

Chapter 5

Reasonable Purchase Price and the Criteria for its Determination

(Knowledge of Reasonable Purchase Price)

Abstract

This chapter describes a basic view of the reasonable purchase price required in the DTCN/DTC methods and the criteria for determining it.

The basic view includes:

1. Steplists for a reasonable purchase price

What determines a reasonable purchase price? This is a practical article published by the author in 1973, and is the origin of all the activities connected with developing the methods described in this book.

2. How to use a price/cost breakdown table for cost control

Appropriate and reasonable cost control requires that we know the details of the keys. A price/cost breakdown table provides the details. This subsection describes the requirements for a table, how to make, use, and check a table, and important principles.

3. Price determination criteria

Whereas subsection 1 describes the step-by-step method for determining a reasonable price, this subsection describes more general and fundamental criteria for determining a reasonable price.

Chapter 5.

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5.1.5 Discussion

5.1.1 Introduction

(1) In response to the questions, "What is a reasonable purchase price, and what determines it? ", this section introduces the way of thinking to practically justify a new price when the old price must suddenly be changed after reconsideration.

(2) Taiichi Ideriha and the author jointly created and published this way of thinking in the proceedings of Society of Japan Value Engineers in 1973. This way of thinking is the origin of the methods introduced in this book and is the starting point for all the techniques in the DTCN and DTC methods. Although it contains some things which are difficult to understand, it is introduced to reflect the social thinking in 1973.

There have been discussions on how to introduce value engineering methods into enterprises. Investigators have reported that "it is important to obtain the direction and understanding of top management," "experiences are essential for understanding VE," and "the method for persuading the top management to introduce VE must be taken into account before proposing VE."

Lawrence D. Miles stated in Chapter 11-6 of his book "Techniques of Value Analysis and Engineering," his point of view with respect to "minimizing the risk of personal loss":

Minimizing the Risk of Personal Loss

A series of research studies brought forth the surprising information that most decisions are made on the basis of avoiding or minimizing personal losses, such as reduction of authority, dismissal, or embarrassment. This finding seemed so improbable and so startling that it caused the writer to think back through several of his most difficult decision-making experiences, especially a considerable number which he knew were wrong, but which "had" to be made in a certain way. Surprisingly, every one of these decisions was made to avoid or minimize personal loss. Again it is suggested that the reader stop to reflect on and analyze some of his own decision-making experiences before proceeding.

A few examples of situations in which the danger of suffering personal loss occurs may further illustrate the point in question:

A purchasing agent may for years have purchased a product from one supplier, even though this supplier may not have kept pace with either technical progress or value innovation. A decision by the purchasing agent to change over to what seems to be a better product at a lower price brings immediate danger of personal loss. Every change brings risk.

The engineer who traditionally used a certain type of assembly for accomplishing a certain function and has decided to change to the use of what he believes to be a simpler, more reliable, and certainly much more economical assembly is certainly taking a chance of personal loss. So, in order to reduce the cost dramatically, it is important as a first step "to take every measure possible to minimize fear of embarrassment or personal loss which comes, or may come" as these fears are apt to cause opposition to the change.

From this viewpoint, measures to prevent personal loss resulting from a sudden change in price were considered, and the framework of the following "Steplist for a reasonable price" was created (Note 1). Because the steplist seemed to be able to not only prevent loss, but also allocate staged decisions from various grounds, it was enlarged to the management control cycle of new products in mass production.

(Note 1) Needless to say, "the case where the way of thinking introduced here can be applied partially and as a whole" is limited to "the case where the way of thinking is accepted by both parties as the relation of offer and acceptance."

5.1.2 Viewpoints for preventing personal loss

A reasonable price steplist was prepared in the following situation. When an enterprise examined the possibility of reducing the cost of their products, the price of the product could be reduced by about 90% after simple examination. The author was consulted by the Senior Manager of the Purchasing Department. (Disclosure of this fact would cause criticism about their work as well as of the person in charge and his/her superior.) The Senior Manager of Purchasing Department needed to explain the reduction in price in a reasonable way. In other words, the price could not be reduced unless the loss of the authority of the persons in charge was prevented. The author, therefore, used the following very general viewpoint to solve the problem. That is, the viewpoint, "discussing from future results side is much easier than discussing from past side in details" was used.

The original price, which was 10 times higher than the reconsidered price, was based on insufficient information at the time that it was decided. The price was reduced because the production line stabilized and more information was obtained. The reconsidered price does not acknowledge the presence of a contract specifying that no mutual price reconsideration will be performed.

This way of thinking can be theoretically explained if price reconsideration over time is stratified. That is, the loss can be prevented by proving the time sequence of the previous and new figures. This theory is affirmed by those who understand that everything has to be reconsidered and that a decrease in unknown elements may result in unexpected outcomes. Therefore, the purpose of publishing his paper is to remove the useless resistance to drastic cost reduction, which seems discontinuous with the previous phase.

5.1.3 The way of thinking for a reasonable purchase price

A reasonable purchase price is decided based on the relationship between offer and acceptance [Note 2]. The price becomes the knot of cooperation between the purchaser and supplier. The general background factors of the offer and acceptance include the following facts:

- (1) No enterprise can purchase products unless their prices are agreed on.
- (2) The function and price of a product purchased by an enterprise must be socially related to those of the upstream product or system produced by the enterprise.
- (3) In the above framework, a reasonable price must be based on business trading principles beginning with the offer including reconsideration.
- (4) The price initially agreed on by both the purchaser and supplier within a limited time should be reconsidered within a limited period if the price is found to be unfair or partial.
- (5) When it becomes evident that the system project cannot be continued as a result of reconsidering the price, and in spite of various overall examinations, adjustments, or actions, the project is socially useless. Replacing the project or discontinuing it should be examined.

Figure 5.1-2 shows the above relations..

(Note 2) The Uniform Commercial Code in the United States (U.C.C.: something like a combination of commercial and civil law in Japan) best covers the relations between Offer and Acceptance from a business trading viewpoint. Figure 5.1-3 shows Article 2-206, which is the basis of the Code. This is essential in trade with US companies and is also helpful in Japan.

5.1.4 Steplist for a reasonable purchase price

The previous subsection described the basic way of thinking about a reasonable purchase price. If we make the step breakdown of the process from the concept of a product to its production phase, we can recognize the process in which the viewpoint of evaluation and judgment to look at things will vary considerably from a vague stage to a confirmed stage.

Figure 5.1-1 shows the steplist for a reasonable purchase price. The relationships of reasonability in the above evaluation and judgment standard about a reasonable price were broken down into steps, and the contents of each step were divided into inputs and outputs. The relationships of reasonability in each step were arranged so that the output in a step would be acknowledged before proceeding to the next input.

This steplist is divided into the following phases:

- (1) Concept phase
- (2) Breakdown phase
- (3) Implementation phase
- (4) Steady phase
- (5) Review phase

Although the steplist starts from the concept phase of a new product, any phased step can be used to examine the price. Moreover, any phased step can be used for purchasing any product by adjusting the content of each item. Furthermore, the following principles can be derived using the steplist:

- (1) When it is necessary to reconsider or review a product already in production through VE examination, the review work should start by reaching an agreement on preconditions before reconsideration or review work is done. Figures 5.1-4 and 5.1-5 are examples of the pre-condition discussion and agreement for the reconsideration or review. Format A is designed for a product to be developed and Format B is for review of a developed product.
- (2) When there is compensation for results gained through reconsideration or review work in cooperation, it is better to determine each receiver's share by the degree of contribution and utility after the result is obtained (it is also possible to pay compensation as a reward for reconsideration-related labor). The discussion, or the share or the compensation before a result is obtained may shift the point of discussion to deal with the share of the result. This may lead to withholding good ideas to get a good result. Therefore it is enough to discuss the share of the result after a good result is obtained.

