

VALUE ANALYSIS - "A PLANT WIDE CREATIVE COST REDUCTION PROGRAM UNDER PURCHASING LEADERSHIP"

By L. D. Miles

General Electric Company

Gentlemen:

On the average, one fourth of manufacturing cost is unnecessary. The extra cost continues because of patterns and habits of thought, because of personal limitations, because of the difficulties in promptly disseminating ideas, and because today's thinking is based upon yesterday's knowledge.

HAS ACHIEVED SURPRISING RESULTS.

I will show you a program which is surprising us in its abilities to cope with these limitations. We call it - Value Analysis. It is a Plant Wide Creative Cost Reduction Program Under Purchasing Leadership.

In the act of evaluation, Value Analysis generates tangible suggestions which eliminate unnecessary costs.

Value Analysis is a creative study of every item of cost in every part or material considering other material, newer processes, abilities of specialized suppliers and possibilities for engineering re-evaluation. It focuses engineering, manufacturing and purchasing attention on one objective -- the same performance for lower cost. It is not a substitute for the engineering and manufacturing cost reduction work which is carried on by every company. It is a supplement. The results reported today are in addition to those developed by the good normal cost reduction activities of a company. It promotes no suggestions which would lower quality. Its job is to get the same, or better, performance for lower cost.

I will further illustrate: What Value Analysis is... Why it is plant-wide... Why it is under purchasing leadership.. How it is done... and What it accomplishes.

#### WHAT IS "VALUE" ANYHOW ?

Value is not inherent in any product. Value is established by comparison. The relationship of the function or service performed by any part or material to the lowest dependable cost for obtaining that function or service establishes value. The value of a pencil is the minimum cost of something to appear well, handle well and write well. The value of a broom cannot be higher than the minimum cost of other methods for keeping the floor clean. The value of a light bulb is the relationship of cost to light. Establishing value always means comparison. The value of Miss Hollywood, bathing in the California sunshine, is not established by a chemical analysis of her blood and bones, but by a direct comparison with the Misses to her right and to her left, comparing the abilities of each to please the eye, the imagination and the sponsor. Without an exceeding broad base of comparison, no true Value Analysis is possible.

As engineering accepts unchallengeable responsibility for dependable performance, so purchasing must accept responsibility and accountability for value. Purchasing must guarantee to management that each dollar of cost buys a real function. It must either improve the operation or the appearance of the product.

Purchasing must know that every dollar it spends plant-wide is "working." For example, we saw yards of asbestos paper rolled out along the floor under a paint conveyor catching paint drippings. "Why an expensive asbestos paper for so simple a function?" "To meet the fire safety code!" Probably yesterday's thinking again! - To evaluate asbestos for catching paint drippings starts a broad inquiry to makers of special papers. Sure enough a non-burning paper is obtainable. It costs less than half and does the same job.

Again, prompted by Value Analysis, the buyer, instead of continuing to buy steel bar, searched out its use in the factory. (Slide 1) A small shaft and a small hub were machined separately, then assembled, costing 60¢. This sent him on a broad search for today's methods and brought a supplier who would use the steel shaft as an insert and die cast the hub onto it, reducing cost from 60¢ to 22¢, providing the same performance for about 1/3 of the cost. Again, (Slide 2), the Value Analyst seeing small gaskets being made by a machinist in lots of a few dozen reached outside of the plant, finding gasket making specialist companies - reduced the cost from \$2.15 to \$.15 ea.

(Slide 3) A wrap-around cover was held in place by angles and bolts. The first creative effort brought forth (Slide 4) metal strapping for the same job, cutting the cost 44¢ each. Prompted by this new information, and by this new stimulus--creative thought by the engineers on the job changed it to (Slide 5) metal stitching with a further saving of 15¢, the resulting performance was identical, with a much nicer appearance and cost was reduced a total of 59¢, \$35,000 per year.

This broad base Purchasing Value Analysis Program must evaluate every part or material whether all, little, or none of the work on it is done within the plant.

#### VALUE PROGRAM IS A "NATURAL" FOR PURCHASING LEADERSHIP

To evaluate is to compare. To truly analyze value is to compare broadly and intensely. The door of the Purchasing Department is by the nature of the job open to all industry, to all ideas, to all methods, and to all products. It is open to all peoples who may have a process or material or part or service which will do the same job at lower cost, thereby setting the value line for other items. Purchasing's day to day job brings in this vast reservoir of evaluation and Value Improvement information. Expect purchasing, then, to carry its rightful share of opportunity by guaranteeing to the Company management, Value, in exchange for every dollar of the stream of dollars being daily handed out by its buyers.

