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DRAFT FINAL REPORT

UNIDO Contract : 91 / 175 / VK

Project No. : US / RAS / 90 / 009

"Regional Seminar on Promotion of Standardization and Quality Control
— Achieving Competitive Quality in Malaysia"

February, 28, 1992

Japanese Standards Association

Table of Contents

1. Preface

With reference to the UNIDO Telefax dated 10 September, 1991, Japanese Standards Association (JSA) was awarded the subcontract (No. 91/175/VK) to execute the substantial part of the project : US/RAS/90/009.

The services required for the subcontractor compose of two works : (1) Organization of a seminar on standardization and quality control in cooperation with Malaysian counterparts and (2) preparation of a volume of audiovisual training materials related to the same project.

Both of them have already been completed as scheduled in accordance with the Terms of Reference of the subcontract.

This draft final report describes the execution result of all of the duties including the evaluation of the activities.

2. Background Information

Standardization and quality control (quality management) are essential elements for all countries to realize industrialization and strengthen international competitiveness of their products by improving quality and productivity through rationalized production processes. Therefore, they are the areas of strategic importance on which a particular emphasis should be placed on the promotion of industrial development.

Concerted efforts are required to develop and establish a well-functioning standardization and quality control structure and system which should entail, among other things, an organic link between national standards and quality control activities a. the enterprise level.

In this connection, Japan has succeeded in establishing a firm basis for industrialization through a systematic introduction of standardization and quality control techniques both at the national and enterprise level. Being well aware of the needs and importance of industrial development in a more integrated fashion for developing countries, UNIDO has been actively engaged in the promotion of programmes in the pertinent fields.

Joint technical co-operation of UNIDO and Japan will contribute to accelerating the process of establishing an industrial base and infrastructure in the field of standardization and quality control in the developing countries.

3. Scope of Work

According to the Terms of Reference (Annex 1), the scope of work of the subcontract summarizes as follows :

A: Coordination and supervision of local authorities for provision of facilities and Malaysian counterparts

B: Preparation of working materials with specific information on the Japanese experience on promoting a firm basis for industrialization through standardization and quality control techniques

C: Provision of five lecturers (experts) from Japan including their travelling and DSA costs

D: Preparation of a volume of audio-visual training materials in English including a video tape in three international systems (PAL, SECAM, NTSC).

In addition to the above, the following provision of facilities is required in cooperation with local authorities.

- Conference room with sitting accommodations for 120 people
- Interpretation services (Japanese-English)
- Translation of materials (Japanese-English)
- Photocopying services
- Typing or word-processing services (including secretaries or clerks)
- Microphones
- Audio-visual material : Projector, movie screen, video-tape player, etc.
- Tape recorders
- Podium for lecturers
- Registration desks and ID card distribution
- Catering services
- Hotel reservations
- Transportation services (Hotel – Conference location – Hotel)
- Miscellaneous services

It is to be noted that the preparation of audio-visual training material (video tape) is to be made not specially or exclusively intended for seminar use but for general use; promotional activities by UNIDO in the fields of standardization and quality control.

This point has been agreed upon between UNIDO's substantive section and the subcontractor at the beginning of project implementation.

4. Activities and Achievements

SEMINAR:

The programme was designed and the selection of lecturers was made taking into full consideration the following objectives set up in the project documents.

- Acquainting representatives of government and industry with the significance and real meaning and benefits of standardization and quality control as support activities for their industrial development, the rationalization of production, of import, export process that must be included in their policies and plans, strategies and programmes, along with human and financial resources.

- Assessing the needs of developing countries (principally in the ASEAN region) and maping out action for standardization, metrology, quality control and other related disciplines to serve as engines of industrial growth.

In March, 1991, two JSA staff visited Kuala Lumpur for advance preparation including negotiation with Malaysian authorities (SIRIM) to confirm the respective roles and details for seminar organization.

On this occasion, the details of the seminar programme were finalized as shown below.