5.1.5 Discussion

The above subsections mainly describe the history of the steplist for a reasonable purchase price. Because the steplist was developed for a specific product, it would be necessary to adapt it to meet the needs of each industry.

The author would be happy if the steplist helped various optimization activities in the present changing management environment.

See Subsection 1.2 "Decision-making mechanism by information of difference" and Subsection 5.2 "How to use a price/cost breakdown table for cost control" for the method to compare similar products, the essentials for the condition of estimate specifications, and the requirements for a price/cost breakdown table.

References

[1] The United States UCC (Uniform Commercial Code, 1958-1968) accepted in each state of the United States

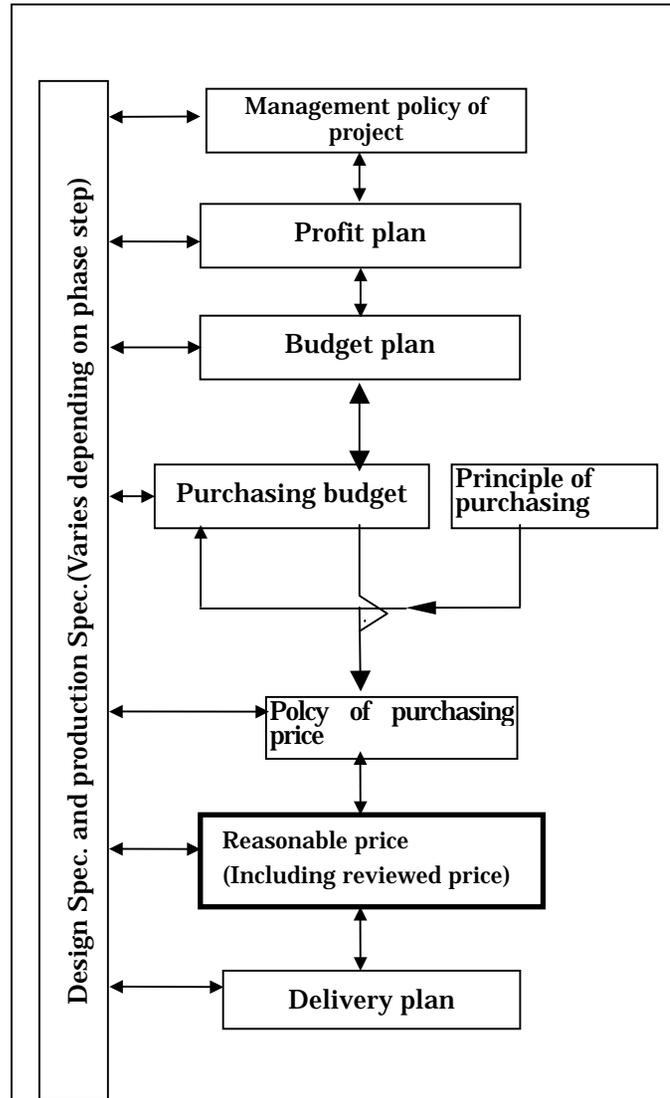
Fig. 5.1-1 Steplist for a reasonable price

(Note) 1 . Approved by manager or chief of section is required before any output step is to be utilized for next input step.

2 . In case no solution is available at each step, it is necessary to return to the previous step.

Step	Steps	Input		Output		Price standard	Notes	Output approval level
		Items	Pre-assurance activity	Items	Post-assurance activity			
Concept phase	Definition of task requirements	Selected item subject to purchase or system (Eng.)	Choose person who takes care of settling company's international matters & person related in each department	<ul style="list-style-type: none"> Specification of our company(draft)(Eng.) Specifications of estimate terms and conditions (Production and Material Dept) 	Check contents of spec. according to checklist. Approve the terms and conditions of estimation			
	Selection of applicable vendor for estimate (Qualitative)	List of applicable vendors and part No. Specifications of our company(draft) Terms and conditions for estimation	Advertise for applicable vendor (domestic and foreign) Review vendor's year book Send RFP to applicable vendor	Vendor's Specifications Vendor's estimation ()	Evaluation of vendor's design/production facility Evaluation of vendor's financial ability		Evaluation of ability is to be made according to past & present business accomplishments	
	Evaluation of fulfillment for price & engineering requirements	Vendor's specifications(draft) Vendor's estimation() Budget/target price Data for similar item (specifications and price)	Review specifications and estimation.	Combine specification of our company & vendor. Vendor's re-estimation with price & cost data () Implementation plan Preliminary test plan (as required) Comparison table of potential vendors.	Evaluate the technical & financial accomplishment for requirements. Check if the product already on the market Compare with master schedule & see if there is enough time. Clarify critical path Make comparison worksheet for final selection of each purchase part item.	Similar price Budget price Functional price	Evaluate quotation by price and cost table of maker is required to provide the price and cost table.	
Breakdown phase	Selection of vendor	<ul style="list-style-type: none"> Combined specifications of our company and vendor Vendor's second estimate () Schedule (draft) Plan for preliminary test (as required) Comparison worksheet for final selection	Examine of requirements by functional test and inspection of initial product; Q/T, FAL Examine patents Negotiate the price and fix the quotation	Preliminary selected vendor Final specifications Implementation plan (draft) Final quotation () (According to nego result) Price and cost data and table ()	To check adequacy (Major assurance) Check that price & cost table data are consistent by sampling (use technique of sampling, similar part, weight, etc.)		Take contingency plan leading up to first delivery of lot 1 & other risks.	
	Placing order and carrying out plan	Implementation plan Final quotation ()	Final negotiation prior to contract (delivery term, price etc.) Examination of final quotation	Purchase order Actual schedule up to delivery date of first lot.(including functional test & inspection requirements for initial product; Q/T, FAL	Make contract Check detail schedule(to clarify critical path) Make periodic report for schedule, and determine who is responsible at each checkpoint of schedule.	Similar price Budget price Arranged price Price & cost analysis	To clarify the division responsible & person in charge when follow-up is scheduled.	
Implementation phase	Stage in practice up to delivery of first lot	Submitted manufacturing schedule Engineering design Actual manhour Grasped achievements for standard amount of material Price cost table () Terms and conditions of estimation()	Obligate vendor to prepare cost data of lot 1 and 2 Determine processing man-hour by dividing into SET & RUN	Standard manhours on mfg. shop order Product result Item to be improved Manufacturing problem, Performance and the improving schedule Price & cost data table by actual result()Divide into non-recurring & recurring expenses)	Check the result according to checklist Select of drill-check point. Clarify the item(draft) for improvement.(Estimate necessary amount money for improvement) Decide which price system can be taken "fix price or lot size pricing" (See remarks)		Review and determine the necessary matter between our company and vendor, and the engineering and purchasing person in charge to summarize the actual result in manufacturing and performance. Apply the learning curve. Take corrective action for material and parts by actual measurement & actual purchasing price. Clarify process cost by the difference between actual and the standard time. In lot size pricing, the price is decided according to the lot size ordered in proportion to non-recurring & recurring expense.	
Steady phase	Stage where stabilization begin after lot 3. Re-evaluation for reasonable price	Schedule to put into practice the draft for improvement of production Extraction of controversial points from contingency standpoint Terms & conditions for improvement () List of what prices are consistent () Data to review establishment of price & delivery terms	Proceed technical survey Calculation of standard manhours Check and find the difference in technique by comparing standard manhours between two vendors.	Periodic report of the results executed for promotion. Established practical method by eliminating the contingency factors. Examined result by our company of the price, cost data, profit & re-establishment of unit price as required Established schedule to proceed annual review	Review the result by specialist Refer to standard quality Check according to checklist Equalization of profit Decide the theme to be reviewed annually Establish VA plan to proceed	Price standard manhours x rate + C.C.I.P Use cost analysis technique Use learning curve costing technique.	(Check according to cost analysis technique by using cost and price breakdown table)	
Review phase	Annual review & stage of analysis)	Submitted theme to be reviewed Submitted items to be examined with VA contract Policy and examination of design changes	Settle the contents of VA contract Settle the contract Design changes as necessary	<ul style="list-style-type: none"> Items put into practice as a result of review Summarization of VA. activity results. Enforcement schedule for design change. 	Review and negotiate the reasonable price due to a recommendable price, according to design change	Method of cost analysis by using price and cost breakdown table. Wage rate Standard price of material Escalation clauses with indices	<ul style="list-style-type: none"> Related matter to be discussed Standard of VA contract(draft) 1st year to pay vendor 50% of money saved by VA. after subtracting the money to proceed VA. activity. 2nd year; Pay 40% 3rd year; " " 30% 4th year; " " 20% 5th year; " " 10% (Note: This clause is not necessary when investigation cost for improving is allocated and contracted to be paid)	