Value study is function study -- no function-no value! Function either pleases people or does a job. Through purchasing's wide-open doors, the best vendors and the best specialists have straight-line opportunity to study the function purchased by each dollar of cost and to suggest better means for lower cost. Only this broad study is true Value Analysis.

For example, a buyer traditionally bought brass rod as requested. Spurred by the Purchasing Value Analysis philosophy, he sought out its use. He found (Slide 6) that it was being machined and milled into U-shaped terminals and screw caps for the purpose of holding a wire for electrical

connection. He immediately offered opportunity to specialist suppliers who make terminals from tubing showing them the function of the parts. They provided terminals fabricated from copper tubing which did an even better job and saved half of the cost - \$25,000 each year.

Or take the case of the buyer who was buying 20,000 screw machine (Slide 7) studs each year at 10¢ each. Not content to spend his Company's money without a true Value Analysis of each part, he put the project up to some good upsetting firms, again following the one and only channel for evaluation - broad comparison. Several told him it couldn't be made on an upsetter, but one said, "I think we can do it. Where the undercut is required, we will roll threads for part of the stroke and interfering threads for the rest of the stroke. We think that this will strip off all of the metal at the undercut." He did it. It worked, and the cost went from 10¢ to 2¢. Identical performance for one-fifth the cost!

Again, a manufacturing unit constantly used and specified a liquid cement hardener. It costs several dollars per gallon. The Value Analyst pressed a broad study of the material, made its function known to supplier specialists, and found that it was compounded of a few common simple ingredients. Its cost became 25¢ per gallon. the same performance for 1/10 of the cost!

NOW--HOW IS PURCHASING VALUE ANALYSIS DONE?

Good seed only grows and bears fruit when it falls in fertile soil and is properly nourished.

So the creative Cost Reduction Program we know as Value Analysis

consists of:

1. Buyers and specialists trained in Value Techniques and in human relations.
2. Carefully studied techniques for operating in the human relations climate and for constantly improving it.
3. The necessary operating information. This includes -- specific knowledge, specialist information, idea sheets, new products and processes information, etc.

#### START WITH VALUE ANALYSIS TRAINED BUYERS

As so well said in the (Slide 8) National Association of Purchasing Agents" new book, "Cutting Costs by Analyzing Values" -- "the buyer must determine the minimum cost at which the function of a desired material or service can be secured. To do this, he must first know the desired function and then search out, learn and study every alternate method for achieving it", that is - the cost, the advantages and the disadvantages of each method. The Purchasing man carrying the initiative and working with those who are informed and those who are responsible makes an intense study endeavoring to promote lower cost by weighing the function obtained for every expenditure on the scale of functional performance.

He studies similar products or services or materials. He studies the use to which each feature of these items is put and he determines whether functional performance can be purchased at lower cost by eliminating, substituting, simplifying or grouping. He studies the special functions which may be obtained from the special skill, knowledge and techniques of Specialized

Suppliers. Using this broad approach, he can more nearly assure value on each specific item.

#### NOW TRAIN VALUE ANALYSIS ENGINEER SPECIALISTS

The "Motive Power" is the Value Trained Specialist.

He is selected for:

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.

Value Analysis specialists must work with all of the facts. They require drawings, specifications, planning cards, and all costs. In discussion with the responsible engineer, they familiarize themselves in general with the basic operation and problems of the product. After a similar study of manufacturing operations, their intense program of seeking out, adapting, evaluating, and applying follows.

There is a full-time job. It must be intense and thorough. It requires serious thought, hard study and immediate action. It is not a "second" activity. They develop the ability to pick out, because of experience and training and contact with similar items, those items of cost which do not represent value.

They develop ability to immediately start actions in the direction that will promptly eliminate unnecessary costs. Value Analysis training programs and "on-the-job" Value Analysis work develop capable specialists.

#### SPECIALISTS USE VALUE ANALYSIS JOB PLAN

The Plan operates on each job through (Slide 9) six phases -

In the...

