

PROMOTION OF VALUE ENGINEERING AT
JAPAN STEEL WORKS, HIROSHIMA PLANT

THE JAPAN STEEL WORKS, LTD.
HIROSHIMA PLANT

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PROMOTION OF VALUE ENGINEERING AT

JAPAN STEEL WORKS, HIROSHIMA PLANT

Introduction

Line of products at the Hiroshima Plant of the Japan Steel Works covers a wide range, consisting of plastics materials manufacturing equipment, various kinds of plastics processing machinery (particularly, medium and large-sized injection molding machines), various kinds of machinery for the chemical equipment industry, paper machines, etc. The plant comes under the category of so-called manufacture of variegated products in small quantities. Therefore, unlike the mass-production system, it is generally believed difficult to expect much result of Value Engineering.

However, with a firm conviction that even in a plant where variegated products in small quantities are manufactured, considerable cost reduction of the essential production items could be realized by accumulation of novel results of cost reduction, if "Value Engineering for pursuance of functions" is properly adopted so as to include even parts, the General Manager of the Hiroshima Plant on his own initiative inducted Value Engineering into the plant in 1967, establishing the VE basic promotion plan. From the standpoint that it is most efficacious to realize cost reduction by applying VE at the designing level of the products, the target was set to train all the designing personnel as Value Engineers and to bring about a revolution in cost consciousness among the designers.

At the Hiroshima Plant VE promotion was centered on the Designing Department. VE workshop seminars were held nine times and on-the-job training courses were conducted nine times. As many as 134 task force project teams were organized, which showed great activities. We have now 306 Value Engineers. During a period of three years the total amount of cost reduction realized on the essential production items has reached \$200,000, in addition to which many intangible merits have been gained.

Regarding the above status of VE promotion, a paper entitled "Value Engineering Promotion and its Motivation at Japan Steel Works, Hiroshima Plant" was presented by Mr. Takehiko Tanaka at the 12th National SAVE Conference held in Miami Beach, Florida, in June 1972, which appears in detail in the SAVE Conference Proceedings, 1972.

The present paper purports to introduce some salient points of our VE promotion since the last report was made at the 1972 SAVE Conference, which are as follows:

- o The total amount of the annual cost reduction by adopting VE proposals
- o The status of countermeasures taken for, and implementation of, development and establishment of VE techniques
- o A partial report on the all-out cost reduction plan by integration of various management techniques such as Zero Defects, Quality Control, Industrial Engineering, Value Engineering, etc. and the engineering techniques of workers personally gained by long experience
- o Other items

I. The total amount of the annual cost reduction by adopting VE proposals

During one year, 1972, the total amount of cost reduction realized by adopting VE proposals at the designing level was approximately \$200,000. This amount is equal to the total amount of the past three years. This indicates steady improvement in results of VE promotion.

A breakdown of the above reveals that various plastics processing machinery and deck cranes for ships comprise approximately 80 per cent. By applying properly VE techniques even to the extent of sub-assemblies and parts, phenomenal success was achieved, particularly in the case of injection molding machines, resulting in the manufacture and sale of a new model machine which enabled reduction of cost considerably. In the case of the deck crane, the margin of profit had been extremely small, and it became an issue whether to continue or discontinue its production. However, thanks to the great efforts exerted on VE by all concerned, success has been attained to secure sufficient profit as if a new competitive product came into existence.

II. The status of countermeasures taken for, and implementation of, development and establishment of VE techniques

1. Inception of educational program for improvement in operation of the first line supervisors on the production line

(Ref. Items Nos. 7 and 8, Development and Establishment of VE techniques in Future, SAVE Conference Proceedings, 1972)

Along with the VE education in the Designing Department, it has been planned to hold an educational program for improvement in operation of the first line supervisors on the production line.

1-1 Objective

The aim is to establish a system whereby the effect of integrated cost reduction will be fully displayed by the VE effort on the part of the Designing Department and the effort to improve operation methods on the part of the Production Department, the relation of which can be likened to the two wheels of a cart.

1-2 Number of personnel to be educated - 250 persons

1-3 Length of program - From Sept., 1972 to Sept., 1973

1-4 Method of education

Number of hours - 70 hours (all day long)

Problems existing in the Production Department will be taken up and improvement methods will be pursued by task force teams by applying Industrial Engineering techniques.

Number of participants in one seminar - 7 persons x 6 teams
= 42 persons

2. Commemorative Lecture Meeting by Mr. Lawrence D. Miles

On the occasion of the visit to Japan in autumn, 1972, of Mr. Lawrence D. Miles, the founder of Value Engineering, an invitation was extended to Mr. Miles to visit our Hiroshima Plant and a commemorative lecture meeting was held on Oct. 31st.

The meeting was attended by the General Manager and management staff concerned, all Value Engineers and Management staff of sub-contractors. Renewed determination was made to revert once again to the original viewpoint of VE, to follow up the basic steps and techniques and to push forward the countermeasures and implementation of the development and establishment of VE.

3. Implementation of re-education plan for Value Engineers

(Ref. Item No. 14, Development and Establishment of VE Techniques in Future, SAVE Conference Proceedings, 1972)

3-1 Objective

- o Improvement in quality of Value Engineers
- o Cultivation of capacity and spirit of cooperation so that Value Engineers can attend to their daily task inreservedly and take active part in VE

- o Deeper understanding regarding application of VE techniques at the development stage of new products
- o Establishment of systems whereby profits can be increased in time of favorable condition, profits can be secured even in time of depression and profits can be secured even from the initial unit of new products, for which Value Engineers have to act as driving force.

3-2 Number of personnel to be re-educated - 300 persons

3-3 Length of program - From March to June, 1973

3-4 Number of hours and personnel per group - 3 hours x 3 days
 = 9 hours
 7 persons x 4 teams
 = 28 persons

3-5 Method of education

First day o Follow-up of basic steps of VE techniques

Second day o Training to draw up definition of functions and function diagrams

o Training to develop originality

o Training to develop creative thinking

Third day o Training of application of VE techniques at the development stage of new products

o Permeation of the countermeasures for the development and establishment of VE

o Holding tests as finalization of the re-education program

4. Resumption of VE workshop seminars

(Ref. Item 1, Development and Establishment of VE Techniques in Future, SAVE Conference Proceedings, 1972)

The following is the schedule to hold the 10th workshop seminars for the newly employed engineers:

4-1 Personnel to attend the seminars - Engineers assigned to the Designing, Planning, Purchasing and Production Departments

4-2 Number of teams and personnel - 7 persons x 4 teams
 = 28 persons

4-3 Length of program - From May to June, 1973
 22 days (all day long)

III. Presentation of VE case studies

In October, 1972, on the occasion of the 5th National SJVE Conference, two case studies were presented, which attracted the attention of those present.