Fig. 5.1-2 Position of reasonable price and categorization by name



Note 1. \rightarrow Means one way, \leftrightarrow means possibility of mutual adjustment.

Note2. Policy of purchasing price consists of the following elements:

1. Sort of price

- (1) From the viewpoint of cost price : Consistency, expenses, accounting, special price, actual expenses and estimate price
- (2) From the viewpoint of contract : Compromise, agreement, negotiation, contract, large demand, rough estimate, reasonable, fixed, custom, precedence, billing, proposal, JASDF, development, reviewed and correct price
- (3) From the viewpoint of free market : Freedom, market, fixed price, precedence, contract, acquired matter, domestic, international, uniformity, competition, supply, price of demand, whole sale price, official quotation, open price
- (4) From the standpoint of control : Control, official rate, distinction, uniformity, accounting, compensation for expenses set up by Defence Agency
- (5) From the standpoint of monopoly : Monopoly, exclusive, one-sided, agreed price based on supply and demand
- (6) From the standpoint of domestic industry protection ; Official rate, control, negotiation, contract, encouragement, compensation of cost price, distinction, duplication, precedence, existing price
- (7) From the standpoint of calculating skill ; Rough estimate, schedule, budget, precedence, cost accounting, solidity, bareness, rate of diminution, standard cost & basic price

2 . Example of background rule to be mainly picked up

- (1) The rule of maintaining degree of operation
- (2) The rule of adequacy
- (3) The rule of proper timing
- (4) The rule of sharing burden of proportional expenses.
- (5) The rule of traditional system
- (6) The rule of techniques
- (7) The rule of solvency
- (8) The rule of substitution
- (9) The rule of maintaining position in the market

3 . The rule of maintaining position in market of purchasing price

- (1) A type of active price ; There are price plotting & initiative types
- (2) A type of passive price

Fig. 5.1-3 UNIFORM COMMERCIAL CODE § 2-206

Basic concept to form a contract by relationship of offer and acceptance
in UNIFORM COMMERCIAL CODE Chapter 2-206

UNIFORM COMMERCIAL CODE

§ 2-206. Offer and Acceptance in Formation of Contract

- (1) Unless otherwise unambiguously indicated by the language or circumstances
 - (a) an offer to make a contract shall be construed as inviting acceptance in any manner and by any medium reasonable in the circumstances;
 - (b) an order or other offer to buy goods for prompt or current shipment shall be construed as inviting acceptance either by a prompt promise to ship or by the prompt or current shipment of conforming or non-conforming goods, but such a shipment of non-conforming goods does not constitute an acceptance if the seller reasonably notifies the buyer that the shipment is offered only as an accommodation to the buyer.
- (2) Where the beginning of a requested performance is a reasonable mode of acceptance an offeror who is not notified of acceptance within a reasonable time may treat the offer as having lapsed before acceptance.

Fig. 5.1-4 Conditions format of estimate for product to be developed (Format A)

<u>To:</u> _____	Division	<u>Date of issue</u>	<u>Person in charge</u>
		<u>Date of answer</u>	<u>Person in charge</u>
<u>Conditions Estimate (Form A)</u>		<u>Date of decision</u>	<u>Person in charge</u>

The purpose of these estimate conditions is to clarify and agree before product estimation.
However adjustments can be made if circumstances and time are changed.

Part No.	Nomenclature	Qty / Aircraft	Year					
			No. of aircrafts					
			Delivery					

No.	Item	Our proposal	Your proposal	Agreed	Note
1	Delivery price				This column item can be skipped before going to the next step.
2	Specification	Drawing Engineering Spec.			Vendor must write the conditions to agree to our requested price as necessary
3	Manufacturing hourly rate				
4	Category of man-hour rate (in house, sub-con)				
5	Lot size				
6	Material cost	Actual result or estimated			Clarify whether result or estimate.
7	Jig cost	Show plan of number of tools			Show a price/cost structure table for high cost tools and jigs.
8	Development cost	Cost must be developed to phase plan			Use price/cost table.
9	Yield rate				
1 0	G.C.I.P				
1 1	Price contingency negotiating conditions				
1 2	The risk until first delivery	Your company owes cost of development			If you do not need to owe the risk cost, how much does the price changes?
1 3	Escalation formula				
1 4	Learning curve %				

Fig. 5.1-5 Conditions format of estimate for reviewing the product price (Format B)

To _____ Division _____
 Date of issue _____ Person in charge _____
 Estimate conditions (Format B) _____ Date of answer _____ Person in charge _____
 Date of agreement _____ Person in charge _____

Part No.	Nomenclature	Quantity / Aircraft	Note

No.	Item	Our proposal	Your proposal	Agreed	Note	
1	Learning %	Set				
		Run				
2	SET TIME Standard time					
3	RUN TIME Standard time					
4	Manhour rate					
5	Yield rate					
6	Amotizing expenses					
7	G.C.I.P					
8	Conditions for making the price/cost structure table	A	Item	Each part } Each process }		
		B	Manhour rate			
		C	Std. Time Basis			
		D	Lot size			
		E	Number of aircrafts for allocated expenses			
		F	Others			
9	Material to explain the jig cost					
1 0	Material to explain the development cost					
1 1	Others					

5.2 How to use a price/cost breakdown table for cost control

5.2.1 Introduction

5.2.2 What is a price/cost breakdown table

5.2.3 Price/cost breakdown table to understand cost

5.2.4 Price/cost breakdown table to provide room for cost control

5.2.5 Discussion

5.2.1 Introduction

This section describes the objectives of a price/cost breakdown table and how to use it effectively in cost control.

5.2.2 What is a price/cost breakdown table ?

A price/cost breakdown table (Figure 5.2-1) shows the details of a product, or the product's component prices and process costs.

To clarify or try to clarify the details of price and cost, the table provides a map and scale, or a draft plan for all the fields where reasonability is required, such as technique, quality control, cost control, cost itself and production span. When this is further divided to clarify the details of cost, the table:

- (1) provides a map to check any cost mistakes (i.e., the cost is too high or too low) and any room for improvement, and
- (2) provides a map and scale for cost control

Subsections, 5.2.3, "Price/cost breakdown table to understand cost" and subsection 5.2.4 "Price/cost breakdown table to provide room for cost control" will describe the way of thinking and viewpoints for (1) and (2).