1. Information phase, The specialist secures all pertinent costs, facts and drawings. He learns the basic engineering and manufacturing facts.
2. In the (Slide 10) Speculation phase he creates and generates every possible solution, consults others, and systematically explores various processes, materials, and rearrangements of parts.
3. In the (Slide 11) Analytical phase, each idea is evaluated carefully. Those which have road blocks which still seem unsurmountable are sifted out and a program is set up to pursue each remaining idea vigorously.
4. In the (Slide 12) Program Planning Phase, the job is broken down into a series of functional areas. That is - a fastening job--a support job--or a surface protection job. Top specialists, both in the company and outside are consulted and given opportunity to suggest their ideas, their materials, and their products, to more economically do a better job in each small restricted but important area.
5. In the (Slide 13) program execution phase, the Value Analyst constantly follows up with the supplier specialist. He goes back for modifications until the obvious roadblocks are removed and definite tangible suggestions for securing the same performance at lower costs result.
6. Finally, (Slide 14) in the Concluding phase, the Possibility Sheet is prepared. Pertinent supporting studies and detailed information are provided to the responsible party and the Value Analysis Specialist moves on to the next job. A typical Possibility Sheet shows a few simple important and pertinent words and usually a simple "before" and "after" sketch. This suggestion sheet immediately becomes property of the management and is given whatever support and follow-up management feels it earns. (Slide 15) A suggestion sheet, for example, will show 100,000 gears - cost, \$58.00 per M. Miniature zinc die castings would cost \$8.00, nylon castings \$10.00 - "make it from pinion rods" - \$21.00, "make it from powdered bronze" \$19.00 or "make it from powdered iron" - \$21.00. The target savings of \$5,058 shows the effort the management is justified in spending to successfully adopt this suggestion.

"Good seed" consists of Value Analysis Trained Buyers and Specialists using good Value Analysis Techniques.

#### CORRECT HUMAN RELATIONS ARE THE KEYSTONE

The "Fertile Soil" is the human relations climate. Purchasing Value Analysts must look a little into engineering, a little into manufacturing methods, and a lot into the Purchasing area. In so doing, however, they always work through the engineers, the manufacturing methods men, and the buyers, never around them, thereby strengthening each man in his own field.

Good Value Analysis activity establishes the attitude of the Value Analyst and the human climate in which he works. In our complex competitive society, no one individual is "good enough" to do any job as well as it need be done. Be his field the design of mechanical equipment, the compounding of chemicals, the adaptation of the best processes or the searching out of the best vendors, he cannot possibly be well enough informed to do the perfect job. Each can always do better by searching for, reaching for and using help.

This attitude brought a managing engineer whose group had just completed a redesign of a very successful and widely used product to the Value Analysis Specialist saying "Our new design is more efficient, requires less space, and costs less than the present, but we know that ten years from now we will look at it and say - "How could we have been so blind? Why didn't we do some things differently? Look it over and tell us some of those things now!" Actually, after Value Analysis, one major component was further improved and its cost reduced 20% as the result.

A product engineer used small springs costing \$10,000/year. The product, the drawings and the story of function were provided to a spring company's chief engineer. "For that function, what do you say that we should use?" He made five suggestions varying in cost from \$2000 to \$10,000 per year. He supplied samples of each grade and a page of test data on each. The engineer glanced it over and said, "My Gosh! Why can't we have this kind of information for all of our decisions?"

In the top league of Human Relations Techniques is the Suggestion Sheet, already shown. These clear concise tangible suggestions containing the dollar sign are not followed up by the Analyst. He sets forth his case and walks away. None of the reminding and needling which has often created bad human relations in the past!

Purchasing Value Analysts make no savings claims. The suggestions which they develop materialize as savings in either the engineering, the manufacturing methods, or the purchasing areas. There must be no flag waving, no claims of big dollar totals to alienate others. The only report issued is the item by item suggestion sheet.

Proper human relations every day accomplish far more in the long pull.

Having taught Value Analysis techniques and having achieved objective constructive attitudes, it remains to provide specialists and buyers alike with the information which they need to meet their opportunities. This is done in several ways.

## SPECIFIC INFORMATION IS THE BRIDGE TO VALUE

1. Specialty companies who can provide specific parts or services or materials and who are good enough to actually excel in their own narrowly restricted fields are constantly searched out and this information is made available to all.
2. Specialists in the various laboratories, engineering departments, manufacturing departments and purchasing departments throughout the company who have achieved a position of leadership through unusual knowledge and experience in a specific area are brought into contact with Value Analysis people.
3. Purchasing agents and buyers throughout the company are taught to call upon other buyers and purchasing agents in the industry, for specific information concerning suppliers who excel in their respective fields.
4. Important among the information provided to assist the (Slide 16) specialist are "Idea Sheets" which list dozens and dozens of methods by which unnecessary costs have been removed from various products. For example, a typical page has three major headings, the first "Eliminate the part." Under it, are items like "change any other part to perform its function." The second, "Simplify It" -- containing items like "use roll pins to eliminate reaming" and the third, "Alter it so that a high speed method can be used" contains items like "drill and tap small parts in the strip before cutting apart."

