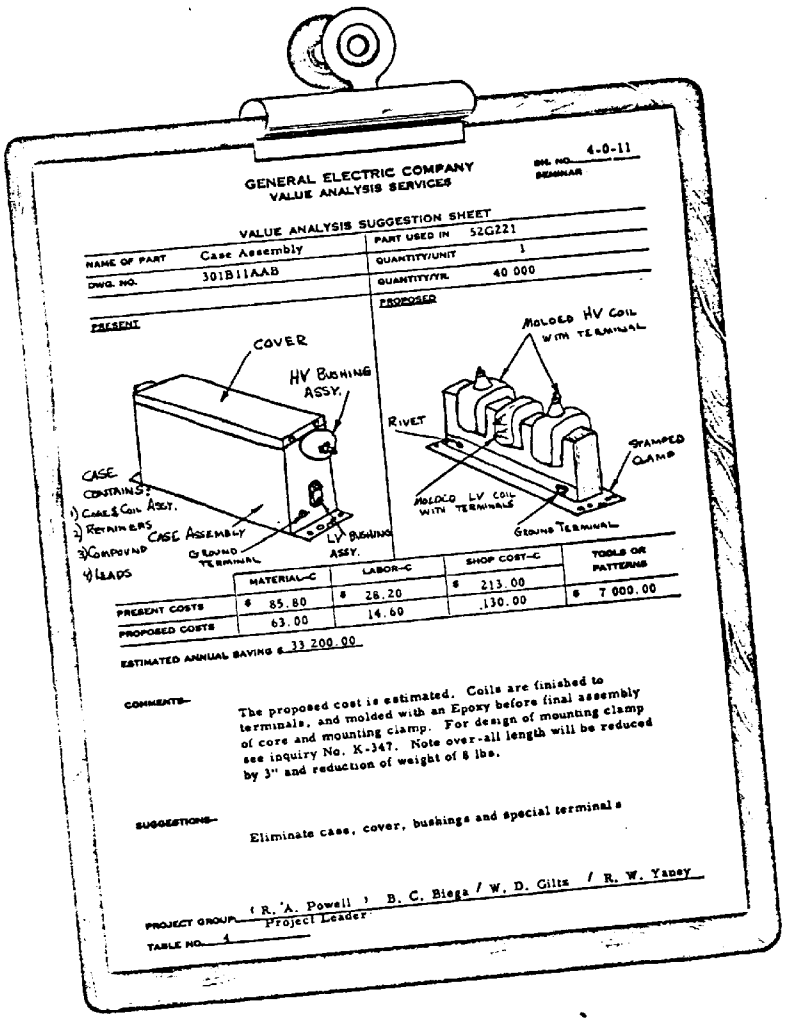
G-E's Value Analysis



In its tenth year, famous program saved $2 million by taking "unnecessary" costs out of manufacturing, material and design

COST CONTROL

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BROADENING the base of its cost reduction activities over the last decade has netted the General Electric Company tens of millions of dollars in manufacturing savings over and above conventional cost reductions. The method: Value Analysis, a program designed to take "unnecessary" costs out of products through investigation and analysis of materials, designs and manufacturing processes — before, during, and after design and tooling.

Pioneered by G. E. ten years ago, Value Analysis is an independent program encompassing engineering, manufacturing and purchasing activities. It relates to these activities as it evaluates product costs along purely *functional* lines. It attempts to obtain function at the lowest possible price, at the same quality and performance.

The direct, functional approach to product analysis has resulted in cost savings which range from 10 to as much as 90 per cent over original costs. Noting that the cast aluminum housing for the kitchen Disposall resembled a cooking pot and similar drawn parts, a value specialist investigated, finally located a supplier able to convert the deep, 7¼-inch casting to a stamping. As a result, unit cost was reduced from $1.02 to 60 cents, an annual saving for the company of $31,500.