5.2.3 Price/cost breakdown table to understand cost

The price/cost breakdown table indicates the details of a price and its effect in any situation where price reasonability is required. To concentrate on the points of the table, this subsection describes the effectiveness of the table in understanding cost, and eight principles for

understanding cost. The basic thinking behind the eight principles is based on the doctrine of the DTCN/DTC methods, that is, "the utmost purpose of an enterprise is to create customers; to create customers, the enterprise must survive; and to survive, it must earn a reasonable profit." It is also based on the thinking of the steplist for a reasonable price.

When the price/cost breakdown table is used on the basis of this thinking, prices and costs can be understood by recognizing and introducing the following 8 principles:

First principle

Most of the cost of a product consists of labor cost, appropriate profit, and a small sum of tax, excluding raw minerals and ore that can only be purchased at the market price.

Second principle

It is always possible to find an reasonable cost through "reconsideration", taking account of wage increases. The following explains why and outlines the measures to find the reasonable cost:

- (1) Some cost estimates may be on the safe side, whereas others may include missing costs. The missing costs must be recovered.
- (2) Cost is improved as time passes, without exception. In particular, because risk cost is removed after completion of a prototype and when production has stabilized, the total cost can be reconsidered and improved (based on the thinking of a steplist for a reasonable purchase price).
- (3) Closely examining the details of price and cost using a price/cost breakdown table yields several views. As for man-hours, on which labor cost is based, Figure 5.2-2 shows a learning curve indicating the relation between production quantity and man-hour reduction.

There are the following 2 views of the estimated man-hours using the learning curve.

Estimated man-hours using the learning curve, starting from initial results (curve from the direction of A in figure 5.2-2)

Estimated man-hours using the learning curve, starting from standard manhours (bottom of learning curve) (curve from the direction of B in the figure 5.2-2)

Based on the above views, A, and B, C, and D in Figure 5.2-2 can be explained as follows:

A: Man-hours after sufficient reduction, or when work contents are well known and controlled. According to the late Hisaichi Yano of the Japan Defense Agency, who proposed the man-hour learning curve rate, the learning curve rate should be used only when the man-hours are not

known.

B: The difference between the standard man-hours (bottom of learning curve) (A) and estimated man-hours when a certain Serial is set as the bottom of the reduction and man-hours are returned to younger Serials by a learning curve.

C: Remainder after subtracting A and B from the actual result line (almost any cost collected from an actual site ("Genba") can be said to not have been sufficiently improved), from the viewpoint of exhaustive cost reduction.

D: Remainder after subtracting A from the actual result line (result in C).

D is the "difference of information" for finding a reasonable cost. Negative D indicates that man-hours have been greatly improved over standard man-hours. Positive D indicates that there is room for improvement.

The positive D is viewed as including insufficient control or effort. The review, or cost reduction, can be processed according to the following principles, and actualized according to the 3-5 phase improvement method.

Third principle

It is always possible to obtain, prepare, or investigate a price/cost breakdown table for any object when the following conditions are met:

- (1) There is no in-house or intra-organizational obstruction to providing and investigating a price/cost breakdown, as long as there are reasonable purposes and standpoints, and
- (2) The basic material contract transaction (see Material 5.2-1) has been concluded.

This contract is usually concluded when Japanese corporations make a transaction. Article 5 allows for a request for a price/cost breakdown table, and Articles 20, 27, and 38 allow for an investigation at B's facilities. Investigating the price/cost breakdown table provides a map that indicates which part of the cost can be examined and improved through the cooperation of both parties (Material 5.2-2 indicating the notification of the Ministry of International Trade and Industry on the next page of Material 5.2-1 is the guideline for examining and improving the cost between companies).

(When an enterprise, such as a trading company, exists between the purchaser and the manufacturer, Article 20 of the contract should be revised so that it also applies to the third party and so on.)

Fourth principle

Before requesting or "reconsidering or reviewing" a price/cost breakdown table, it is necessary to reach an agreement on the reconsideration for review policy as in Table 5.1-4, or the estimate conditions for reviewing the product price, as in Table 5.1-5. This is essential for directing subsequent jobs and avoiding possible disputes.

Fifth principle

A price/cost breakdown table for each part or process will provide technical experts on general processes with a map for looking through and understanding the detailed purchase part and the man-hours of the process to be improved.

It also helps us:

- (1) approach problems and find solutions by assuming numerical gaps to be technological gaps (note: the technique includes control or management technology),
- (2) detect processes containing unnecessary man-hours, and
- (3) compare "similar parts" more easily.

(Note) The following story exemplifies (1) (See Figure 5.2-3).

A price/cost breakdown table showed that the process of cutting a 1 inch diameter steel rod required 1 man-hour. Although the experiences of the author suggested that the work required 10 to 15 minutes at most, he did not immediately discuss the matter, but investigated the field site of the process. As a result, it was shown that the steel rod was cut with a reciprocating metal saw instead of the cutting-off tool of a lathe. As shown in this example (Fig. 5.2-3), a numerical difference in the estimate of man-hours becomes evident when there is a difference in technology.

Sixth principle

The most important principle when a problem is detected or suspected after reconsidering or reviewing a price/cost breakdown table is to observe the field side (genba) or facilities and make an opinion based on observation without requesting an explanation of the problem. It is an important principle to start from an opinion based on the field (genba) site and have frank discussions about the possible improvements.

Treating the problem from the opposite process direction will lead to unproductive disputes, failure, or bad relationships (See Figure 5.2-3 left side "bad approach process"). To start from observation at the field (genba) site is an absolute principle.

Seventh principle

The final reasonable price is obtained from the following formula:

Final reasonable cost = { minimum standard cost } \pm overall adjustment factors

Minimum standard cost: minimum cost that can be understood

Overall adjustment factors: factors to be taken into account of the period and plant rate of operation before the minimum standard cost is obtained

See Section 5.3 "Price Determination Criteria" for the overall adjustment factors.

Eighth principle

A reasonable profit added to the final reasonable cost is essential for a company to survive. When a project cannot keep a reasonable profit due to competitive market prices, the impartial profit or transitional negative profit must be allocated to each party before getting reasonable profit. When there are no future prospects of reasonable profit, the project must be discontinued.

5.2.4 Price/cost breakdown table to provide room for cost control

Cost control is adjusting various costs in order to manage a company or implement a national budget. Cost control is easy when each cost is accurately understood. The previous subsection described how to use a price/cost breakdown table to understand costs. This subsection describes the clues for using the price/cost breakdown table for cost control.

Table 5.2-1 exemplifies the checklist of purposes to make a price/cost breakdown table in cost control. Table 5.2-2 is the checklist for cost control original check.

(1) Summary of a price/cost breakdown table as a place to give keys to controlling costs

A price/cost breakdown table that reveals cost details in numerical values is effective in any field where reasonable costs and prices are required.

Because the price/cost breakdown table can express cost factors of processes, parts, or functions using numerical values, it can provide the place and scale for cost control by the following:

The cost factors, when expressed using numerical values, can be compared with standard or

empirical values, or those obtained in other companies or at other job sites.

The difference obtained by the comparison of numerical values can be considered to be the difference in technology, control level, or way of thinking, and can be the starting point of an approach (the difference in technology includes that of cost control technology).

