studies, etc. to one copy and all studies pertinent to manufacturing methods, techniques, etc. to another of the copies given to the designated follow-up man.
e. Finish the job promptly and go on to the next.

WHAT DOES THE VALUE ANALYSIS ENGINEER ATTEMPT TO DO?

A. Eliminate the part.

1. Change another part to perform its function.
2. Check accessory items and features--possibly the need for them no longer exists.

B. Simplify it.

1. Put all the tapped holes into one part--eliminate them from others.
2. Use available fastening devices and eliminate tapping entirely.
3. Challenge secondary punch press operations or secondary screw machine operations or other secondary operations.
4. Make the parts straight instead of curved--straight fittings cost less than elbows.
5. Don't plate copper parts which are later painted.
6. When blind holes are needed, show minimum depth with notation. "Don't Drill Through", rather than specifying depth limits.
7. Use squared ends--ground ends double the cost of the spring.
8. Instead of two tapped holes for set screws at 90° put set screws one on top of the other in the same hole.
9. Avoid undercuts on molded plastics to eliminate mold cycles and slower machine cycle.
10. Question chrome plating or polishing on screw heads.
11. Question unusual machined surfaces. It may require secondary operations to obtain them.
12. Consider pal-nuts to eliminate nuts and lockwashers on light parts.
13. Stamp the nut impressions into the part--eliminate fastening devices.
14. Don't bend it.
15. Use a miniature casting in lieu of several small assembled stampings.
16. Use square instead of rounded corners on stampings.
17. Use roll pins to eliminate reaming.

C. Alter it so that a high speed method can be used.

1. With a slight change, perhaps it can go on a header or upsetter.
2. Make it of round or flattened wire on a wire forming machine rather than a complicated terminal.
3. Strike the slot in the screw instead of saving it.
4. Design parts for die cast threads. A small flat in the parting line eliminates flash difficulty.
5. Drill and tap small parts in the strip before cutting apart.
6. When cross drilled screws or bolts are needed, design so that random drilling is permissible.
7. Make irregularly shaped parts of assembled laminations thin enough for stamping to avoid costly machining jobs.
8. Eliminate insulating sheets, strips, punchings and welding operations by making a composite molded parts for electrical applications.

9. Instead of long screw-machine parts for filter housings, etc., use flared copper tubing and a small internal flare nut.
10. Mold gears from powdered iron to save cost of machining the teeth. If extra strength is needed, impregnate the iron with copper.
11. Use permanent mold iron castings for lower cost and better quality.
12. Use projections and resistance weld in one operation rather than spot-weld one spot at a time.
13. Consider magnesium--it machines twice as fast as aluminum and five times as fast as steel.
14. On thin gears--alter for punching instead of broaching.

D. Alter--so that standard parts or materials may be used.

1. Design around standard nails, rivets, eyelets, washers, spacers, etc.
2. Specialty vendors provide standard materials in many classes. For example, use standard terminal boards, standard switch contact blades, standard contact blade spacers, etc.
3. Design for standard bushings--don't make it necessary to cut them off.
4. Instead of fabricating terminals, buy them from a specialist in parts made from tubing.
5. Try "Johnson" weld nuts for resistance welding to sheet metal. They cost less than half the price of most others.
6. Use stamped "weld" nuts for even lower cost.
7. Use standard sizes for raw material to avoid "extras" in cost.

E. Determine where the design might reasonably be altered for automatic assembly.

1. Don't use a complicated terminal when simple flattened wire applied by an automatic stapler would do as well.
2. Don't have springs pressing against all of the assembly parts.
3. Don't assemble concealed parts between plates. Make up some sub-assemblies which are made openly and snapped together.

F. Use a lower cost material.

1. Use spring steel instead of music wire excepting when excessive loading demands additional properties and justifies additional cost of music wire.
2. There are many tempers of copper and many types of bronze. Remember that generally half the weight of copper will carry the same current as equivalent bronze.
3. Remember also that 1/2 to 1/4 the weight of spring brass carries equivalent current to phosphor bronze. Forty cent brass may replace 65¢ phosphor bronze. Suitable brass can be aged to provide comparable spring qualities.
4. Use Terratex or Quinterra instead of mica for high-temperature, low voltage applications.
5. Buy an aluminum or other disc instead of sheet or strip stock.
6. Use more magnesium extrusions. Dies cost only a few hundred dollars for small extrusions.
7. Check tubing costs. In smaller sizes, copper is lower cost than steel-aluminum and magnesium still lower-magnesium is the lowest.
8. Don't use drill rod if steel rod will do the job.
9. Use Zn-Cu-Be instead of brass. Save 20 per cent.
10. Use graphite-impregnated phenolic compound for a low-friction, low-cost bearing, thrust disc or seal nose.
11. For large die cast parts, check aluminum. It may cost less than zinc.