"Cost Reduction of Large-sized, Ordermade Products"

Machine Designing Department

Kenji Hirata

"VE Techniques of Purchasing Items"

Supply Section

Hideo Wakashima

IV. Positive cooperation in making slides for VE educational materials

We rendered positive cooperation to the Japan Productivity Center when it made slides for VE educational program with the cooperation of the Society of Japan Value Engineers.

The slides were in three series as follows:

No.1 A first step in VE

No.2 VE techniques

No.3 From the induction till the establishment of VE

No. 3 was a full depiction of the induction and promotion of VE by the General Manager of the Hiroshima Plant of Japan Steel Works, recognizing the necessity thereof and completing the VE basic promotion plan. It then described in detail the circumstances leading to the afore-mentioned successful results obtained in cost reduction and the present status of VE at the plant.

Conclusion

The foregoing is the present status and the future plans of our VE promotion program since the last report made at the SAVF Conference in 1972. The actual cost reduction of \$200,000 realized during the past year by adoption of VE proposals of the Designing Department may not necessarily be large, but it far exceeds the average annual amount realized during the past three years. It can therefore be stated that the VE investment is gradually but increasingly paying dividends. Even though VE had been inducted, if vigorous promotion had not been made, it would not have been possible to expect revolution in cost consciousness among the employees centered on the Designing Department, much less to realize the cost reduction and the increase of profits obtained today.

At the Hiroshima Plant, with the General Manager forming the nucleus, management personnel of all levels and all Value Engineers are making united efforts in steadily putting into practice various countermeasures for the development and establishment of VE techniques, the above-mentioned actual achievements of VE serving as a stepping stone. As the next step, it is our plan to tackle the problem positively to formulate and implement a program of consolidated cost reduction of the plant by integration of the various management techniques and the engineering techniques of workers gained personally by long experience.

Appendixes

1. A paper presented at the SAVE Conference, 1972
"Value Engineering Promotion and its Motivation at Japan Steel Works, Hiroshima Plant" - 8 pages
2. Case studies presented at the 5th National SJVE Conference, 1972
"Cost Reduction of Large-sized, Ordermade Products" - 5 pages
"VE Techniques of Purchasing Items" - 7 pages

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VALUE ENGINEERING PROMOTION AND ITS MOTIVATION
AT
JAPAN STEEL WORKS, HIROSHIMA PLANT

Takehiko Tanaka
Value Engineering Specialist Chief
Japan Steel Works, Hiroshima Plant

INTRODUCTION

The Japan Steel Works, Hiroshima Plant, is one of the widely known plants in Japan where the top of the plant is promoting Value Engineering, having obtained good results in considerable amount of cost reduction and a remarkable revolution in consciousness of cost and value brought about by the Value Engineers.

My paper purports to explain in detail by citing examples of achievements attained with reference to VE promotion and its motivation such as decision making and leadership of the top; administration of VE by the manager and section chiefs; complete cooperation extended to the designing department by the managers and section chiefs of the various departments such as the planning, purchasing and production; effective application of VE promotion manuals; advice rendered the tops and the designing department by the VE staff whose task more often than not is considered a thankless one.

ESTABLISHMENT OF BASIC YEARLY PLAN

The induction of VE was made by the general manager of the plant in 1967 and the basic yearly plan was formulated. Based on the thinking that it is most efficacious to realize cost reduction by applying VE at the designing level, the plan was made to train all designing personnel for four (4) years.

During the four years, nine (9) VE workshop seminars and nine (9) on-the-job training courses were established at the plant, during which time 134 VE task force project teams were organized, displaying considerable activities.

There are 306 Value Engineers. In terms of proportion, the number of Value Engineers is twelve (12) per cent of the total number of the employees.

THE WORKSHOP SEMINAR COURSE

An outline of the workshop seminar course is as follows:

• Participants: Engineers of the designing, planning, purchasing and production departments

• Number of VE teams: Four (4)

• Length of seminars: 22 days (all day long)

ON-THE-JOB TRAINING COURSE

An outline of on-the-job-training course is as follows:

◎ A Value Engineer of the designing department who has complete information concerning the VE project team is appointed a leader.

○ Value Engineer of the designing department

□ Designers to be trained

□ Designers to be trained

△ Value Engineers of the planning, purchasing and production departments

LENGTH OF VE ACTIVITY

• Two (2) weeks (all day long) on one (1) theme

• The two (2) designer trainees are trained for four (4) weeks on 2 themes and they are awarded 2nd degree Value Engineer Certificate and VE badge by the plant when they pass the VE qualification tests.

Why we organized the VE team with members of the designing, planning, purchasing, production departments, etc.? The reasons are as follows:

We can expect outstanding VE proposals originating from coordination of designers, industrial engineers and quality control engineers. In other words, we expect numerous merits made through integration of various management techniques.

NUMBER OF VALUE ENGINEERS AND VE TEAMS

During the past four years, nine (9) workshop seminars and nine (9) on-the-job training courses were established at the plant.

• VE task force project teams which were organized: 134

• Number of Value Engineers who were trained: 306

SPECIAL FEATURES OF VE PROMOTION

It is significant that the promoter of VE is the top of the plant, but the distinctive feature is that the managers and section chiefs of the designing

department administer VE by applying VE promotion manuals in order to realize cost reduction of products at the designing level.

VE PROMOTION MANUALS

When we first started our training program, the manuals were quite simplified ones. Based on one year's experience, we drafted our manuals incorporating more detailed procedures. The present VE promotion manuals consist of the following three (3) manuals:

For section chief of the designing department

For VE team leader and members

For VE staff

FEATURES OF THE MANUAL FOR SECTION CHIEF OF THE DESIGNING DEPARTMENT

VE promotion is one of the most important tasks of the section chief, because he can control the cost of products at the designing level, and it is most efficacious to realize cost reduction by adopting VE proposals.

This manual prescribes the following actions to be taken:

1. Planning level

1-1 Selection of VE themes

1-2 Indication of cost reduction goal

1-3 Organization of VE team

1-4 Determination of the length of VE activity

2. Doing (execution) level

2-1 Declaration of VE team activity

The section chief has to explain the plan of the task force team and explain that he is expecting good designs by the VE team members. Thereby, VE team members will be well motivated, thus arousing a feeling to tackle the job.