As for the compared numerical values, the difference can be considered the possible width of improvement. The rate can be considered the possibility of realizing the improvement.

The difference and rate obtained from the comparison can be used as the order of the improvement work, and as the parameter that indicates the investment limit for the improvement.

To make the price/cost breakdown table effective as a method of cost control, the "preparation of estimating conditions" or "estimate condition specifications" have to be decided according to the following criteria:

Cost may vary according to standpoint, time, conditions, criteria, and other materials as time passes.

Therefore, to make the price/cost breakdown table effective as a contact of cost control, it is necessary to clarify the purpose and preconditions for making the table. Then, based on mutual agreement, improve the matter or thing.

When the stepwise preparation and use procedures of the price/cost breakdown table are considered from the above viewpoints, the "steplist for cost control procedures" and the "steplist for budget preparation procedures" can be formed.

(2) Preparation of the price/cost breakdown table for cost control and the steplist for the procedures to use the price/cost breakdown table

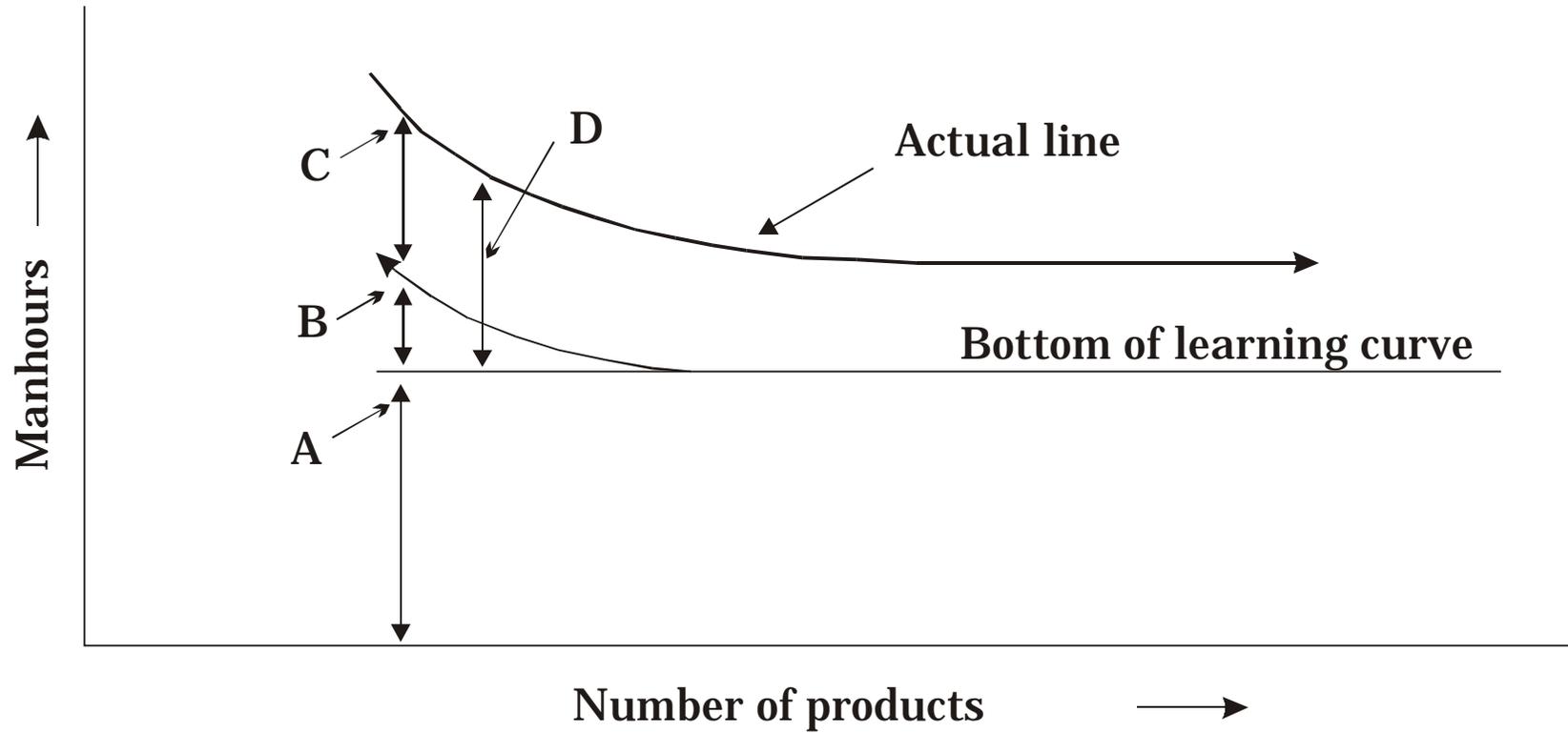
The steplist in Table 5.2-3 summarizes the general procedures for preparing and using the price/cost breakdown table for cost control.

5.2.5 Discussion

This section discusses the way of thinking of a price/cost breakdown table for a case in which an agreement was reached concerning wage rate. However, because the calculation of the man-hour rate is affected by the plant's rate of operation, the wages of the laborers, and the

plant equipment amortizing cost, the calculated man-hour rate is not always applicable (also due to the competition with other companies in the same industry). This may affect actual price determination. It is necessary to refer to the cost calculation manual for each industry (such as the airplane manufacturers' cost calculation manual; Japan; 1959) to calculate man-hour rates.

Fig. 5.2-2 Two ways of looking at the learning curve



Reference material 5.2-1: A extracted Example of Basic Contract of Material Transaction prepared by Japan Purchasing Management

BASIC CONTRACT OF MATERIAL TRANSACTION

AA Co, Ltd,(hereinafter called A) and BB Co, Ltd,(hereinafter called "B") agree here as follows concerning to the basic items which are required for the contract of sales of material, equipment, and parts or consignment manufacturing (including consignment repair; same in the following).

SECTION I CONTRACT

Article 1 Basic Contract and Individual Contract

1) The details specified in this Basic Contract shall be applied to an individual transaction (hereinafter called "Individual Contract") based on this contract between A and B unless otherwise specified.

2) A and B shall fulfill the contract according to the terms of orders placed by A and the dealing procedures, specifications, drawings and standards specified by A in addition to the terms of this contract.

3) A and B may exclude a portion of this contract or determine other terms than this contract in Individual Contracts.

Article 5 Submission of Quotation

1) B shall submit quotations at the request of A. And when requested by A, breakdown details of the quoted price shall be submitted promptly according to the forms requested by A.

2) In case of quotation, B shall not make any unfair action such as consulting before the bidding and other matters.

Article 20 Inspection on Demand

If required, A may perform Inspection on Demand, in addition to the Acceptance Inspection mentioned in Article 16, of material, parts, jigs and tools, equipment, facilities and so on which are used for the items of consignment manufacturing, and even of the way of manufacturing, fabrication or repair of the ordered items at B's manufacturing facilities,

Article 27 Quality Control

When requested by A, B shall establish the Quality Control system to maintain quality of consignment manufacturing items according to the common quality control specification separately specified by A,

Article 38 Instruction

When it is necessary, A may indicate or instruct B in manufacturing technique, quality, delivery control, facility improvement and safety control etc. on the object items contracted.

Reference Material 5.2-2: Extract of Promotion Standard based on Subcontractor and small Business Promotion Law Article 3, Paragraph 1.

**Promotion Standard
based on Subcontractor and Small Business Promotion Law
Article 3, Paragraph 1**

June 11, 1986
Advisory No.209 issued
by Ministry of International Trade and Industry

No.3 Items relating to modernization of facilities, improvement of techniques and mutual collaboration among subcontractors.