G. Use Lower Cost Processes.

1. Do the operation in a tumbling barrel. If the parts are too heavy and too precise--mount them on fixtures in the barrel and let the abrasive mixture flow through them.
2. Use automatic dial tapping machines.
3. Dip in paint rather than spray.
4. Design parts for barrel plating rather than hooking in still tank.
5. Use Multi-slide machines to eliminate secondary operations.
6. Stamp parts in punch press rather than hand stamp.
7. Use tubular rivets rather than solid rivets which have to be peened over slowly in a high speed hammer.
8. Lithograph or print rather than etch.
9. Permanent mold rather than sand cast.
10. When desired actually reduce the size of the shank on a screw by a special thread roller arrangement.

H. Use a higher cost material, which, by its nature and properties will afford a simplified design and facilitate lower cost assembly.

1. Consider fixture heat-treated beryllium copper, when phosphor bronze won't quite do the job. Eliminate adjusting labor.

2. Use Silicones--for innumerable benefits and savings.
3. Make the whole tip and support from silver rather than silver tip and brass support. Eliminating welding may offset the cost of additional silver.
4. Use Micaloi in flux paths. High permeability may save many laminations.
5. On very small parts with intricate forming use stainless to eliminate plating cost.
6. For high temperatures and high dielectric strength use Teflon to produce various savings.
7. Use brass instead of steel on very small screw machine parts. The saving in labor more than offsets the increased material cost.

I. Miscellaneous Lower Costs

1. Use a good sampling method instead of 100 per cent inspection.
2. Make an entire subassembly smaller reducing material accordingly.
3. When buying adjacent parts from a vendor, have them pre-assembled if practicable.
4. Don't spend money for sizing if supplementary operations are necessary anyhow.
5. Make as many parts as practicable on a particular job of identical raw material.
6. Design part and tools to hold scrap in machining to a minimum.
7. Use Carboloy.
8. Hopper feed parts in assembly.
9. Provide proper tooling to eliminate need of expensive labor.
10. Conveyorize to facilitate material handling.
11. Avoid complicated equipment that requires continuous scrutiny and maintenance.

J. Check it against other methods of fabrication.

1. Fabricate it.
2. Die Cast it.
3. Extrude it.
4. Permanent mold cast it.
5. Roll and weld it.
6. Roll form it.

K. Check it against unique, less well-known methods of fabrication.

1. Lost wax casting.
2. Miniature casting.
3. Miniature casting on wire, cord, tape or rod.
4. Miniature casting automatically with inserts.
5. Electro-forming.
6. Low cost, low quantity stampings.
7. Fabrication from copper or brass tubing.
8. Powder metallurgy.

L. Check unusual but available forms of raw materials for use on the job.

For example Steel

1. Preplated steel
2. Prepainted steel
3. Steelclad with aluminum. Stainless, monel, etc.
4. Fibreclad steel
5. Rubberclad steel
6. Embossed metal
7. Expanded metal

Or Miscellaneous

1. Silicones
2. Nylons
3. Micalex, etc.

M. Survey the purchasing with the buyer.

1. Are the available highly specialized low cost suppliers being used?
2. Have the suppliers' engineers been given sufficient facts and pressed for suggestions which would produce equivalent performance at lower cost?
3. Has the buyer taken advantage of the know how of other purchasing units using larger quantities of similar materials?
4. Should some minor changes suggested by the supplier which afford lower cost material, be considered further?
5. Has the buyer found the basic source, the manufacturer who may be in a position to extend minimum prices?
6. Are parts obtained in best economical lot size?

WHAT DOES THE VALUE ANALYST DO WITH THE INFORMATION DEVELOPED?

(See Item 6 of the Value Analysis Job Plan)

Quality of Value improvement is determined by ...

1. How frequently and effectively are good practical tangible specific ideas generated.

2. How effectively is action secured.

The first is a Value Analysis Specialist job ...

The second is a management job.

A manager, who is responsible in both engineering and manufacturing areas, appoints a man, sometimes in engineering, sometimes in manufacturing, sometimes in finance, to receive the Value Analysis suggestion sheets and see that each receives the attention that it deserves.

The Analyst at once starts the next job.

WHAT SAFEGUARDS ARE TAKEN TO PREVENT PROJECTS STOPPING PREMATURELY BEFORE RESULTS ARE ACCOMPLISHED?

The necessary safeguard is the basic philosophy that "There is a lower cost way to get equivalent quality--only as yet it has not been thought of."

It is important not to waste time going around in mental circles. If progress towards lower costs seems stalled, some of the following or similar actions must be taken.

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

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 per cent of the cost must be removed and study with him how to start.

4. Determine how similar jobs are being done in other branches of the G.E. Company.

5. Determine how competitors are doing it.

6. Counsel another G. E. buyer who may have a similar problem.

7. Find in the G. E. Company a proponent of the idea and foster it through him.

8. Talk about it to a man in one of the laboratories--tell him the problem--get some ideas from him.

9. Discuss it with the Standards Department. Frequently they have assisting information.

10. Talk it over with a man in the Manufacturing Services Division.

11. Mentally review all of the new processes and products reviewed in trade magazines for their applicability.

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

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

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

15. Don't accept first effort--challenge further endeavor. Value Analysis pays off after the first answer is "no".