5. The now well-known Value Analysis Ten Tests For Value are used. As each part or material or service is studied, these ten questions prompt and direct thought. (Slide 17)
  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?
6. Value News (Slide 18), a weekly single page flyer goes to engineering, manufacturing and purchasing management. A typical issue uses an eye-catching sketch of a magician viewing the two bleeding halves of a freshly sawed woman as the caption says, "They've sawed her in half again." Then follows an illustration of a military package in which our equipment was shipped. This package did cost \$26.00 but now we have found a way to do it for \$8.50--1/3 of the cost.
7. Another "Informer" is New Materials News. Each month (Slide 19) it is issued to engineering, manufacturing and purchasing people. It contains several pages of one paragraph extracts of what is said to be new

and useful to industrial products. The manufacturer's claims are stated and his name and address are given.

When buyers have learned "function" or "Value" buying, when Value Analysis specialists are trained in Value techniques, when the proper human relations climate has been created, and when the necessary specific information is provided to each, then the job of plant-wide creative cost reduction under purchasing leadership is well on its way.

#### WHAT ARE THE RESULTS?

Let's look at the parade.

#### Save Vendor Manufacturing Expenses

A perforated metal sheet (Slide 20) cost \$1.75 each. It has thousands of holes, yet special holes are made at the ends for mounting. Wouldn't this same job be accomplished by a continuously perforated sheet using the same holes for mounting? The ends are in mounting straps anyway. Sure enough! The same performance results, and the cost drops from \$1.75 to \$1.25 - saving \$35,000 per year.

#### Use Available Vendor Standards

Switches (Slide 21) cost \$86 each. Material was purchased and stampings were made in the factory. But specialists were found who make standard switch blades and insulation parts for this type of construction and the search disclosed that their parts could be provided for \$16. The same performance for 20% of the cost!

Use Vendors' Special Machines and Skills

Or, (Slide 22) let's consider a cover made as a machined casting costing \$1.07. A specialist supplier will provide it as a stamping from heavy steel accomplishing the same performance and cost drops from \$1.07 to 57¢, saving \$54,000 each year.

Use A Different Form of Raw Material

Or let's study (Slide 23) the valve body which machined from bar costs 17.8¢ but when made as a machined casting costs 5.8¢, saving 60%, \$40,000 each year.

Use Available Functional Products Instead of Specials

The specially made small metal knob (Slide 24) was supplanted by the sturdy plastic knob having metal inserts and pointer and cost dropped from \$2.25 each to 25¢. The same performance for 1/9 of the cost.

It Pays Off For High Volume

In the high volume field, millions of very precise stainless steel pins (Slide 25) were being purchased for \$3.00/M but after Value Analysis studies with the people who made them and with others, changes which did not affect quality were made in the vendor's plant so that much unnecessary expense was eliminated. The result was that the supplier requested a still profitable item at \$2.00 instead of \$3.00. Saving was near \$100,000 a year.

It Pays Off For Low Volume

Small quantities of 3" plugs (Slide 26) were being made for \$15.00 each. They can be purchased in plumbing shops for \$3.00.

It Pays Off For Production Materials

Small terminal boards (Slide 27) were traditionally made of small metallic terminals on plastic. Going for help to a maker of special machines, terminal boards of identical performance were made of metallic ribbon automatically assembled to similar plastic, for one-third of the cost.

It Pays Off For Expense Materials

A package cost \$.43. Brought to the attention of specialists in the company and outside, a different package which would better stand all of the bump and crush tests was developed. Instead of 43¢ it cost 20¢. Better performance for one-half of the cost! . . . Or a shipping carton (Slide 28) about a 6" cube complete with fillers which brought four small rugged metal clamps each the size of a pencil eraser. A mailing bag would have done the same job for one-fifth of the cost.

IS VALUE ANALYSIS ALWAYS TOO LATE?

Always when the opportunities of creative Purchasing Value Analysis are shown, there are those who say, "But you're too late--these vendor products, these available specialty materials, these special vendor skills, these engineering modifications should be used right from the start. After tools are bought and production started it is too late!"