- 1) Modernization of facilities
- 2) Improvement of techniques
- 3) Modernization of management control etc.

(1) Subcontractors shall make an effort to modernize management control and labor management by adopting an effective management method which is adequate to the actual situation of corporation management such as establishment of management plan for long range, management policy, profit plan, funding plan, facilities plan, production plan and so on, and to conduct value analysis and numeric management control system.

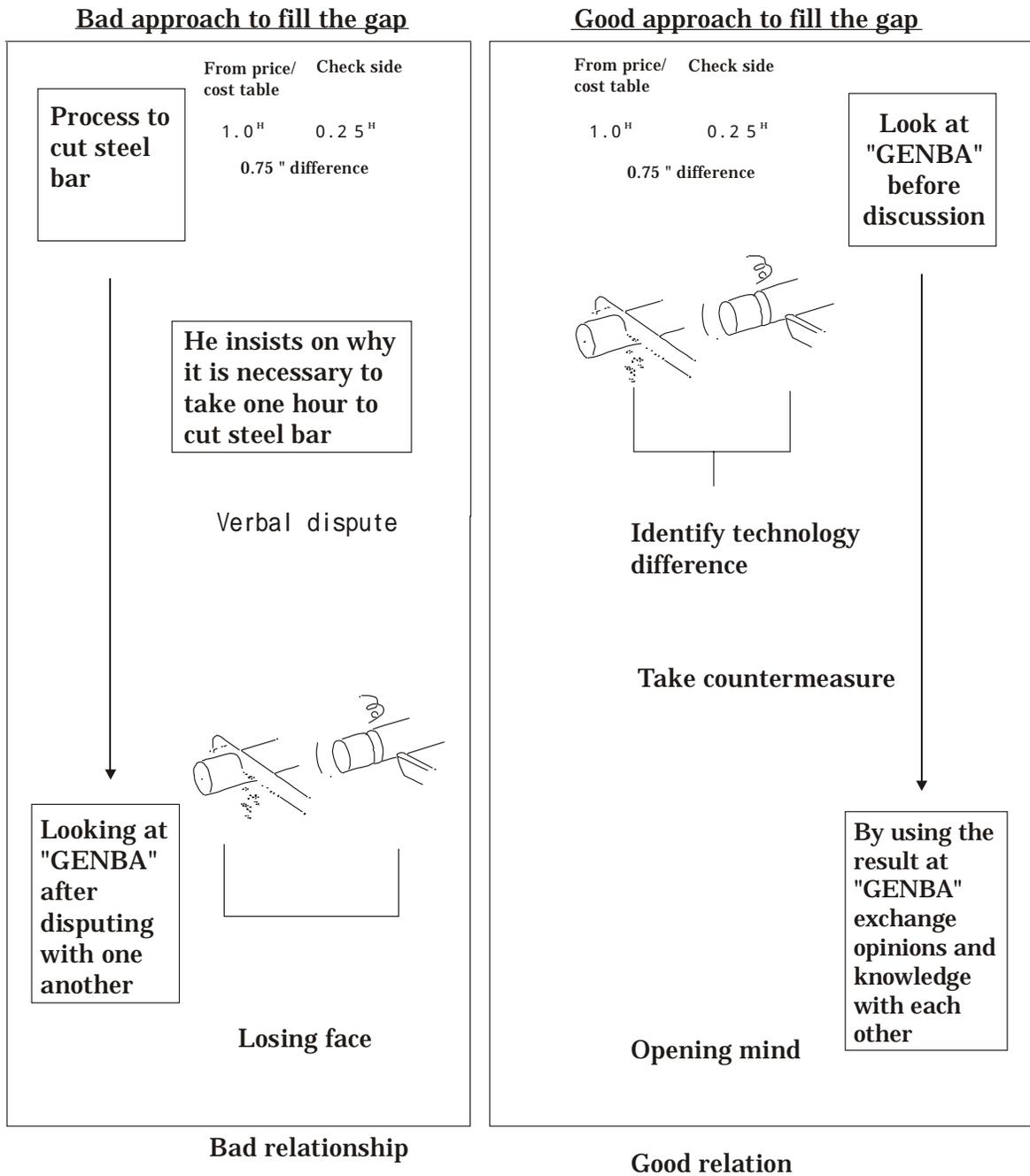
No.4 Items regarding the improvement of pricing method, delivery inspection method and other dealing conditions.

- 1) Improvement of pricing

(1) Dealings price shall be settled by negotiation between subcontractor and parent contractor based upon reasonable calculation method to include proper amount of profit with consideration of quantity, delivery, payment, quality, material cost, labor cost, other expenses and market price trend.

(2) The above-mentioned negotiation shall be made periodically for the items of continuous orders, or whenever orders are placed for the items of non-continuous orders. A record of such negotiation shall be kept by both parties.

Fig. 5.2-3 How to comfortably fill the technology gap difference which is found using price/cost structure table



**Table 5.2-1 Checklist of purpose to make price/cost breakdown table
(Contents will vary depending on the purpose)**

<p>1 .For outside use</p> <ul style="list-style-type: none"> (1) To obtain the budget (2) To decid sales price (3) To propose a preliminary estimation for customer (4) To explain or understand the practical result of the present status <p>2 .For inside use</p> <ul style="list-style-type: none"> (1) To proceed “design to cost” (2) To proceed design value analysis (3) To select vendor (4) To decide inside production or outside production (5) To sum up or allocate the budget (6) To decide and manage the target of each assignment or working group (7) To create a place to do the following jobs: <ul style="list-style-type: none"> a . To express the process in numerical form in order to analysis and make improvement b. To find waste by expressing the process and cost in numerical form c. To analyze manufacturing engineering problem d. To analyze how to keep the rate of operation of each working place e. To compare with standard superior benchmark f. Comparison of companies g. To establish parameters to allocate jig cost etc. for improvement (8) To allocate the target
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Table 5.2-2 Cost control original check

<p>The baseline of cost control is to control the following four(4) items from the standpoint of profit ratio over operating capital.</p> $\text{Profit ratio over operating capital} = \frac{\text{Profit}}{\text{Operating capital}}$ <p>(Operating cost is the sum of current assets and fixed assets)</p> <p>1 .How to reduce the fixed cost in total cost</p> <ul style="list-style-type: none"> Ex. a. Sell surplus equipment (Reduce the depreciation ratio) b. Reduce or move unnecessary staff c. Reduce overhead administrative expenses <p>2 .Reduce recurring costs</p> <ul style="list-style-type: none"> Ex. a. Change transportation vehicles (air sea, sea air) b. Reduce the operating costs of manufacturing c. Reduce material costs by improving material layout d. Reduce cost by changing design e. Reduce waste <p>3 .Reduce fixed asset ratio or obtain profit</p> <ul style="list-style-type: none"> Ex. a. Sell surplus equipment b. Reduce inventory(safety stock) <p>4 .Reduce variable/current assets</p> <ul style="list-style-type: none"> Ex. a. Collect bills quickly, reduce credit b. Rotate stock quickly and reduce inventory c. Reduce making span

Table 5.2-3 Steplist for making and using price/cost structure table to proceed with cost control