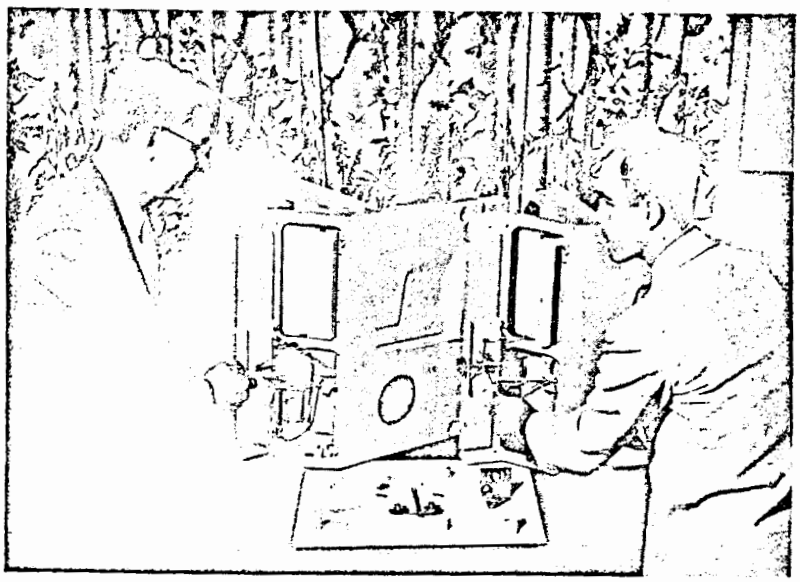
The company, to date, has recruited and trained 117 product and manufacturing engineers, and assigned them mostly as two-man value specialist teams in some 60 G.E. plants. Trained in Value Analysis Job Plan and creative thinking techniques, the value specialist analyzes products through all phases of manufacture, from the purchase of materials to the packaging and shipping of finished parts. He collaborates with product and manufacturing engineers, and reports to plant management; recom-

mends changes in design, processing or purchasing, but does not execute them. This is up to the particular department involved. For this reason, Value Analysis is concerned less with claiming dollar savings than in co-operating smoothly with operating departments. Dollar savings on specific jobs are "temporary," anyway, consultants in General Electric's Value Analysis Service in Schenectady, N. Y., point out, because a good job of Value Analysis on a new or existing product reduces the opportunity to make further savings on the same product. On the other hand, a good working relationship continues to produce savings year after year on a variety of jobs.

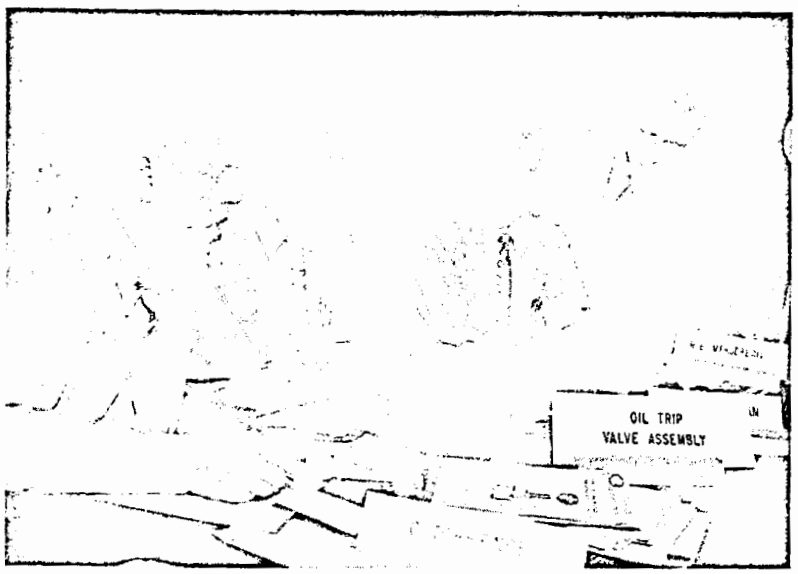
value analysis methods

Value Analysis conserves product and manufacturing engineering time by first researching opportunities and then extending the skills of those departments into areas where worthwhile return can be expected. While the product engineer, for example, is primarily concerned with creation of the design, arranging for drawings and tests, and meeting schedules, the value specialist assists by providing first-hand knowledge of possible alternatives in material, design or supplier talents.