2-2 Control of VE team activity

Frequently he has to go the VE team room and coordinate the plan, to advise them, and to give much useful information.

2-3 Chairmanship of the VE team meeting

He must see to it that the team members could explain the VE proposals at the VE team meeting in a congenial atmosphere with good communication between line members of the designing department and VE team members. If questions are raised by the line members of the designing department, the section chief has to support the VE team from the

standpoint of the team members and also to give guidance to VE team members to accept the opinions or proposals of the line. He has to give as many opportunities as possible to speak to the two members who are trained by on-the-job training.

In short, VE team meeting should be considered a good opportunity for the section chief, the line of the designing department and VE team members to have good communication.

2-4 Determination of adoption or rejection of VE proposals

He has to make definite decision as to whether the VE proposals will be adopted or rejected at the meeting, because if clearcut decision is not made, the participants might not participate with enthusiasm in the next team.

2-5 Safeguard of ideas

He has to see to it that application for patent be made on good ideas emanating from the VE team activity in the joint names of the VE team members.

3. Seeing (control) level

3-1 Even after the team ceases activity, he has to undertake the job to see that good proposals are adopted by the designing line, or give guidance to the designing line to decide whether or not to adopt the proposals as they are or to manufacture for trial or to determine its adoption based on the results of tests.

3-2 Daily work of the section chief

He has to manage his daily work of VE at the seeing (control) level.

- To check whether the proposal is incorporated into the drawing or not in a prescribed form (See Fig. 1)

- To report the forecast amount of cost reduction to the manager of the designing department

- To check the actual results of cost reduction amount

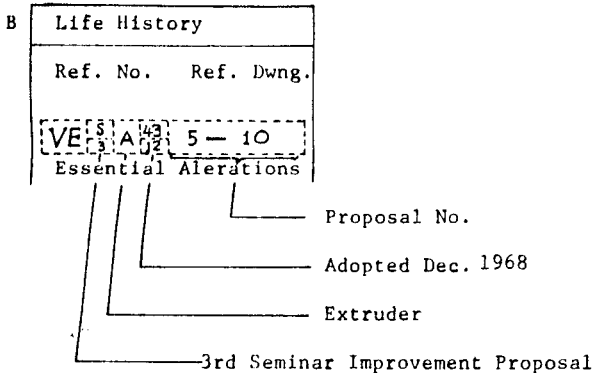
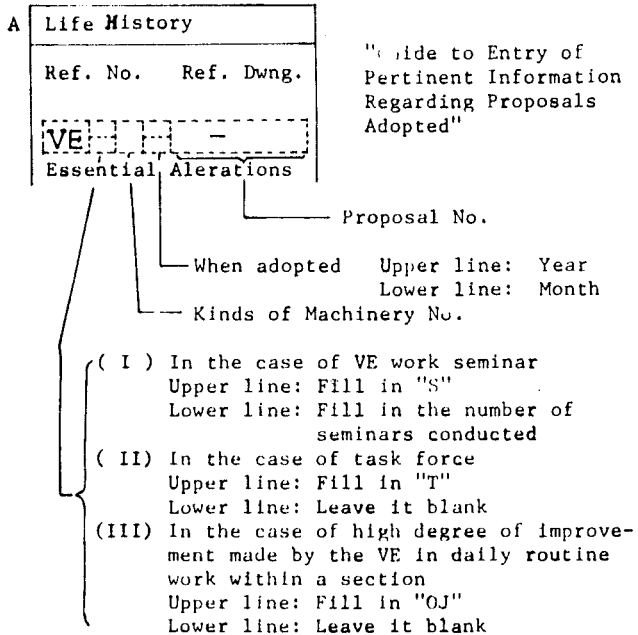
- To inform the actual cost reduction amount to the designers and VE team members

To inform the amount of cost reduction and to share the joy thereof results in the motivation of VE promotion and also good communication.

It is very important for the designing section chief when he works together with his subordinates and members of the VE team, always to bear in mind the various psycho-

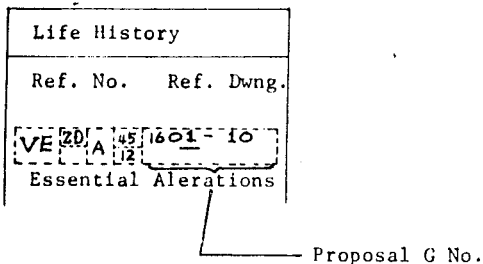
logical and mental phases involved. The reason for this is that the psychological and mental attitudes of the VE team towards the VE proposals generally conflict with those of the members of the designing line.

Fig. 1



Work Method Improvement
ZD Improvement

Fill in the blank
with Proposal No.



C Even in the case of not being adopted or not used as reference, fill in the space of Proposal No. with "Nil".

FEATURES OF THE MANUAL FOR VE TEAM LEADER AND MEMBERS

This manual consolidates the method of preparation of VE team activity, procedure of VE meeting and vigorous activities after the VE team activity is over such as response to the challenge of section chief; selling of VE proposals; motivation of team members.

Moreover, the feature of this manual and that of the designing section chief is that it complements each other. In other words, the two are incorporated into one and the two are inter-related.

1. When a cost reduction goal is indicated to a team leader by the section chief, the team leader fully communicates with the section chief and the team members who have been appointed. He has to make all preparations necessary for the team activities.

2. Matters required on the first day of inception of team activity

He has to call the team members together quickly and to conduct the section chief to the team office and request him to explain the cost reduction goal, the purpose of team design, the length of activity of the team. It is very important and efficacious to create congenial atmosphere among team members.

3. Teamwork

The team leader has to bear in mind that good proposals are produced by good teamwork.

4. Cooperation with the line of the designing department

The team leader has to try to obtain useful information from the line of the designing department and when proposals are submitted by the members, he has to make efforts to obtain proposals and opinions from the line. If the proposals are so-called joint proposals, which include those of the line of the designing department, they facilitate acceptability in the future.

5. Explanation at the VE meeting

If a proposal on a given theme is to be adopted, the contents of the VE proposal report will have to be such that remarkable cost reduction can be realized and increase in value can be expected.

Moreover, it is desirable that this proposal includes that of the line of the designing department, having room for further improvement by the line engineers. It requires sufficient supporting data. Proposals jointly submitted by the line of the designing de-

partment and the team members are more readily acceptable than those submitted separately.