Phase No.	Step	Step contents	Input		Output		Notes	Output approval level
			Item	Pre-assurance activity	Item	Post-assurance activity		
I	Planning phase by price/cost structure table	Objective concept to make price/cost structure	1.The purpose 2.The object 3.The target	1.Use cost control purpose checklist 2.Use of this steplist	1.Specifications and conditions to make price/cost structure table(draft) (Estimate conditions)	1.Start to partially fill in the price/cost structure Table 2.Check by cost control purpose checklist		
II		Conditions to make price/cost structure table (Conditions to estimate)	1.Specification and conditions to make price/cost structure table(draft) (Conditions to estimate) 2.Material which can be obtained	1.Extract and adjust the problem and conditions to make price/cost structure table 2.Identify data level(which will show WBS level) 3.Use grade of estimate 4.Use design steplist 5.Use reasonable price steplist 6.Choose the practical result record or just the estimation	1.Specification and conditions to make price/cost structure table (Estimate conditions)	1.Fill in the format	1.Agreement or decision must be made about specifications and conditions by; a Agreement among related people, or b. As the policy of the highest level person	
III		Procedure for making	1. Specifications and conditions to make price/cost structure table(draft) 2. Format of price/cost structure table	1.Fill in the following items in price/cost control table; a The purpose b The standard reference c Caution(e.g. for outside or inside company)	1.Cost item level 2.Detailed level of cost items 3.Who is responsible for that cost item and its contents	1.Follow the policy to fill in the price/cost table depends on the purpose	1. The meaning of "who is responsible to that cost item and conditions" is what group is responsible, e.g. a Design group, or b Manufacturing planning group	
IV		Procedure for making details	1. Cost item 2. Detailed level of cost item 3. Who is responsible for that cost item and its contents 4. The purpose	1. In order to attain the target, review and adjust who and how to make price/cost table	1. Summarized policy who will fill in the data of each item 2. Price/cost table making schedule	1. Follow the policy of data a Standard manhours b Resultant manhours c Allocated manhours d Similar part cost e Book value f Year price	1. As necessary, each data has to be accompanied by e.g. a Safety factors b Improvement rate c Margin	
V		Work to make price/cost structure table	1. Data policy 2. Who is responsible to fill in the data 3. Schedule	1. Make price/cost table of company	1. Specs. and conditions 2. The data-filled price/cost structure table 3. Focus point to attain the target	Compare data with; 1. Standard cost list 2. Function cost list 3. Market cost list	1. After comparison of data; a The larger the ratio is, the easier it is to improve b The larger the difference is, the greater the improvement Therefore, focus on the larger priority of a or b	
VI	Cost control phase	Cost control action by price/cost structure table(Plan)	1. Specs. and conditions 2. completed price/cost table 3. Focus to realize the target 4. Review policy	1. Identify starting focus is to starting focus to be start with difference between sum of the price/cost table and target cost.	1. "Do" cost control policy 2. Action item priority 3. Extracted conditions to proceed 4. Schedule 5. Allocation of assignment	1. Use the difference and ratio priority to proceed 2. Raise the adjustment level if lower level Management has difficulty adjusting the conditions to proceed the project	1. Example how to decide priorities; a. Difference priority + ratio priority = "Do priority" b Add the weight of importance to the items, as necessary	
VII		Implementation of cost control(Do)	1. "Do" cost control policy 2. Action item priority 3. Extracted conditions to proceed 4. Schedule 5. Allocation of assignment	1. Proceed "Do" of cost reduction or cost control work	1. Attain ratio % of each implemented work item	1. Evaluate the attained Result 2. Compare with other Results of cost reduction or cost control activities		
VIII		Result review of cost control (See-Check)	1. Ratio % of implementation result 2. Evaluation of ratio % 3. Comparison result with other cost reduction/cost control activities	1. Find the problem and engineering work from the difference of compared ratio % and make a plan to resolve it	1. The still unsolved problem and priority 2. Next countermeasure 3. next step schedule	1. Improve countermeasure 2. Accumulate the learned results as a base of know-how	1. If a big problem still exists, return to appropriate step above	

5.3 Price Determination Criteria

5.3.1 Introduction

5.3.2 Pricing principles

5.3.3 Purchase price policy and the overall adjustment factors of the policy

5.3.4 Types of prices

5.3.5 Viewpoints required for purchase price policy

5.3.6 Purchase price patterns and the factors to change them

5.3.7 Purchase market investigation

5.3.8 Technical purchasing ability

5.3.9 Discussion

5.3.1 Introduction

This section describes the principal price design standards that form the background for the "steplist for reasonable purchase price" and "how to use a price/cost breakdown table" from the viewpoint of purchasing control. The standards clarify the basis for determining prices. The materials which are used are supplied by the Japan Association of Purchasing Management and are commented on by the author.

5.3.2 Pricing principles

To purchase the optimum quantity of a material at the optimum price with optimum timing is the principle of quantity, price, and timing. Therefore, material purchasing must be based on the purchase request of a material plan, be in accordance with a purchase standard, and be done at an optimum purchase price. To determine the optimum purchase price, suppliers are selected whose estimates are compared with each other as well as with reference and budget costs. Moreover, other factors, such as market conditions, must be taken into account. It is also essential to make a purchasing contract.

(1) Since the optimum purchase price varies according to the moment of evaluation, the price is decided by the following formula:

Optimum purchase price = {Minimum standard price} \pm the overall adjustment factor

Therefore, the person in charge of purchasing decides an optimum purchase price by finding or confirming the minimum purchase price at each time point, and considering the overall adjustment factors. The

overall adjustment factors are one or more of the factors described in the purchase price policy in the next subsection, 5.3.3.

(2) The minimum standard price is based on the following factors:

estimate conditions;

the technical requirements, such as standard and quality assurance conditions, shown at evaluation;

cost standard (standard man-hours based on a certain technical standard and material cost standard);

and

the lowest price among similar products

5.3.3 Purchase price policy and the overall adjustment factors for the policy

5.5.3.a Overall adjustment factors explained in this subsection

Purchasing price policy is the single or combined policy established by the purchasing department of the company to determine reasonable prices according to the principle for purchasing budget preparation and purchasing. The overall adjustment factor(s) taken into account as a single factor, or weighted and combined factors, are meant to lead the buyer's and seller's policies to the final agreement on reasonable prices. This subsection describes the following items in the purchase price policies and the overall adjustment factors:

(1) Types of price

(2) Viewpoints required for purchase price policies

(3) Purchase price patterns and factors to change them

(4) Purchase market investigation

(5) Technical purchasing ability

5.3.3.b Other adjustment factors

Other than the above, there are the following adjustment factors:

(1) Operation rate

(2) Actual GNP growth rate (See note)

(3) Nominal GNP growth rate (See note)

(4) Rate of increase in labor costs and prices

(Note) These increase scales are effective in detecting any abnormal changes in price because the scales become linear when converted to logarithmic scales, such as in land prices.

5.3.4 Types of prices

Prices can be classified from various angles. Any price can be called by a different name when different viewpoints are taken. The following introduces various names under which to categorize the ways of determining prices.