1) Title: Seminar on Achieving Competitive Quality Through Standardization and Quality Control

2) Dates: 29th. – 31st. October 1991

3) Venue: The Regent of Kuala Lumpur

4) Invited: Malaysia, Thailand, Singapore, Philippines, Indonesia, and Brunei countries (invitation was made through UNIDO Headquarters)

5) Expected number of participants: 120 middle-class managers and 20 – 30 top managers

6) List of textbooks prepared (Full text attached as Annex 4)

For General Seminar

① Keynote Address

② Total Quality Control (I) (II)

③ UNIDO Presentation of Case Studies

④ Quality Control in Small & Medium-sized Industries (I) (II)

⑤ Panel Discussion (I) (II)

⑥ International Quality Certification Systems

⑦ Aspects of Standards & Certification Systems

⑧ The Need to Implement ISO 9000 in Malaysia

⑨ Implementation of Quality Assurance Activities in Factories

For Top Management Seminar

① Quality – The Key To Success

② Quality Control in Manufacturing (– Japanese Approach)

7) Schedule of the programme

DATE & TIME		CONTENTS
10/29	9:05 – 9:40	Opening Ceremony
	9:40 – 10:00	Coffee Break
	10:00 – 11:00	Keynote Address
	11:00 – 12:30	Total Quality Control (I)
	12:30 – 14:00	Luncheon
	14:00 – 15:30	Total Quality Control (II)
	15:30 – 16:30	UNIDO Presentation of Case Studies
	16:30 – 17:00	Question & Answer
	17:00 – 17:30	Refreshment
	11:05 – 12:30	Seminar for Top Management
10/30	9:00 – 10:30	Quality Control in Small & Medium-sized Industries (I)
	10:30 – 11:00	Coffee Break
	11:00 – 12:30	Quality Control in Small & Medium-sized Industries (II)
	12:30 – 14:00	Luncheon
	14:00 – 15:30	Panel Discussion : Implementation of Quality Control in Small & Medium-sized Industries
	15:30 – 16:00	Coffee Break
	16:00 - 17:30	International Quality Certification Systems (IECQ)
10/31	9:00 – 10:00	1) Aspects of Standards & Certification System 2) The Need to Implement ISO 9000 in Malaysia
	10:00 – 11:00	Implementation of Quality Assurance Activities (ISO 9000) in Factories
	11:00 – 11:30	Coffee Break
	11:30 – 12:45	Panel Discussion : Competing in The World Market
	12:45 – 13:00	Closing Ceremony
	13:00 – 14:30	Luncheon

The number of participants of the General Seminar amounted to 130 to 150 for each day of the three consecutive sessions, and for the Top Management Seminar, about 26 were present. All participants were observed to be an attentive audience having interest in most of the subjects, especially in the case of the Joint Venture, and participation of the panel discussion was very active.

On the last day of the seminar, questionnaires (attached as Annex 2) which had been prepared in cooperation with SIRIM staff were distributed to the participants in order to collect their reactions and opinions about the seminar.

An evaluation report compiled in cooperation with SIRIM including analysis on the participants replies to the questionnaire was attached as Annex 3.

Video Tape:

The first volume "Industrial Standardization and Quality Control" produced previously was a general concept of these themes and was aimed at introducing the outlines of industrial standardization and quality control. Then, we planned to produce a series of Vol. 2 to Vol. 6 covering particular subjects, and we have now produced the second volume under the theme of "Standardization" as the first of these volumes.

Even if it is not a glamorous job, standardization is the most important and basic idea. In this video tape we tried to explain the practice of and points to be considered for company standardization established in enterprises based on international or national standardization.

In the production of the video tape Vol. 2 we held seven meetings of the committee for the production of video tapes under the chairmanship of Prof. Yozo Mukawa, Honorary Professor of Chuo University who had delivered lectures on TQC at the UNIDO seminars in Thailand and Malaysia. This committee was composed of specialists selected from the fields of electricity and electronics, precision machinery and iron and steel, consultants for standardization, and members selected from ministries and government agencies.

We gave special consideration to the following points:

(1) Production of a video tape which would be useful for standardization bodies of individual governments to extend the knowledge among leading technical experts* of industries.

Note)* The technical experts whom this video tape aimed at were neither enterprisers nor field workers but managers and supervisors.

(2) How the purpose, necessity and merits of standardization (demerits without standardization) should be compiled as a story for easier understanding.

(3) How to find enterprises which are sympathetic to the situations of developing countries, because field photographing was not permitted due to enterprise secrecy before.

As a result of rewriting a draft several times with stress on the above points, we prepared a scenario with five main chapters:

(1) Prologue

(2) About Standardization

(3) The Merits of Standardization

(4) Company Standardization

(5) Towards the Future

Especially, with respect to part 4, we could go on location to the Ohtawara Plant of Juki Corporation and take on-the-spot pictures over three days, in cooperation with the company which had been awarded the "Deming Prize" for the first time in the sewing machinery industry in 1981.