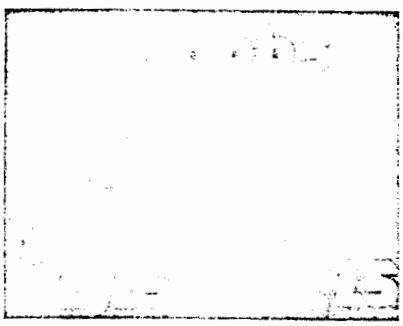
Evaluating products along functional lines breaks with past methods and "accepted" ways of doing things. The steam locomotive was doing a good job, one Value Anal-



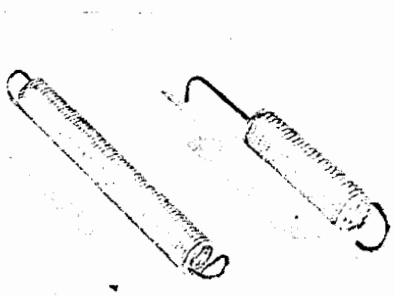
Value Analysis seminars at Schenectady feature group projects in product evaluation. Materials, processes are questioned unless they "buy" function.



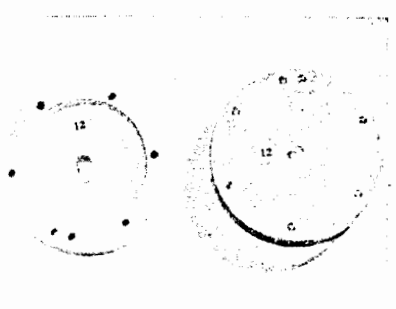
STANDARD FROM SPECIAL . . . effects big savings



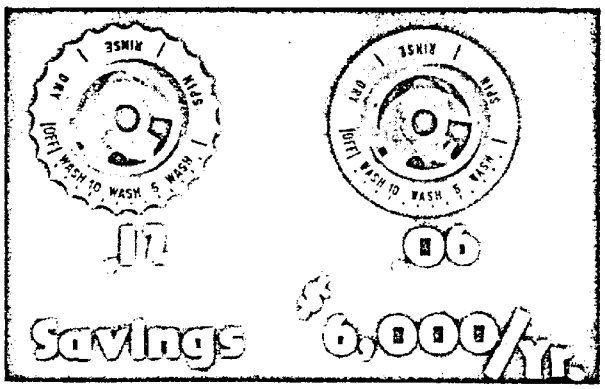
Standard metal-plastic knob (right) saved 9/10 cost of screw machined part.

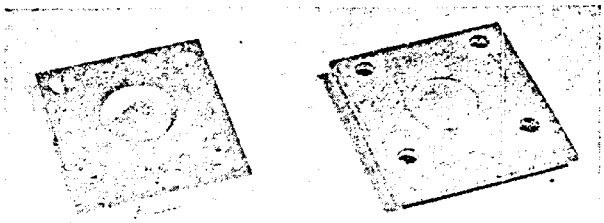


Converting special spring to standard (left) reduced the cost from 9c to 3c.



Aluminum disc replacing machined steel hub (left) cuts unit cost $1.27 to 13c.





Design change allowed conversion of machined part (left) to stamping, reducing cost from 53c to 18c plus tooling.

Supplier-specialist permitted change from hot stamp lettering to automatic paint-filling and wiping (right).

ysis consultant said, until the diesel locomotive came along. "Same function, but a different, more efficient form." This characterizes one basic Value Analysis technique, called *blast — then refine;* analyze from the standpoint of doing a minimum job, then add features necessary to do the total job.

basic questions

Here, basic questions are asked: *What is it? What does it do? What does it cost per year? What else would do the job, and what would that cost?* Each item of cost is questioned unless it "clearly buys function." While evaluating an oil wick assembly, a value specialist found that an ordinary staple could fasten the assembly as well as the aluminum strap then in use. The substitution reduced fastener costs, from $7.50 to nine cents per thousand.