6. Activity of seeing (control) level (after the team activity is over)

After the team activity is over, they will return to their post and job, but they have to maintain close contact and gather more supporting data.

Some engineers who return to the designing section have to make endeavors to have the line engineers accept the team's joint proposals and they have also to apply for patent on their good ideas in the joint names of all the members

The team leader has to check the actual cost reduction amount of the products involving the proposals adopted and to grasp the circumstances of improvements made in value. It is important that he informs the above results to the team members so as to enjoy together the fruits of achievements.

When the leader or members wearing VE badge are approached and challenged with questions by the section chief regarding cost or function of a product, they will have to respond with confidence.

FEATURES OF THE MANUAL FOR VE STAFF

VE staff has to render the top and the designing department advice and services, reconciling itself to the lot that its task more often than not is considered a thankless one, primarily for the sake of promotion of VE programs.

- His tasks are as follows:
- Coordination between designing department and other departments such as the planning, purchasing and production
- Advice and services to the manager or section chiefs of the designing department
- Planning of VE training programs (workshop seminars and on-the-job training courses)
- Exchange of VE information between plants of Japan Steel Works
- Public relations to the sub-contractors

MERITS OBTAINED BY VE PROMOTION DURING FOUR YEARS

Essential merits obtained during the past four (4) years by VE promotion are as follows:

1. Total cost reduction of main products amounts to about 200,000 dollars (as of March, 1972) by applying VE proposals at the designing level. The amount is rather small, but intangible merits undermentioned (from No. 2 to No. 8) have been indeed great.
2. Remarkable revolution in consciousness of

cost and value is now spreading among the employees by the efforts of the Value engineers.

3. Designing personnel have all been trained as Value Engineers and have formed the habit of applying VE techniques at the designing level.
4. Communication between section chief and Value Engineers has improved. All Value Engineers take pride in wearing VE badges. Whenever the badge catches his attention, the section chief of the designing department loses no opportunity to challenge the Value Engineer with problems of cost and functions of products, and then Value Engineers always respond with confidence. In the other departments also, we can see the same phenomena.
5. Coordination between designing department and other departments such as planning, purchasing and production has shown considerable improvement.
6. The so-called "Master of all trades and master of none" has been eliminated.

At the Hiroshima Plant, all kinds of machinery are installed. By virtue of "Master of all trades and master of none", practically all the parts can be manufactured within the plant. However, it can be said that this has been the cause of higher cost of our products compared with other companies, conversely resulting in diminishing value. Value Engineers are now putting into practice the purchasing of cheaper but higher value parts made by speciality makers.

7. Forecast of cost reduction amount and checking of the actual results of cost reduction

Value Engineers of the designing department enter the forecasts of cost reduction amount on the printed form (Fig. 3 The Cost Reduction Forecast Table) at the time they apply the VE proposals at the designing level. After the products are completed, checking of the actual results of cost reduction is made by the cost accounting section and information on the results and the difference between forecasts and actual results are fed back to the next design.

8. Integration of management techniques (VE, IE, QC, etc.) and engineering techniques gained personally by workers.

We are now organizing VE team with some of the experienced engineers such as Value Engineers, Industrial Engineers, Quality control Engineers and workers who have some engineering techniques gained personally by long experience. We anticipate good designs and drawings that require no correction, based on proposals by the above-mentioned integrated teams.

Fig. 3

Date:

Cost Reduction Forecast Table

Kind of job		Classification		Symbol		Quantity		Per Unit		Total amount reduced		Name			
Job Order No.	Drawing No.	Name of product	Estimated cost before improvement B	Estimated cost after improvement C	Actual cost after improvement D	Amount reduced		Forecast E	Actual F	Forecast F x A	Actual F x A	S	TOJ	ZD	
						B-C	B-D								
						* Classification by proposals Mark "0" in the applicable column									

* S: Seminar
 T: Daily team
 OJ: Proposal adopted by designing line
 ZD: Proposal adopted by ZD

Objectives

1. To grasp the effect of proposals adopted (made to order or made for stock) at the time of designing
2. To compare the effect forecast with actual results
3. To feed back information for the next proposal

Designing section concerned (Feed back)

4. Note: When special mention is necessary, it is to be made in the next line each time.
5. Related matters:

Disposition

1. Fill in: Record information every day as they become available () Actual results are recorded by the cost accounting section
2. Time of proposal and number of times adopted are of no concern (Old proposals are recorded on the job order number each time they are adopted, regardless of how many times)
3. Flow route:

In order to ensure the results are reflected on the cost, make sure to refer to instructions given in Fig. 1, "Guide to Entry of Pertinent Information Regarding Proposals Adopted" on the drawings and specification sheets.

Person responsible for preparation or group leader (Tabulated at end of every month)

Control engineer

Asst. Sec. Chief Section Chief (Reported at the regular meeting of designing section at the beginning of the month)

Cost accounting section (Actual cost investigated)

DEVELOPMENT AND ESTABLISHMENT OF VE TECHNIQUES
IN FUTURE

The first four-year plan of experimentation has just recently ended, and we are now reviewing the results by self examination. During the above period, it is true that various merits have been realized, but it is also true that the development and establishment of VE techniques in future are not without difficulties.

For the purpose of achieving development and establishment of Value Engineering, the top of our Hiroshima Plant has presented the following 16 measures to be taken. In order to pursue the objectives indicated by the top, we are executing each and every one of them steadily.

1. Reopening of VE workshop seminars.

VE workshop seminars according to the basic yearly plan have been completed, but it will be reopened as soon as a certain number of participants can be gathered.

2. Arrangement of VE proposal reports

The number of VE proposal reports submitted is 134, and we have to arrange them by sections for useful application.

3. Re-check of VE proposals

4. Consolidation of VE proposals

We have to re-check and arrange VE proposals by products and find high cost and low value products and promote the VE program.

5. Promotion of test and trial production to apply VE proposals at the designing level

6. Strict enforcement of entering cost reduction forecasts on printed forms and checking of the actual results

7. Integration of management techniques and engineering techniques gained personally by long experience.

8. Promotion of VE proposals at the production level

Our experience in VE at the designing level has taught us that it is equally vital to apply the techniques in production in order to realize over-all effect. Both branches can be likened to two wheels connected with an axle, so to speak. Synchronization of the two is vital.

We have ^{to} promote VE proposals at the production level including ZD and IE suggestions and to apply them at the production or designing level.