Yes--that's true--but they cannot be used from the start! We'd like to have them in the original design, so in Purchasing Value Analysis we do everything possible to assist the design engineers. Of course, the better we try, the better we do, but the Value Analysis yield we have shown here is the yield after the finest we can do in engineering and in manufacturing

methods and the best job we can do in Purchasing. Precise engineering decisions cannot be made in short "design time" while the whole field is chance -- but after production, with experience, with the flow of physical samples, with time to test each detail separately, unnecessary costs can then be isolated and eliminated. Each functional group or part of the product can then be illuminated by the suggestions of specialists and its value improved by the new processes, materials, and skills of today and tomorrow.

The job of Purchasing Value Analysis is to get today's and tomorrow's materials, ideas, methods, and processes into use today. To accomplish this, Purchasing Value Analysis provides facts--facts with a broad base-- facts on which all manner of management decisions will be based. Sometimes the facts will support decisions to buy new machines, sometimes to eliminate non-working material, sometimes to use different suppliers, sometimes to make more and sometimes to buy more. But always, these facts support more function to the user for less cost--always Better Value.

IT GETS BETTER VALUE BY PROMOTING GOOD VENDOR RELATIONS.

Purchasing Value Analysis truly provides to the best vendors.. opportunity. Opportunity to sell their ideas and materials where they will be effective.

For example, we quote one:

"I feel that never before has a specialty vendor had so wonderful an opportunity. ...."

And another:

"I wish to thank you for the opportunity to participate. ...."

**FIFTH ANNUAL INDUSTRIAL  
ENGINEERING INSTITUTE**

Presented by  
**DIVISION OF MECHANICAL ENGINEERING  
 INSTITUTE OF INDUSTRIAL RELATIONS  
 SCHOOL OF BUSINESS ADMINISTRATION  
 UNIVERSITY EXTENSION**

In cooperation with  
**AMERICAN INSTITUTE OF INDUSTRIAL  
 ENGINEERS, INC.  
 SOCIETY FOR ADVANCEMENT OF MANAGEMENT  
 THE AMERICAN SOCIETY OF MECHANICAL  
 ENGINEERS**

**PURPOSE**

Present fundamentals and recent practical applications in the field of industrial engineering and management. Special attention will be devoted to the problems of small business. New techniques and areas of application for industrial engineering will be featured.

**GENERAL INFORMATION**

Time will be allowed after each lecture for a discussion period. In order that we may make suitable and comfortable arrangements for those who wish to attend, *please register by mail in advance.* Registration Fee: \$11.50 per person for Institute luncheon sessions only (excluding luncheons but including copy of the printed Proceedings of the Institute). Luncheon Sessions: *Institute participants only* may attend the Friday and Saturday luncheon sessions at International House Auditorium. Price for each luncheon, \$1.75, including tax. Luncheon reservations close Monday, January 26.

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**Fifth  
 Annual**

**INDUSTRIAL  
 ENGINEERING  
 INSTITUTE**

**Friday and Saturday  
 January 30 and 31  
 1953  
 University of California  
 Berkeley**

**REGISTRATION FORM**

**Department of Conferences and Special Activities  
 University Extension  
 University of California  
 Berkeley 4, California**

Enclosed is a check drawn payable to THE REGENTS OF THE UNIVERSITY OF CALIFORNIA in the amount of \$..... for ..... registration(s) at \$11.50 each, plus ..... luncheon reservation(s) at \$1.75 for each luncheon, for the FIFTH INDUSTRIAL ENGINEERING INSTITUTE, Friday, January 30, and Saturday, January 31, 1953.

*Please check the appropriate space if you desire luncheon reservation(s).* LUNCHEON RESERVATIONS CLOSE MONDAY, JANUARY 26, 1953.

Luncheon, \$1.75 per plate including tax

NAME(S) <i>(Please print)</i>	<i>(Check box)</i>	
	Jan. 30	Jan. 31
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# FIFTH ANNUAL INDUSTRIAL ENGINEERING INSTITUTE

Friday and Saturday  
January 30 and 31

D. G. MALCOLM, General Chairman  
BRUCE G. McCAULEY, Chairman, Berkeley Session

Room 155, Dwinelle Hall  
University of California, Berkeley

## Friday

8:30 a.m. Registration—155 Dwinelle Hall  
9:00 a.m. Welcome—M. P. O'BRIEN, *Dean of the College of Engineering, University of California, Berkeley*