Tests for value are also applied to parts, processes and materials. *Is its cost proportionate to its usefulness? Does it need all of its features? Can a lower cost method be used? Can a standard, instead of a special part do the job? Is it made on proper tooling, considering quantities used? Is anyone else buying it for less?*

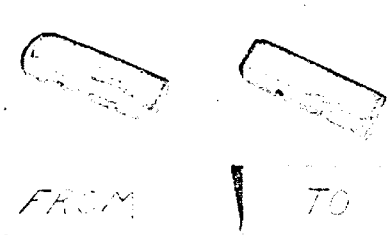
To help the value specialist answer these questions, a complete breakdown of costs is necessary to see where most of the money is being spent. It also spotlights processing or handling costs that are far out of proportion to the part's original cost or worth. Cost elements include shop costs (material, direct labor and indirect costs) and annual production or ordering quantities. Also obtained are process sheets and drawings of parts and assemblies, and other data necessary to "completely define the product."

After learning as much as he can about the product's design and methods of manufacture through discussion with respective engineers, the value specialist proceeds through several phases of Job Plan development which lead to the final recommendation. These are (1) speculative phase — generating every possible solution to the problem, exploring every material or method that comes to mind; (2) analytical phase — putting a "dollar value" on each idea; (3) program planning phase — break down the job into functional areas, consult with company specialists and outside suppliers specializing in these areas; (4) follow up, obtain suggestions and quotations; and (5) incorporate ideas on suggestion sheet and forward to those designated by management for proper action. Include before-and-after sketches, present and proposed costs and appropriate comments.

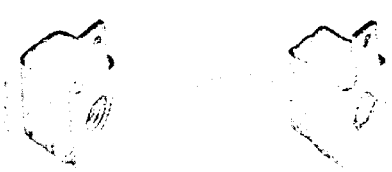
vendor help

In exploring material and fabrication alternatives, the value specialist carries part of his job into the purchasing sphere by maintaining contact with outside suppliers. General Electric has some 45,000 suppliers, more than twice as many as the average Big Three automo-

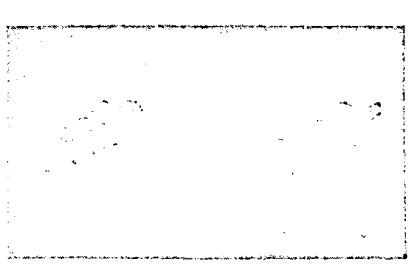
SPECIALIST-SUPPLIERS . . . suggest cost-cutting techniques



Investment casting (right) eliminated machining of sand casting, halved cost.

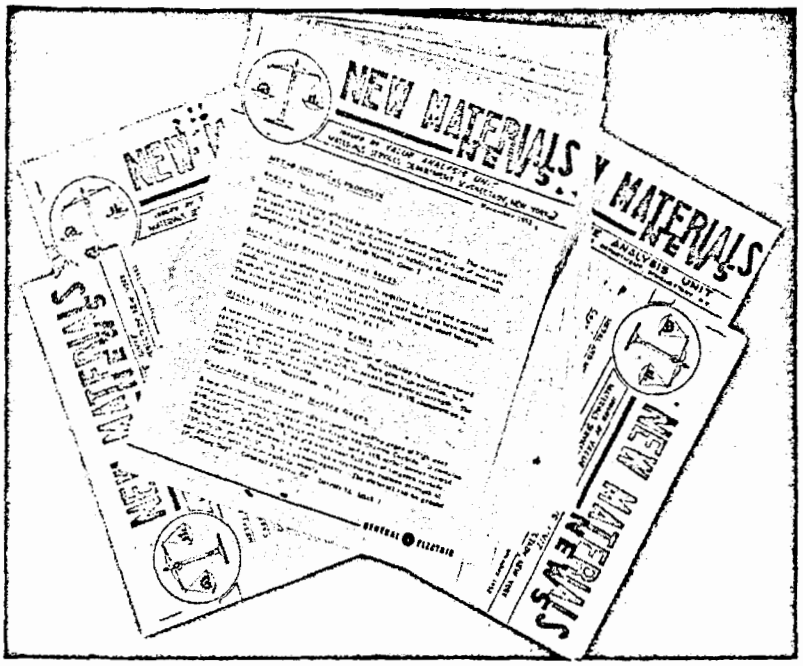


Terminal formed from tubing (right) instead of flat stock saved $8,000 a year.