9. Promotion of cost reduction by the cooperation of the designing department and other

departments such as planning, purchasing and production

10. Arrangement of VE information, for example, brain storming data

11. Reinvestigation of VE activity at the purchasing level

It is most efficacious to apply the VE proposals at the designing level, but there are still many merits to promote VE at the purchasing level, which is important.

12. Application of VE techniques to the research and development of new products

It is most efficacious to apply VE techniques at the research and development level. After the trial production is accomplished, we have to check the forecast cost, the actual cost, function, value, System cost effectiveness of the new products.

13. Improvement in cost consciousness of managers, section chiefs and Value Engineers

The managers and section chiefs have to expedite the cost reduction programs together with Value Engineers and to find always the sources of cost reduction.

14. Re-education of Value Engineers

15. Training of section chiefs

Training of section chiefs has already been completed in February 1972.

16. VE promotion jointly with sub-contractors

CONCLUSION

In the past, many Japanese plants induced various kinds of management techniques such as VE, IE, QC, etc., but they often could not make full use of them or continue their programs and could not obtain good results, because the understanding and leadership of the tops were lacking or insufficient.

Besides, some of the staff has often delved into academic studies of management techniques and overlooked the practical phase of development and establishment at their plants.

The top of Japan Steel Works, Hiroshima Plant has had full recognition and understanding and gave splendid leadership towards VE promotion and gave instructions as follows:

1. To formulate and accomplish yearly plan of VE promotion

2. VE promotion center is to be the designing department

3. Both the manager and sections chiefs of the designing department have to promote and

control VE in accordance with the top's policy

4. The main duty of the VE staff is to render the tops and the designing department advice and services, recognizing the fact that his task more often than not is considered a thankless one.

The top has promoted VE expecting increase in value Engineer personnel and revolution in consciousness of cost and value. He has not only succeeded in laying the foundation of the development and establishment of VE but has also presented timely and adequately measures for the future VE development and establishment.

It is conceivable that there are many problems pursuant to the development and establishment of VE in future, but we are hopeful that our managers, section chiefs and VE staff will work together to overcome and eliminate these difficulties, however numerous they may be, in order to achieve great results.



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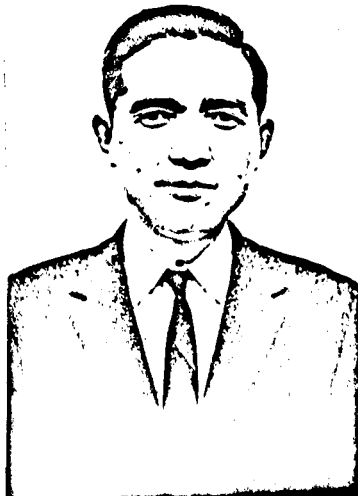
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PERSONAL HISTORY

Name TAKEHIKO TANAKA



- Occupation** :
- Value Engineering Specialist Chief and Assistant to manager of production Control Department. The Japan Steel Works, Ltd. Hiroshima Plant
 - Assistant Professor of Hiroshima Denki Institute of Technology and Hiroshima Junior College of Automobile Engineering.
- Education** :
- Graduated from Mechanical Engineering Department of Kanazawa Technical College.
- Qualification** :
- Group leader of "Corporate Cost Reduction Programs" U.S. Tour Group 1970 and Attended 10th National Conference of SAVE at Dallas.
 - Executive Secretary of SJVE (Society of Japan Value Engineers),
 - Elector of the Science Council of Japan (Nippon Gakujutsu Kaigi).
- Paper Submitted** :
- "Manuals of Value Engineering Promotion" at the 3rd Conference of SJVE 1970.

COST REDUCTION OF
LARGE-SIZED, ORDERMADE PRODUCTS

MR. KENJI HIRATA

MACHINE DESIGNING DEPARTMENT,

HIROSHIMA PLANT,

THE JAPAN STEEL WORKS LTD.

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1. Introduction

The products which are manufactured in the Hiroshima Plant are broadly divided into two groups. One group is standard products which are manufactured in advance such as pinsetter for bowling, deck crane, injection moulding machine, etc.; and the other group is ordermade products which are designed and manufactured after receiving orders such as plastics processing machine, high pressure gas compressor, paper machine, etc.

In the case of ordermade products, the quantity to be manufactured is ordinarily one. Therefore, the quality of materials and the shapes of parts differ every time a product is manufactured. Accordingly, the VE technique differs considerably in comparison with that for general standard products.

My paper purports to explain the cost reduction of large-sized, ordermade products, taking as an example the paper machine. JSW has produced many sets of paper machine under a license agreement with J. M. Voith GmbH in F. R. Germany since 1964. At the beginning of the technical co-operation, we had invariably gone into the red, because the paper machine which we manufactured based on the drawings of Voith was too rigid and heavily built, which are characteristic of Germany. At one time, it was apprehended whether the manufacture of the paper machine could be continued or not.

But today we are steadily making profit since the induction of VE technique, after expending considerable time and personnel, as reported hereunder.

2. Outline of the structure of paper machine

Fig. 1 shows an outline of the structure of paper machine. The paper machine consists of parts shown as follows:

o Stock-inlet

The stock which is pumped up from the stuff box is agitated and spread out on the Fourdrinier wire at proper pressure.

o Wire part

Water is removed from the stock formed into sheet on the running wire.

o Press part

The sheet entering the press part from the wire part contains from 80 to 85 percent water. The water is further mechanically removed from the sheet by pressing.

o Dryer part

The sheet which touches the large-sized dryer-cylinder, to which steam is supplied, is then dried mainly by evaporation so as the moisture contents are reduced to about 2 to 3 percent.

o Breaker stack

The sheet is pressed to obtain higher smoothness.

o Size press

The sheet is sized by special sizing material.

o Calender stack

Uniform thickness and gloss of the sheet are obtained as the sheet passes through the nips.

o Reel part

The sheet is wound to a fixed diameter on to the reel which is the last unit on line of the paper machine.

o Winder

The sheet is slitted to a fixed width and rewinded a fixed diameter required by the customers.

If there is a flaw in one of the above parts, the paper machine would not function properly.

