To

Jimmie Carter
Jerry Kaufman

DATE 12/14

SUBJECT Value Engineering Work in Japan

Fellow Value Engineers;

Enclosed is a report that Takehiko Tanaka just sent. My belief is that he did the work so that we could see something of the direction and amount of their activity, and the effectiveness of it. For that reason I have made copies and am sending them to you gentlemen.

I so much respect people who, day-by-day, do what they can to keep efficient—don't wait until they are non-competitive, then scream for help from political or pressure groups.

If you have a way to use this report for some good constructive purposes, I'm sure you will do so.

Hal, I'm sure you can feel free to quote.

Have a good year, and a lot more!

Larry Miles
VALUE ENGINEERING APPROACH
TO
LARGE SIZE INJECTION MOULDING MACHINES

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VALUE ENGINEERING APPROACH TO LARGE SIZE INJECTION MOULDING MACHINES

1. The Japan Steel Works Limited has its head office in Tokyo and its plants in Muroran, Hiroshima, Tokyo and Yokohama. Its sales network covers not only Japan but all over the world with its eight domestic offices from Sapporo in the north to Fukuoka in the south as well as six overseas offices - New York, Houston, Los Angeles, Dusseldorf, Teheran and Singapore.

Since its foundation in 1907, the company has distinguished itself as an integrated maker of large size castings and forgings, various kinds of quality steel plates and industrial machinery.

Taking charge of the field of industrial machinery, the Hiroshima Plant manufactures a variety of large size machinery covering diversified fields of industry, such as pipeline valves, plastics processing machinery, medium and large size injection moulding machines, chemical machinery, paper making machine, deck cranes and others.

Value Engineering has been adopted by the Hiroshima Plant since 1967. To date, many Value Engineers centered on designers have been trained through Value Engineering Workshop Seminars. By virtue of strong promotion of Value Engineering activities, great achievements have been obtained.

As mentioned above, the Hiroshima Plant manufactures an extensive line of products in small quantities, so that quite a number of Value Engineering teams i.e. a large number of VE Engineers are needed to apply VE activities to all the products. Under the circumstances, the basic policy was set up to train all designers as Value Engineers which was achieved in 1972.
Thereafter, VE Workshop Seminars have been continually held as the occasion demanded to supplement the natural decrease of Value Engineers owing to retirements and transfers as well as to train new Value Engineers. More recently, fresh Value Engineers were appointed through the 12th VE Workshop Seminar held in June. When VE activities are developed to a variety of products manufactured in limited quantities, investment efficiency will be aggravated unlike mass-produced products, unless VE effect per product is large. It was feared at the onset that these activities were paying. However, we have now found it to be unfounded apprehensions. The cost reduction multiplier ranged from 3 - 50 times with the average of approximately 10 times. It is now keenly felt that VE plays a large role in cost reduction.

2. VE Developments to Large Size Machines.

In VE activities, competent members, particularly leaders will be those who are familiar with VE subjects. These people are able to arrange highly adoptable VE proposals in order and to execute efficient VE activities.

Since there are limitations to the number of Value Engineers having the knowledge of a specific machine and the length of time allotted to VE activities, however effective they may be, it is impossible in case of large size machines with quite a number of components and elements to carry on VE activities by forming a task force and a project team (TFPT) all at once for each section and equipment.

Furthermore in the case of VE activities on a large size machine, even if one of the components or elements is taken up and a great improvement is made, its cost reduction ratio will be diluted in the total cost of the machine. Consequently, the extent of result to which sales people expect will be hard to achieve.
On the other hand, the VE activities include in addition to those by a task force and a project team (TFPT) formed by staff members selected from various departments, QC circle activities, usual activities on the job and individual proposal activities. Furthermore, production departments can achieve appreciable result by utilizing the VE approach.

Therefore, the VE developments for a large size machine should be carried out by assigning VE activities to the above-mentioned types of activities and making efforts to attain the projected VE targets as the whole machine through combined activities.

The type of the injection moulding machine taken up here as an example is classified as a product manufactured in large quantities. Its standard type can be manufactured in lots and is one of our products to which Value Engineering approach can be applied with ease.

3. Outline of Injection Moulding Machine

As illustrated in Fig 1, the injection moulding machine is composed of an injection unit, clamping unit, hydraulic unit etc. The injection unit heats up and melts resin material which is then injected into a metal mould fixed on the clamping unit and thus plastic products are moulded.


(1) Activities by VE Team (TFPT)
VE activities by a task force and a project team (TFPT) have been practiced 29 times so far with respect to respective components and elements and have achieved outstanding results.
(2) QC Circle Activities have held meetings once a month in a section or workshop and have made improvements on users' requests through VE approach.

In addition teams were banded in usual business activities according to necessity and VE activities were put in practice. Many proposals of individual workers were also adopted based on the proposal system.