Small zinc die casting (right) replaced machined shaft, cut cost from 7c to 1½c.

bile company. Through Value Analysis, the abilities of these suppliers are used to the fullest extent. Among them are a variety of specialty manufacturers adept at fabricating unusual shapes or working with "nonstandard" metals and materials, at comparatively low cost. This knowledge alone has been responsible for many of the company's biggest cost savings. As an example, one specialist supplier converted a small push button with attached stem from a screw-machined part to a cold heading from aluminum wire, with a resultant drop in unit cost from 19 cents to two cents.



Newsletters keep departments informed of supplier developments.

Supplier developments are also followed by the Value Analysis Service group at Schenectady and publicized in newsletters that keep value specialists and other employees up to date. Its current range of interest includes a wire formed, welded motor mount which costs one-third that of an assembly, fabricated of stamped parts and bolts, washers and screws; a production tool that automatically drives miniature screws; an "airless spraying" plant system, which incorporates a hydraulic atomization principle for improved spray control, eliminating much of the accessory equipment, such as spray booths and exhaust systems, as well as saving space; examples in prototype and short-run tooling, employing plastic and steel-rule dies; ultrasonic degreasing methods; "liquid lock" sealants, to eliminate mechanical fasteners; adhesive bonding applications; honeycomb sandwich panels, which add structural strength to control panels, for example, deaden noise and reduce weight;

"ROADBLOCKS"

Time-worn working habits and "accepted" ways of doing things often lead to negative thinking. Value specialists are taught to recognize these "roadblocks" that bar effective action. Some examples:

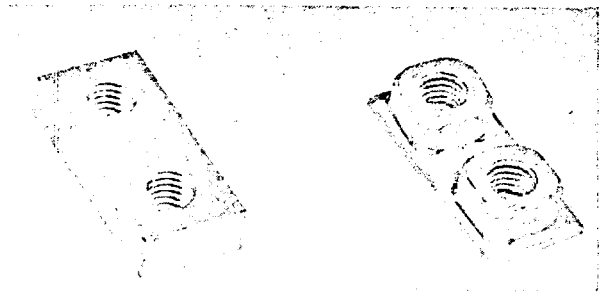
- It won't work
- We don't do it that way in our plant
- That's been tried before
- It's not practical
- It costs too much
- We can't take out any more costs
- We can't pay for the tools
- We can't help it — it's policy
- It's been done this way for 15 years —why change?
- We don't have enough time
- Our business is different
- We're making a profit
- We're not ready for it yet

PART SIMPLIFICATION . . . takes out 'unnecessary' costs

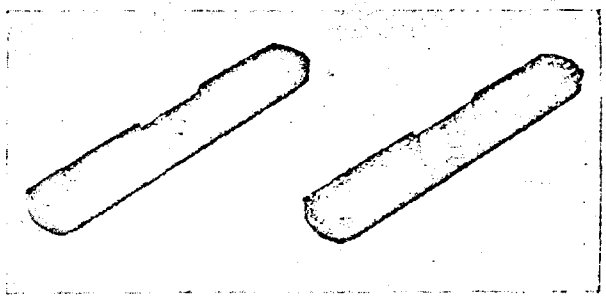
Staple on oil wick assembly replaced strap, cut cost from $7.50/m to 9c/m.

Upset roll-threaded stud at 2½c (rt.) replaced 15½c screw-machined part.

Snap-in rubber bumper eliminated screw, reduced part and assembly costs.



Stamping and two nuts resistance-welded on, replaced machined clamp, cut cost from 32c to 8c plus $350 tooling.



Since counterweight was hidden in product, flash grinding ends (right) was eliminated for yearly saving of $2,100.

and countless developments in machine tools, metals and materials.