3. The selection of the theme

The type of paper machine individually differs, because the kind of paper, the output and the rate of mixing of stock are involved, which necessitate different size and speed of each machine. However, every equipment can be standardized to three stages by size. We can assemble a complete paper machine by combining those equipment. The selection of VE theme on the paper machine of ordermade, large-sized product is as follows:

3.1 The cost of the equipment itself, which is possible to reduce drastically by adoption of VE proposals at the designing level, is not expensive, but the quantity is numerous. The following are examples:

o Automatic guide equipment

It stabilizes the running speed of the wire in the wire part, the felt in the press part and the canvas in the dryer part. About ten equipment or so are installed in all paper machine.

o Stretcher

The function of the stretcher is to give proper tension to wire, felt and canvas. About ten equipment or so are installed in all paper machine.

o Doctor

The functions of doctor are to remove paper powder and dust and to keep the surface of roll clean. Several tens of doctors are installed in each paper machine.

The others such as bearing, platform, etc. fall under the above-mentioned category.

3.2 There are equipment, of which is impossible to reduce the cost by adoption of VE proposals at the designing level but it possible to reduce the cost drastically by Industrial Engineering at the production level. The production quantity of it is small, but the cost is very high. To cite an example:

o Suction roll

Suction rolls are installed in the wire part and the press part. The function of suction roll, which has suction boxes inside of it, is to remove the water from the sheet efficiently. The material of roll shell is centrifugal cast iron or cast steel, and several ten thousands of small holes are drilled on the surface of it. The cost of suction roll is about ten million yen.

It is possible that the cost of the roll shell can be reduced drastically by adoption of IE. There is also room for cost reduction of the inner parts by application of VE. There is another idea which performs the same function as the suction roll, but it requires long tests and verification.

3.3 Relative effect of cost reduction between adoption of VE proposal at the designing level and by IE at the production level.

There are equipment which are heavy and have numerous parts, the cost ratio of materials and manufacturing being about the same. For example, the dryer part, see Fig. 1, needs space more than half of the paper machine. The greater portion of the dryer part is made of cast iron and its weight is several hundred tons. We can reduce the cost of the dryer part as follows;

- (1) Improvement of the work by IE which reduces the manufacturing time and the preparative time
- (2) The designing which minimized the manufacturing phase (based on the thinking of seeking same mechanical function although manufacturing phase is minimized)
- (3) The designing which reduces allowance for machining.
- (4) The changing of the machine structure from casting to welding

I have mentioned above the selection of the theme. These are typical examples, and it does not necessarily mean that all these standards can be applied to the entire paper machine. Where such applications are not feasible, we have tried to reduce the cost of the equipment by VE, wherever it was deemed the merits were found.

4. The estimated cost reduction and the actual cost by VE

As a result of tabulating the cost reduction figures of each equipment, we found it was possible to reduce the estimated cost by eleven (11) percent.

Subsequently, as the job was completed one after another, the figures of the actual cost were obtained, which showed that the actual cost bettered the estimated cost.

Since the induction of VE, the themes which were selected in connection with paper machine numbered more than thirty. The participants of each VE team were six persons, four of them being engineers of the designing department and others being those of the purchasing and the production departments. The length of VE activity was two weeks on one theme, after which VE proposals were submitted.

The proposals based on the themes relative to the paper machine were adopted and fully applied.

The paper machine section is provided with the VE proposal report, the cost table, the purchase price list, and a showcase of VE samples. These are utilized in our daily routine work.

Also, in the production and supply (purchasing and sub-contracting) departments, the application of VE has produced effect on production. It is felt that the effect of the working estimation system has become evident as manifestation of consciousness of cost.

5. Conclusion

I have explained the cost reduction by VE for large-sized, ordermade products, choosing the paper machine as an example. At first, we feared that it was impossible to put to practical use the VE technique for ordermade products, if we have to change our design on account of change of specifications at the request of customers, which will affect our delivery schedule. However, in fact, we were able to use the VE technique relatively without much difficulty even after the change of design, as the groundwork of VE had been completed.

The important factors of the cost reduction by VE are as follows:

- (1) The drastic cost reduction by efforts at the designing level
- (2) The drastic cost reduction by IE at the production level
- (3) The drastic cost reduction, if efforts at the designing and the production levels are mutually made.

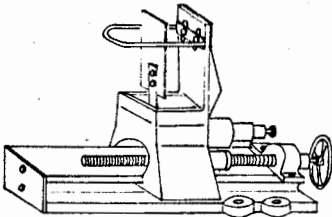
It is obvious that big effect can be realized to reduce the cost, if concerted efforts are made by the designing and production departments.

I would also like to report that the VE technique which was applied to paper machine was applied also to the plastics processing machine, which is one of our main line of products in the Hiroshima Plant, and it is obtaining good results.

Fig. 2 Samples of VE proposal

Ref. 3. The selection of the theme, 3.1 (see p.3)

Sample A



\$ 237 (≒73,000¥)

VE proposal A No.1



\$ 132 (≒40,600¥)



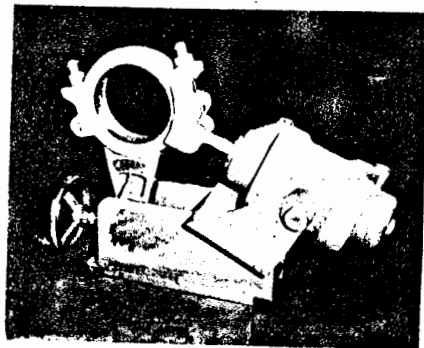
\$ 75 (≒23,000¥)

Sample B



\$ 633 (≒195,000¥)

VE proposal B No.1



\$ 253 (≒78,000¥)