9:15 a.m. Session Chairman — A. R. BAILEY, *President, San Francisco Chapter of SAM and Vice-President, Coast Counties Gas and Electric Company, San Francisco*

**The Industrial Engineering Function in Medium Sized Business** — STEWART M. LOWRY, *Coordinating Partner, Western Region, Booz-Allen and Hamilton, Management Consultants, San Francisco*

**Industrial Engineering, Planning and Control for Small Manufacturing Plants**—C. LLOYD THORPE, *General Personnel and Public Relations Manager, Guy F. Atkinson Company, South San Francisco, and Consulting Technical Editor, Western Industry*

12:00 m. Luncheon—International House  
Chairman—KEN MOELLER, *Manager, Alameda County Manufacturers Division, Oakland Chamber of Commerce*

**Job Enlargement—Imperative Problem of Industrial Engineering** — DWAYNE MORTON, *Director of Education, International Business Machines Corp., New York, N.Y.*

3:30 p.m. Session Chairman — R. L. JOHNSON, *Chairman, San Francisco Section of ASME; President, R. L. Johnson and Company, Redwood City*

**Automation in Smaller Industry** — FRANK K. SHALLENBERGER, *Associate Professor, Industrial Management, Graduate School of Business, Stanford University, Stanford*

**A Case Study in the Relationship between Design Engineering and Production Engineering**—JOSEPH P. HAHIR, *Manager of Production, Schlage Lock Company, San Francisco*

## PROGRAM

### Friday

8:00 p.m. **Results of Industrial Engineering Research**—Room 104 Engineering Building  
Session Chairman—H. A. SCHADE, *Director, Institute of Engineering Research, University of California, Berkeley*

**A Film Showing Results of a Visual Inspection Project** — E. P. DeGARMO, *Assistant Dean, College of Engineering, University of California, Berkeley*

**Accuracy in Reading Instrument Dials** — BRUCE G. McCAULEY, *Assistant Professor, Mechanical Engineering, University of California, Berkeley*

**A Study of the Additive Properties of Motion Element Times**—DONALD E. STILLING, *Job Study Engineer, Proctor and Gamble Manufacturing Company, Long Beach*

**A Statistical Analysis of Visual Inspection Methods** — KEITH C. MCKINNEY, *Staff Aid, Southern California Gas Company, Los Angeles*

9:00 p.m. Guided Tour of Industrial Engineering and Production Laboratories

### ACTIVITIES CHAIRMEN

*General Chairman*  
D. G. MALCOLM, *Vice-President, Engineering and Production, Bacon Vulcanizer Manufacturing Company, Oakland*

*Chairman—Berkeley Session*  
B. G. McCAULEY, *Assistant Professor of Mechanical Engineering, University of California, Berkeley*

*Luncheon and Speaker Reception*  
R. A. GALUZEWSKI, *Assistant Professor of Mechanical Engineering, University of California, Berkeley*

*Student-Faculty Relations*  
E. C. KEACHIE, *Associate Professor of Mechanical Engineering, University of California, Berkeley*

*Inspection Trip—Displays*  
J. T. LAPSLEY, *Assistant Professor of Mechanical Engineering, University of California, Berkeley*

*Audio-Visual Aids*  
R. W. PINGER, *Lecturer—Mechanical Engineering, University of California, Berkeley*

### Saturday

8:30 a.m. Registration (for those not attending Friday)—155 Dwinelle Hall

9:00 a.m. Session Chairman — JOHN R. BURTON, *President, San Francisco-Oakland Chapter of AIIE; Senior Industrial Engineer, Columbia-Geneva Division, U. S. Steel, San Francisco*

**Job Evaluation**—M. R. LOHMANN, *Professor of Industrial Engineering and Vice Dean, Oklahoma A & M College, Stillwater, Oklahoma*

**Incentives for Indirect Labor**—GEORGE H. GUSTAT, *Superintendent of Industrial Engineering, Eastman Kodak Company, Rochester, New York*

12:00 m. Luncheon—International House  
Chairman — ROBERT GORDON SPROUL, *President, University of California*

**The Future of Industrial Engineering**—LILLIAN M. GILBRETH, *President, Gilbreth, Inc., Montclair, New Jersey*

2:30 p.m. Session Chairman — EWALD T. GREYHER, *Dean, School of Business Administration, and Director, Institute of Industrial Relations, University of California, Berkeley*

**The Application of Operations Research to Industry**—ELLIS A. JOHNSON, *Director, Operations Research Office, The Johns Hopkins University, Chevy Chase, Maryland*

**Cost Reduction in the Purchasing Function**—L. D. MILES, *Purchasing Department, General Electric Company, Schenectady, New York*

*Recorder*  
F. T. MALM, *Assistant Professor of Business Administration, University of California, Berkeley*

*Photographer*  
J. S. CAMPBELL, *Assistant Professor of Mechanical Engineering, University of California, Berkeley*

This Institute is part of a state-wide program. A similar meeting is scheduled in Los Angeles on February 2-3, 1953.