One lucrative source of supply which is perhaps unique at General Electric is found within the company, itself. In the search for low-cost methods, the value specialist can call on any of the hundreds of specialists in the company's services and laboratory components for assistance and advanced information. These component services are engaged in pure and applied research, and development work in engineering, manufacturing and marketing activities. The high degree of specialization is illustrated by a look at the manufacturing services, in which are a manufacturing laboratory, manufacturing engineering service, materials service, manufacturing operations and quality control service. Breaking it down further, one component, materials service, for example, includes value analysis, production control, purchasing, and traffic. Personnel in each of these organizations devote full-time efforts to assist the company's operating departments.

What kind of recommendations are made by the value specialist, as a result of the functional approach and his working knowledge of product, production and purchasing practices?

specialist's recommendations

Eliminate the part. Change another part to perform its function; check function — possibly the need for it no longer exists. A coil spring for a major appliance required a special hook at one end. The product was redesigned, using the same spring. A value specialist later discovered that the special spring was no longer required. A standard, double-hooked spring was substituted. Unit cost was reduced from nine cents to three cents.

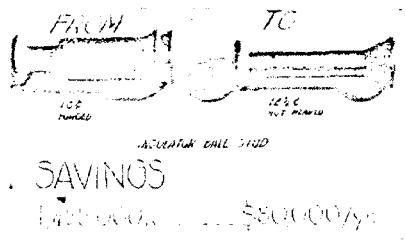
Simplify it. Challenge secondary operations, question unusual machined surfaces, eliminate fasteners. A snap-in rubber bumper was substituted for a screw-in type, eliminating the fastener and simplifying the operation. Cost reduction: From $24.46 per thousand to $9.61 per thousand. Flash grinding was eliminated from a small counterweight because it was hidden in the product. Cost was reduced from 63 cents per thousand to 57 cents per thousand.

Alter it to adapt to high speed methods. Design for cold heading or sintering instead of machining, design for die-cast threads, drill and tap small parts in strip before separating. A screw-machined spacer stud was changed to an upset and roll-threaded stud plus rolled spacer, at a unit cost reduction from 15½ cents to 2½ cents; a hinge was changed from a stamping to a roll-formed strip part at a unit cost reduction from 37 cents to 27 cents.

Alter — to use standard parts and materials. Design around standard fasteners, spacers and other components; parts which are special to G. E. may be "standard" to a vendor. When a potentiometer knob was changed from a special aluminum piece to a standard plastic-metal knob, unit cost dropped from $2.25 to 25 cents; copper tubing, formerly cut off in 1-¾-inch pieces from 20-ft lengths was obtained from a specialist-sup-

PROCESS CHANGE . . . same function, lower cost form

Converting screw machined part to stamping cut cost from $1.08 to 8c.



After working out problem with supplier, forging was replaced with hot heading.

Steel stamping (right) replaced die casting, cut cost from 60c to 21c each.

plier who cuts off tubing as he draws it, unit cost dropping from four cents to one cent.

material costs

Use lower cost materials and processes. Make sure specifications calling for special properties are necessary; check material costs — they vary with different shapes and alloys: dip paint rather than spray; use multi-slide machines to eliminate secondary operations; permanent mold rather than sand cast. Substituting perforated sheet metal for wire mesh, for a cabinet screen, reduced unit cost from 28 cents to 18 cents; reprocessing a small valve handle from a sand casting, which required machining, to a precision investment casting, with no machining needed, reduced unit cost from $1.10 to 60 cents.

Use a higher cost material if it simplifies design and lowers assembly cost. Small parts made of stainless may eliminate plating; brass instead of steel for very small screw machine parts may save in direct labor.

Compare fabrication methods: Die casting, extruding, permanent mold casting, roll and weld, roll form; check less well-known methods, such as investment casting, miniature casting, powder metallurgy, electroforming; check preformed materials, such as preplated and prepainted steel, embossed and expanded metals. Look at clad metals.

valve control

For G. E., Value Analysis has worked so well that, in addition to training selected engineers as professional value specialists, the company plans to train instructors to impart the method to technical personnel generally in all G. E. plants. Also planned are postgraduate courses and workshops. And, from the recently-instituted Value Research Laboratory has come a new concept, Value Control, a system of Value Analysis standards. This program is expected to increase the incorporation of value analysis experience into the premanufacturing stages of product development. ◘