Fig. 1
第 1 图

BREAKER STACK
ブレイクスタック

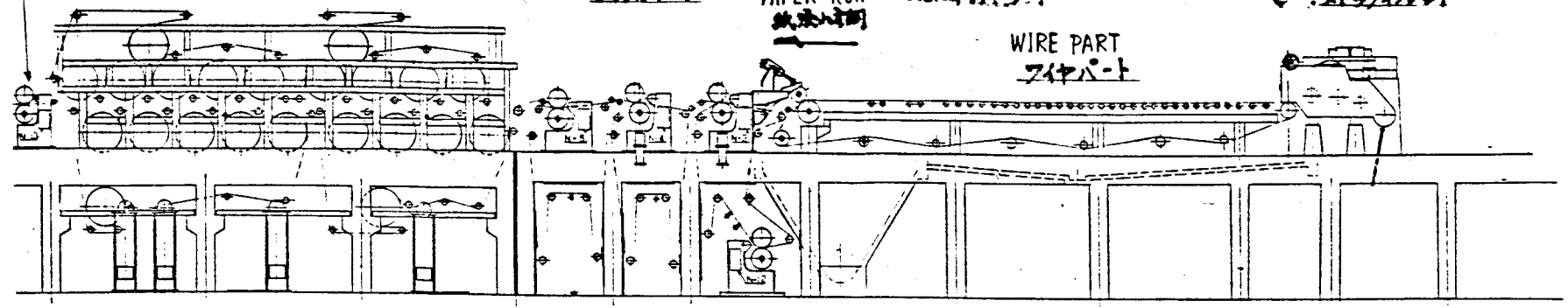
DRYER PART
ドライヤパート

PRESS PART
プレスパート

PAPER RUN
紙の流

WIRE PART
ワイヤパート

STOCKINLET
ストックインレット



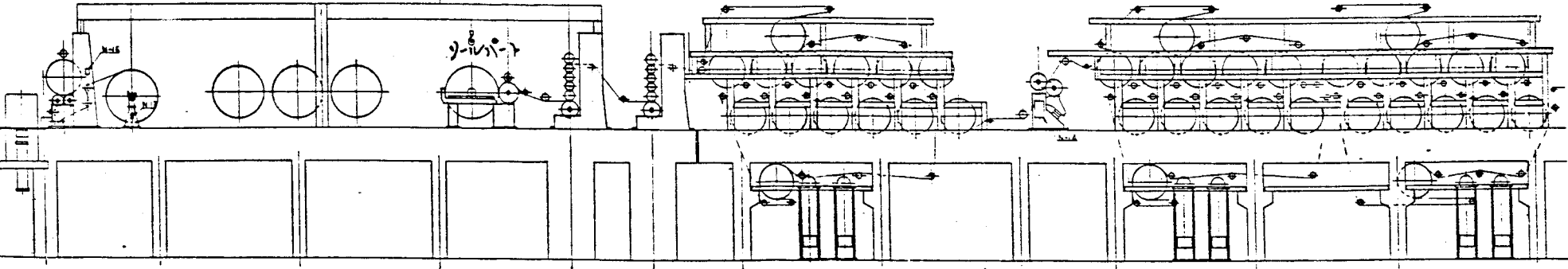
WINDER PART
ワインダパート

REEL PART
リールパート

CALENDER STACKS
カレンダースタック

SIZE PRESS
サイズプレス

DRYER PART
ドライヤパート



VE TECHNIQUES OF PURCHASING ITEMS

MR. HIDEO WAKASHIMA

HIROSHIMA PLANT,

THE JAPAN STEEL WORKS LTD.

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2. Progression of induction of VE
3. Motive of VE for purchasing items
4. Procedure for VE
5. Case study
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1. Introduction

The Japan Steel Works, Hiroshima Plant, is one of the widely known plants in Japan where the top of the plant is promoting Value Engineering, having obtained good results in considerable amount of cost reduction and a remarkable revolution in consciousness of cost and value brought about by the Value Engineers.

My paper purports to explain in detail by citing examples of techniques of purchasing items.

2. Progression of induction of VE

The induction of VE was made by the general manager of the plant in 1967 and the basic yearly plan was formulated. Based on the thinking that it is most efficacious to realize cost reduction by applying VE at the designing level, the plan was made to train all designing personnel for four (4) years.

During the four years, nine (9) VE workshop seminars and nine (9) on-the-job training courses were conducted at the plant, during which time 134 VE task force project teams were organized, displaying considerable activities.

There are 306 Value Engineers (201 in the designing department). In terms of proportion, the number of Value Engineers is twelve (12) percent of the total number of the employees.

At the beginning of the induction of VE, VE staff and Value Engineers wearing VE badges were sometimes looked upon coldly. Many employees used to say, "What is VE?" "Does VE stand for Vacation Enjoyment?" But VE staff endeavored to disseminate VE among the employees by writing VE introduction and the results of VE workshop seminars and explaining the basic yearly plan in the monthly bulletin published at the plant.

Along with the increase of Value Engineers, VE has spread among almost all of the employees, including female employees and employees of sub-contractors. VE is about to reach the stage of permanent establishment.

3. Motive of VE for purchasing items

At the stage of completion of the VE basic plan, all employees of the supply section, including one in supervisory position, were trained as Value Engineers.

Just about this time, there occurred the so-called "dollar shock" and upward revaluation of yen, and as a measure to cope with the recession caused by the above situation, cost reduction was chosen by the top management as one of the important objectives of Management for Results.

The employees of the supply section were instructed to reduce drastically the cost of purchased items by applying VE techniques. However, based on the thinking that it is most efficacious to realize cost reduction by applying VE at the designing level, basic yearly plan was made to train all designing personnel. Therefore, almost all of the specifications of items to be purchased are thoroughly checked by applying VE techniques at the designing level. Thus, it was thought that there was hardly any margin for further cost reduction at the purchasing level, but we did not give up hope.

Just at this time, an experience I had personally several years ago with the system of inquest of prosecution occurred to me. Under this system, the members are chosen by drawing from the principal poll book. They are simply laymen regarding legal matters, whose duty is to re-examine the cases that are dropped by the prosecutor.

This system is not so well known, but according to last year's record, the national average of 8.5% of the cases for trial was sent to the Public Procurator's Office as deserving indictment.

Encouraged by the above fact, instead of giving up hope, we resolutely started to make a challenge to VE.

4. Procedure for VE

4.1 Collection of VE information

We collect catalogs by reading ads in various industrial newspapers or technical magazines. At the same time, we not only request catalogs and other datum to give them the impression that we are interested in purchasing cheaper but higher value parts but we also send them our own company literatures to acquaint them with our products. At the same time, we inquire their business offices or agencies in the Hiroshima district.

4.1.2 Collection of VE information of speciality makers at the stage of marketing research or through public relations of speciality makers' new products.

4.2 Feeding information to the designing department about speciality makers' new products

From the information gathered, we pick out items that can be substituted (with equivalent to or better than parts hitherto used and cheaper in price) for former purchased items and pass on information to the designers concerned or request the maker's expertise to come and make detail explanation

4.3 Function analysis

We evaluate the function of new products in comparison with those presently used.

4.4 Collection of samples of new products

As a result of function analysis, if merits of the new products are found, we obtain samples. The samples are either purchased or borrowed.

4.5 Testing and verifying

The cost of the samples and expenses for testing are covered by VE budget or cost for research and trial manufacture earmarked.

4.6 Adoption

We adopt the new products at the designing level, if the tests are satisfactory.