Though most of the proposals thus adopted had a narrow range of applicability to VE subjects as compared with VE proposals through TFPT activities and gave small effect as a single proposal, they eventually gave birth to marked result as a whole because of quite a number of proposals filed in total. All of these proposals were put into practice from the next lot.

Despite the afore-mentioned history, the Value Engineering did not necessarily come up to the needs and demands of the market affected by the rise in the costs of purchase items and materials and labor cost and as a result VE activities have been taken up again this time.

5. Value Engineering of This Time on Injection Moulding Machine.

Conventionally specific components and elements have been selected as subjects of VE, from the viewpoint of cost ratios of respective components and elements in relation to the entire injection moulding machine as well as from the viewpoint of performance evaluation, but adoption of alternative ideas had to face limitations owing to such problems as violations of patents.
However, as time passed, further cost reduction and upgrading of performance have increasingly come to be demanded. With such circumstances in mind, it has been decided to carry out Value Engineering activities not only on specific components and elements but also other elements to which we have not paid any attention.

Our VE Team Activities have initiated three subjects and other elements have been assigned to the QC Circle Activities Usual Activities on the Job and Individual Proposal Activities. Through these activities, marked improvement of performance and substantial cost reduction have been worked out.

The formation of VE Activity Team and the schedule were decided as below.

(1) Formation of Team.
A team was banded with experts chosen from different departments based on the TFPT system.

- Design Department - 2 persons (one of the two as leader)
- Production Department - 2 persons
- Supply Department - 1 person

*Total 5 persons*

(2) Schedule
Half day in the afternoon was allotted for a duration of about one month, totaling 14 days.

It is normally rather difficult to finish compiling an improvement plan following every VE steps in a short period of 14 days, but on the contrary its strained feeling helped bring about superior proposals.

The safety door mentioned hereinunder shows an example which had been excluded from VE objects as an element having a high value.
6. An Example of Safety Door.

(1) Target
Cost reduction ratio: 15%

(2) Present Situation.
The general view of the present safety doors is shown in Fig 2. The safety doors are mounted on both sides of the clamping unit, one being a movable type and the other being a fixed type.

(3) Analysis of Functions.
A functional system chart drawn through definition of functions and tabulation of functions is shown in Fig. 3.

(4) Collection of Information.
With the attendance of the door maker, we collected information about the fabrication process, costs and others as well as other types of doors.

(5) Drafting of Alternatives.
Different ideas were presented with the assistance of the maker. They were then polished up and alternatives were drafted.

<table>
<thead>
<tr>
<th>Function</th>
<th>Present Practice</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>To Peer Through Inside</td>
<td>Metal Screen</td>
<td>Acrylic Panel</td>
</tr>
<tr>
<td>To Make Movement Smooth</td>
<td></td>
<td>To Make Weight Lighter</td>
</tr>
<tr>
<td>To Guide Door</td>
<td>Manufactured in JSW shop</td>
<td>Purchase Parts</td>
</tr>
</tbody>
</table>

An improvement plan for the safety doors are illustrated in Fig. 4. With this arrangement, components having overlapping functions have been simplified, thereby resulting in smooth operation and stylish appearance.
(6) Cost Comparison

The cost comparison between the existing safety doors and the safety doors in the improvement plan are as below:

<table>
<thead>
<tr>
<th></th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Safety Doors</td>
<td>¥731,650</td>
</tr>
<tr>
<td>Safety Door in Improvement Plan</td>
<td>513,600</td>
</tr>
<tr>
<td>Amount of Cost Reduction</td>
<td>218,050</td>
</tr>
<tr>
<td>Cost Reduction Ratio</td>
<td>29.8%</td>
</tr>
</tbody>
</table>

7. Conclusion.

For the VE developments of large size machines, the injection moulding machine has been taken up and referred to as an example in this article. It has been demonstrated through this VE application that functional improvements as well as cost reduction can be possible if we are not satisfied with VE application only to elements of low value but fix our eyes upon elements from which we think results of VE can not be anticipated at first sight.

The VE developments of the entire large size machinery covering such elements as those not taken up before have enabled us to extend to, beyond the regular TFPT (task force and project team) activity, all-inclusive activities including QC Circle Activity, Normal Activity on the Job and so forth. As a consequence appreciable result has been fulfilled even when it is viewed from the entire machinery.

We would feel very delighted if this small article could furnish you with some information.
GENERAL VIEW OF INJECTION MOULDING MACHINE

Fig 1
FUNCTIONAL CHART OF SAFETY DOOR

To Insure Normal Machine Operation

To Protect Operator
- To Peer Into Interior
- To Shut Off Inside From Outside

To Insure Smooth Operation

To Take Out Moulded Products
- To Open And Close Doors
- To Guide Doors

To Have Cam Valve Struck
- To Stop Mould Closing Sequence
- To Switch Over Selector Valves
- Determine Cam Valve Position

To Protect Metal Mould
IMPROVEMENT PLAN FOR SAFETY DOOR

Stationary Safety Cover

Movable Safety Door

Acrylic Sheet

Acrylic Sheet