# INDUSTRIAL ENGINEERING *institute*

## ORGANIZED BY

College of Engineering, the School of Business Administration and The Institute of Industrial Relations, University of California, Los Angeles,

## OPERATION WITH

American Institute of Industrial Engineers  
American Society of Mechanical Engineers  
Society for Advancement of Management  
Society of Applied Industrial Engineers  
American Society for Quality Control

Monday and Tuesday, February 2 and 3, 1953  
147, Business Administration and Economics Building  
University of California, Los Angeles

## GENERAL INFORMATION

Registration will be allowed after each lecture for a discussion period. It is preferred that we may make suitable and comfortable arrangements for those who are to attend, please register by mail in advance. If reservations for luncheons are desired, the registration card should be received not later than Friday, January 30, 1953.

## REGISTRATION FEE:

One dollar per person including registration fee and printed proceedings (no luncheons). Luncheon reservations (\$1.75 each) close January 7, January 30, 1953.

## PARKING:

Free parking is available on the Campus in parking lots adjacent to the conference room.

*(Tear off and mail)*

Department of Conferences and Special Activities  
University Extension  
University of California  
Los Angeles 24, California

Please send check or money order (made payable to the Regents of the University of California) for \$\_\_\_\_\_ to cover enrollments as follows for the FIFTH INDUSTRIAL ENGINEERING INSTITUTE, Monday, February 2 and Tuesday, February 3, 1953.

\_\_\_\_\_ registration(s), (\$11.50 each) including proceedings \$\_\_\_\_\_

\_\_\_\_\_ luncheon(s), Monday, February 2 (\$1.75 each) \$\_\_\_\_\_

\_\_\_\_\_ luncheon(s), Tuesday, February 3 (\$1.75 each) \$\_\_\_\_\_

\_\_\_\_\_ provide the above information, on name, position, etc., on a separate card for each additional registrant.)

The institute is scheduled for January 30 and 31 to be held on the University Campus of the University of California. Those desiring additional information on the Berkeley Institute may write to the Department of Conferences and Special Activities, University of California, Los Angeles 24, or Berkeley 4, California.

# LIFELONG LEARNING

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*fifth*

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L I F E L O N G  
L E A R N I N G

**Chairman:** D. G. Malcolm  
**Los Angeles session:** Ralph M. Barnes

## DAY: FEBRUARY 2

**8:00 a.m.** Registration—147 Business Administration and Economics Building

**9:00 a.m.** *Welcome:* L. M. K. Boelter, Dean of the College of Engineering, University of California, Los Angeles

**9:15 a.m.** *Session Chairman:* Ralph M. Barnes, Professor of Engineering and Production Management, University of California, Los Angeles

*Job Evaluation:* M. R. Lohmann, Professor of Industrial Engineering and Vice Dean, Oklahoma A. & M. College, Stillwater, Oklahoma

*Incentives for Indirect Labor:* George H. Gustat, Superintendent of Industrial Engineering Division, Eastman Kodak Company, Kodak Park, Rochester, New York

**12:00 m.** Luncheon—Kerckhoff Hall

*Chairman:* D. G. Malcolm, Vice-President, Engineering and Production, Bacon Vulcanizer Manufacturing Company, Oakland, California

*Job Enlargement—Imperative Problem of Industrial Engineering:* Dwayne Orton, Director of Education, International Business Machines Corporation, New York

**2:00 p.m.** *Session Chairman:* Charles A. Bogenrief, President, Los Angeles Chapter of the Society for Advancement of Management

*Time Reduction Curves—Introduction:* H. W. Thue, Works Manager, Douglas Aircraft Company, Inc., Santa Monica, California

*Mathematical Theory of Time Reduction Curves:* B. I. Maynard, Ass't. to Director of Industrial Engineering, Douglas Aircraft Company, Inc., Santa Monica

*Production Applications of Time Reduction Curves:* N. H. Shappell, Manufacturing Control Manager, Douglas Aircraft Company, Inc., Santa Monica

**4:30 to 5:30 p.m.** *Inspection of Engineering Laboratories:* L. L. Grandi, Associate Professor of Engineering, University of California, Los Angeles, Chairman of Inspection Trip

- (a) Production Plant—Mechanics Building
- (b) Prosthetics and Human Heat Tolerance Laboratory, Room 3138, Engineering Building
- (c) Computers Laboratories—Temporary Engineering Building 2H

## MONDAY EVENING: FEBRUARY 2— ROYCE HALL

*Note:* This session is open to everyone and no fee will be charged.