4.7 Forecast of cost reduction amount and checking of the actual results of cost reduction

Value Engineers of the designing department enter the forecasts of cost reduction amount on the printed form (Fig. 1, The Cost Reduction Forecast Table) at the time they apply the VE proposals at the designing

5. Case study

Comparison of cost between old type and new type products of cylinder, pump and cooler which are installed in some industrial machinery in the nature of repeat manufacture (although in a limited quantity) is as follows:

Fig. 3

unit: Dollar

Kind of machinery	Cylinder		Pump		Cooler	
	Before VE	After VE	Before VE	After VE	Before VE	After VE
A	328	221	688	422	192	101
B	633	308	601	422	227	101
C	643	266	1721	552	269	240
D	906	318	1721	714	513	240

Kind of machinery	Total of 3 theme		Difference	Rate of cost reduction	Rate of cost reduction against total theme purchased
	Before VE	After VE			
A	1208	744	464	38.4	9.1
B	1461	831	630	43.1	10.2
C	2633	1058	1575	59.8	22.3
D	3140	1272	1868	59.4	19.7

Note:

(1) Cylinder

We ordered the old type cylinder to the speciality maker according to the drawing of our designing section. The cost was always higher, and the delivery time of the maker was often delayed, and the quality of cylinder was not good. Thereupon, by applying the VE proposal, we had the cylinder made which was very close to the standard type of the maker, after repeated discussions with the maker. But there was still some trouble and after trials and errors we succeeded in putting it into practical use.

(2) Pump

We checked some pumps sold by several makers which have merits of large capacity and low noise. We adopted a combination pump which has the function of two pumps.

Now the general trend is to decrease the noise of machinery. As a result of adoption of low noise pump, the noise of other parts of the machinery became pronounced, but after great efforts, the problem was finally solved.

(3) Cooler

We found a new maker's cooler which is mass-produced and lower in price with better function. As this cooler is made of standard pipe, the outer diameter of the pipe is limited, and the total length is made longer than the old type in order to retain the same heat exchange capacity. When we adopt the new type cooler for the rest of the old machinery, we have to give consideration to the space problem of the new pumps.

6. Problems

6.1 Waste of VE labor owing to small quantity production of various kinds of products

Unlike motor cars that are mass-produced, our products are of various kinds and manufactured in small quantity. After taking great pains in studying VE for main parts and the stage for application is reached, if repeat order is not obtained for the particular product, it ends up in waste of VE labor.

6.2 Shortage of mechanical engineers in the Supply Section

On account of the shortage of mechanical engineers, when technical studies are required, it become necessary to enlist the help of engineers of the designing department.

6.3 VE specialist staff not assigned to the Supply Section

Since VE is performed by line personnel, they are pressed by daily routine work and sufficient time is not available for VE.

However, not despaired of these problems, we are always tackling the problems with a forward looking attitude. We are working out ways and means of finding time to devote to VE. When group meeting for Zero Defects is held every month or when other companies are not at work and our company is, concentrated discussions are held on problems accumulated. Every possible opportunity is utilized for VE activities such as meetings held to make reports on plant tours of other companies, on attending VE conferences sponsored by Society of Japan Value Engineers and various other conferences, on attending training courses, etc.

7. Conclusion

It would be useless, if, under the good name of VE, it should turn out to be "penny wise and pound foolish". Although testing and verifying are performed, there is naturally a limit to testing in the company. For example, in spite of the fact that tests performed in the company prove to be satisfactory, various conditions change in actual operation, making the product often susceptible to claim arising after it is delivered to a user.

However, if such fear should be entertained, effective VE cannot be expected. If there is a great fear of risk, one way to cope with the situation in the early stage is to have on hand both new and old parts.

Henceforth, as sales competition among rival manufacturers will become more and more stiff, high sales profit cannot be expected. Even if sales price is lowered, the situation is such that there is no way of making profit other than by reducing cost by VE techniques. I firmly believe that success can certainly be attained by VE, if enthusiasm, nay, tenacity of purpose and efforts, are directed toward VE by all concerned, with a view to reducing the total cost of the products, starting at the designing level, down to production, completion of erection, shipment, and also for the products after delivery to the user, from the time of initial operation until the service life ends, and moreover if there is strong determination on the part of the management to adopt VE proposals.

The history of VE in our country shows VE activities were first conducted in the materials purchasing department and next it was thought that VE activities were most efficacious at the designing level. Lately, VE centered on designing has come to the fore. On the other hand, it is said that time has come to take another look from the original viewpoint at VE activities of materials purchasing department. To explore further possibilities of VE out of the accomplishment of VE at the designing level is the true VE activities of the materials purchasing department. I keenly feel that our biggest appointed task from now on is the consolidated systematic VE activities of outstanding production plan by the planning branch and efficacious VE by the designing and supply branches, in addition to which improvement efforts through IE and VE techniques by the production branch.

Fig. 1

Date:

Cost Reduction Forecast Table

Kind of job		Classification		Symbol		Quantity		Per Unit		Total amount reduced		Name				
Job Order No.	Drawing No.	Name of product	Estimat- ed cost before improve- ment B	Estimat- ed cost after improve- ment C	Actual cost after improve- ment D	Amount reduced		Forecast	Actual	F x A	F x A	S	T	OJ	ZD	
						Forecast E	Actual F	F x A	F x A							
						B-C	B-D									

* Classification by proposals
Mark "0" in the applicable column

* S: Seminar
T: Daily team
OJ: Proposal adopted by designing line
ZD: Proposal adopted by ZD

Objectives

- To grasp the effect of proposals adopted (made to order or made for stock) at the time of designing
- To compare the effect forecast with actual results
- To feed back information for the next proposal

Disposition

- Fill in: Record information every day as they become available () Actual results are recorded by the cost accounting section
- Time of proposal and number of times adopted are of no concern (Old proposals are recorded on the job order number each time they are adopted, regardless of how many times)
- Flow route:

Person responsible for preparation or group leader (Tabulated at end of every month)

Control engineer

Asst. Sec. Chief Section Chief
(Reported at the regular meeting of designing section at the beginning of the month)

Cost accounting section
(Actual cost investigated)

Designing section concerned (Feed back)

- Note: When special mention is necessary, it is to be made in the next line each time.
- Related matters:

In order to ensure the results are reflected on the cost, make sure to refer to instructions given in Fig. 1, "Guide to Entry of Pertinent Information Regarding Proposals Adopted" on the drawings and specification sheets.