5.3.4.a From the standpoint of cost

- (1) Stratified price
- (2) Expense plus profit price
- (3) Calculated price
- (4) Specific price (when purchased from multiple companies)
- (5) Cost plus profit price
- (6) Expended lost result indemnifying price
- (7) Planned price

5.3.4.b From the standpoint of contract

- (1) Compromised price
- (2) Agreed price
- (3) Technology price
- (4) Contract price
- (5) Bulk demand price
- (6) Provisional price
- (7) Approximate price
- (8) Appropriate price
- (9) Fixed price
- (10) Traditional price
- (11) Previous price
- (12) Bid
- (13) Proposed price
- (14) Defense Agency price

(15) Development price

(16) Reviewed price

(17) Conventional price

5.3.4.c From the standpoint of a free market

(1) Free price

(2) Market price

(3) List price

(4) Net price

(5) O.E.M. price

(6) Official price

(7) Custom price

(8) Previous price

(9) Contract price

(10) Acquired price

(11) Domestic price

(12) International price

(13) Fixed price

(14) Bid

(15) Competition price

(16) Supply price

(17) Demand price

5.3.4.d From the standpoint of control

(1) Controlled price

(2) Official price

(3) Agreed price

(4) Discrimination price

(5) Fixed price

(6) Calculated price

(7) Cost result indemnifying price

(8) Defense Agency price

5.3.4.e From the standpoint of monopoly

- (1) Monopoly price
- (2) Oligopoly price
- (3) One-sided decision price
- (4) Historical price
- (5) Natural law price

5.3.4.f From the standpoint of domestic protection

- (1) Official price
- (2) Controlled price
- (3) Negotiated price
- (4) Contract price
- (5) Promotion price
- (6) Expended result cost indemnifying price
- (7) Specific price
- (8) Dual price
- (9) Previous price
- (10) Existing price

5.3.4.g From the standpoint of calculation technology

- (1) Approximate price
- (2) Planned price
- (3) Budget price
- (4) Previous price
- (5) Calculated cost price
- (6) Fixed price
- (7) No profit price
- (8) Leaning curve price
- (9) Cost standard reference price

5.3.5 Viewpoints required for a purchase price policy

In the previous subsection, prices were classified by name. This subsection introduces the viewpoints for politically considering each of the strata constituting a price.

When a price is determined, the following viewpoints have to be taken into account as occasion

demands.

(1) To keep and improve the plant rate of operation

Actions to minimize an allocated fixed cost per unit by eliminating idle facilities and keeping full operation

(2) Appropriate quality

To keep quality in compliance with technical requirements

(3) Appropriate timing

Keep appropriate timing of delivery, reasonable price with appropriate evaluation of time and the evaluation time, deadline, and technical requirements (See the steplist for a reasonable purchase price)

(4) Compensation of proportional cost at minimum level

To keep minimum plant operation cost by compensating only proportional cost even at the sacrifice of the fixed cost, if necessary

(5) Tradition of technology

To keep the quality and the tradition of technology in wartime by taking on a one-company or two-company policy.

(6) Priority given to technology

Emphases on developmental and production technologies, and to owning specific facilities.

(7) Solvency

Not placing a strong emphasis on discounting by bulk purchasing, but confirming the relation between the solvency of each purchaser, and the bulk purchasing and possibility for products to become outdated during long-term storage.

(8) Replace-ability

Examination of whether a currently used product can be replaced with other products, and whether there is a way to improve it

(9) Maintenance of market position

Maintaining the current market position by taking several measures.

5.3.6 Purchase price patterns and the factors to change them

The types of purchase prices and the viewpoints about the STRATA in each price were described in the previous subsections. This subsection describes what kinds of patterns are used to combine the viewpoints to determine a purchase price. The pattern to combine them depends on the adjusted steplist for a reasonable purchase price and the situation of each project.

(1) Active price type

Price determination by cost planning

The profit plan of a company includes the plans of both profit earnings and costs. A cost plan is made by considering a given market and the sales conditions, expenses, and prices. A purchase policy is decided on the basis of the cost plan, and the pattern of a component purchase price from a vendor must be decided as a part of that policy.

Therefore, to achieve a flexible price policy required by top management, such as the determination of active sales price and the release of a new product, it is necessary to establish a purchase policy and a purchase price plan based on the policy for each project.

Initiative price determination

This type of price determination takes advantage of the dominant position of the purchaser. As in , a purchase price is determined so that it complies with the policy and plan of the purchasing department. It is necessary to determine the base of minimum profit and cost to survive (naked cost) or lowest reference price for this type of price determination.

(2) Passive price types

Pattern of an auto-passive price restricted by the market and its conditions

(3) Supply-demand variation price

(4) Monopoly price

(5) Competition price

(6) Controlled price

(7) Free competition price

(8) Incentive price

(9) Cost compensating price (appropriate profit and compensating price)

When this purchase price pattern is used, it is necessary to maintain a system in which expenses generated by insufficient control are minimized and other factors are not confused with actual expenses.

5.3.7 Purchase market investigation

To systematically perform a purchase market investigation and survey, a purchase manager decides on

the policies concerning the following points every term, and reports and accumulates purchase results so that they help establish subsequent purchase policies, and performs purchase activities.

(1) The items to be investigated or surveyed

The items are selected from important items.

(2) Appointment of person

At least 2 persons are appointed: one must be able to understand man-hours by looking at the plant and process at the site (genba); and the other is a coordinator.

(3) Scope of the research

Domestic and overseas trends in general economic conditions

Because trends are also investigated in sales market research, it is best to do joint research with the sales department, or obtain necessary materials from the control and planning departments, and arrange them in a form fitting the purpose.

Trends in the same product industry.

Production and consumption amounts, and price trends are investigated.

Trends in industries with similar products

The following are investigated and put together:

- A. Trends of companies with similar products
- B. Alternative product trends
- C. Trends of technologically new products

Investigation of distribution process

The following are put together. Special attention is paid to the traditional results and difference from the previous year.

- A. Distribution organization trends
- B. Customer trends
- C. Price statistics trends
- D. Transportation trends
- E. Packaging-style and method trends

5.3.8 Technical purchasing ability

The purchasing department has to have technical purchasing abilities. They include purchase policy, and planning ability, which is the ability to purchase things at reasonable prices compatible with the purchase budget, without compromising "purchase principles." They also include the ability to reduce prices on the basis of sufficient engineering knowledge of the purchased product and skills, as well as the purchasing functions, which I will discuss next.

To obtain these abilities, it is necessary to have cooperation from other departments and that there be a person who is concurrently in charge of both purchasing and other department jobs.

The functions required for the purchasing department include:

- (1) Reasonable price policy planning for each project (through the combination of conventional purchasing and engineering abilities)
- (2) Preparation and use of abilities of a standard man-hour manual, standard purchase cost and standard materials cost
- (3) Estimate and calculation ability of material costs and product cost from materials including drawings, process figures and tables, and suppliers' price/cost breakdown tables
- (4) Analysis and evaluation ability of the adequacy of the price/cost breakdown tables for various materials
- (5) If necessary, reduction of purchase prices by providing reasonable methods for reducing costs and examples, thereby coordinating the improvement at the supplied plant rather than forcing discounts
- (6) Combining the abilities of the engineering, manufacturing, planning, and quality assurance departments in negotiating with suppliers to purchase quality and reliable products at desired prices (Application of the thinking for the steplist for a reasonable purchase price)

To be concrete, the purchasing department plays the following role in the application of the Design to Cost method described in Chapter 7 and the development of new products. When the engineering department finishes an outline (draft) of the specifications of a product, the purchase department asks the engineering department to release the tentatively fixed specifications, the tentatively fixed outline (draft), the estimate conditions (number of models, period, and expected rate with allowances), and the desired purchase prices to a supplier. Then, it requests the supplier to submit a DTC plan to produce the product at the desired price as well as additional ideas, technical conditions, requests, and opinions. Through these procedures, the purchase department makes the framework for mutual adjustment, and guides the adjustments of the contents and prices after the purchase has been decided.

5.3.9 Discussion

This chapter describes a standard for thinking about prices, which is the premise of the introduction to the Design to Cost method described in the next chapter. The information in this chapter provides the clues to making a final decision on prices.