**8:00 p.m.** *Session Chairman:* Edward P. Coleman, Chief Quality Engineer, Hughes Aircraft Company, Culver City, and Lecturer in Engineering, College of Engineering, University of California, Los Angeles

*Discovery Sampling—A New Approach in Inspection:* James R. Crawford, Manager, Inspection Technical Services, Lockheed Aircraft Corporation, Burbank, California, and Chairman, American Society for Quality Control, Los Angeles

*Building Reliability into Complex Equipment Through the Application of Quality Control Procedures:* Major General Leslie E. Simon,\* Assistant Chief of Ordnance and Chief of Research and Development, United States Army, Washington, D. C.

*Prepared Discussion:* B. F. Durall, Quality Control Engineer, and Harry G. Romig, Quality Manager, of the Hughes Aircraft Company, Culver City, will present brief discussions of the papers by Mr. Crawford and General Simon.

*\*If exigencies of the last moment prevent General Simon's appearance, Charles A. Bicking, Chief of the Design of Experiment Unit in General Simon's office, will present the paper.*

## TUESDAY: FEBRUARY 3

**8:00 a.m.** Registration (for those not attending Monday)

**8:30 to 9:00 a.m.** *Inspection of Production Management Laboratories:* John G. Carlson, Lecturer in Production Management, University of California, Los Angeles, Chairman of Inspection Trip

**9:00 a.m.** *Session Chairman:* C. M. Sandland, Chairman, Southern California Section, The American Society of Mechanical Engineers

*Cost Reduction in the Purchasing Function:* L. D. Miles, Purchasing Department, General Electric Company, Schenectady, New York.

*The Applications of Operations Research to Industry:* Ellis A. Johnson, Director, Operations Research Office, The Johns Hopkins University, Chevy Chase, Maryland

**12:00 m.** Luncheon—Kerckhoff Hall

*Chairman:* Neil H. Jacoby, Dean of the School of Business Administration, University of California, Los Angeles

*The Future of Industrial Engineering:* Lillian M. Gilbreth, President, Gilbreth Inc., Montclair, New Jersey

**2:00 to 2:30 p.m.** *Inspection of Production Management Laboratories:* John G. Carlson, Chairman of Inspection Trip

## SESSION A

**2:30 p.m.** 147 Business Administration and Economics Building

*Session Chairman:* Frank W. Cross, President, Society of Applied Industrial Engineering

*The Industrial Engineering Function in Medium-Sized Business:* Stewart M. Lowry, Western Region, Coordinating Partner, Booz, Allen and Hamilton, San Francisco, California

*Industrial Engineering, Planning and Control for Small Manufacturing Plants:* C. Lloyd Thorpe, General Personnel and Public Relations Manager, Guy Atkinson Company, South San Francisco, and Consulting Technical Editor, *Western Industry*

## SESSION B

**2:30 p.m.** 121 Business Administration and Economics Building

*Session Chairman:* Joseph F. Manildi, Associate Professor of Engineering, University of California, Los Angeles

Report on Results of Research at University of California, Los Angeles

*An Analytical and Graphical Solution for Some Problems of Line Balance:* Elwood S. Buffa, Lecturer in Production Management, University of California, Los Angeles

*Research Developments of Quantitative Methods in Production:* M. E. Salveson, Assistant Professor of Production Management, University of California, Los Angeles

*Analysis of a Cargo-Handling System:* R. R. O'Neill, Lecturer in Engineering, and Joseph D. Carrabino, Lecturer in Production Management, University of California, Los Angeles

*The Evaluation of an Electrical Artificial Arm Using Motion and Time Study Techniques:* M. S. Gottlieb, Junior Psychologist, University of California, Los Angeles

## ACTIVITIES CHAIRMEN

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Student and Faculty Relations Chairman—R. R. O'Neill  
Inspection Trip and Displays Chairmen—L. L. Grandi and John C. Carlson

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