To enhance the effectiveness of these video tapes as a teaching aid, sub-text were prepared so that the viewer/listener would not miss the message even though he/she may have not heard or missed the narration.

The video tapes are available in all three video formats: VHS-SECAM, VHS-PAL and VHS-NTSC.

5. Remarks

SEMINAR:

The 1st seminar held in Bangkok, Thailand in January, 1990 was given a very favorable reception. However the seminar was mostly for managers, and we received many opinions that practical affairs directly connected to the activities on the field should also be included.

Participants were composed of those concerned with government officials and members of groups, industrial associations and private companies, and they were people of various kinds and with versatile experiences. It was not easy, therefore, to make a curriculum that would satisfy each person.

This seminar explored the theme "Achieving competitive quality". It was aimed at middle-level managers who were directly responsible for promoting standardization and quality control in their plants. A curriculum was made based on JSA' experiences of seminars and technical cooperation with developing countries over many years; as a result, participants could acquire correct understanding of standardization and quality control, recognition of their importance on the basis of practical measures, and utilization of that knowledge.

Lecturers of the seminar were not limited to Japanese. We asked SIRIM and UNIDO to provide lecturers and also requested joint ventures who were familiar with the situation in Malaysia to arrange lecturers. Further, for panel discussions two themes were selected in which the Malaysian side had an interest. The panelists included not only lecturers from Japan but also those from local private companies, SIRIM and UNIDO representatives and efforts were made to focus on current issues and methods for their solution.

Further, the Top Management Seminar was held at the same time in the morning of the first day. Aiming at the top management of small- and medium-sized industries, we selected a joint venture, which has been manufacturing semiconductors in Penang for nearly ten years from a field of electricity and electronics companies in which Malaysia had interest, and requested it to make the lectures.

Its managing director lectured on the attitude of managers to strengthen competitiveness, and then senior managers spoke on what should be done by enterprises to improve their quality efficiently.

The questionnaires were collected, tabulated, and compiled by SIRIM, and the results are shown in Annex 3.

The number of respondents to the questionnaires were 69 out of the 141 participants in the General Seminar, and the recovery rate was 48.9%. The responses of participants to "Seminar content", "The usefulness of the seminar", "The quality of presentation", "Seminar programme", "Interpreters", etc. were very favorable. Ninety percent of the respondents to "Overall satisfaction" were "very good" and "good", and the other 10% were "average", but "poor" was zero. It is to be noted that UNIDO's presentation of case studies was also favorably accepted by the audience.

This time, questionnaires were not distributed to the participants in the Top Management Seminar, but several keen questions were raised in the seminar. According to the opinions of people of SIRIM and MITI other than local participants, the seminar was very favorably accepted by the participants.

For the 2nd UNIDO Seminar held in Malaysia, therefore, we think that not only the General Seminar but also the Top Management Seminar was greatly successful.

The success in these seminars was wholly due to the excellent arrangements made by staff members of SIRIM and their collaboration with us, and we at JSA wish to express our hearty thanks to the efforts of these people.

From the member countries of ASEAN, one representative from each of IIS of Indonesia, DTI of the Philippines, SISIR of Singapore, and TISI of Thailand was present in the seminar. Therefore, we could receive these representatives from the most appropriate organizations of all the ASEAN countries except Brunei. From this fact, this seminar not only contributed to enhancing the international competitiveness of industrial products of Malaysia which was host to the seminar, but also the results obtained in the seminar will be extended into ASEAN countries and will greatly contribute to the development of these countries. Thus, we think that the purpose of the seminar as a regional one was sufficiently achieved.

Video Tape:

Not a few video tapes as teaching aids for standardization and quality control have been conventionally produced for education within an enterprise, but it is not too much to say that there was no video tape of this kind intended for developing countries.

Therefore, we have specially produced the video tape with a scenario to be used exclusively for extension among managers and supervisors and for their education in industries of developing countries.

The scenario of the video tape in Vol. 2 "Standardization" is so composed that the standardization can be easily understood through conversations of Mr. A and Mr. B, at stages from Chapter 1 "Prologue" citing the inconvenience that anybody experiences on an overseas business trip at the inconformity of a shaver plug and its outlet, Chapter 2 "About Standardization" dealing with cameras and films at hand, traffic-control signs, and symbols and marks in hotels to Chapter 3 "The Merits of Standardization".

Further, the video tape is composed of an integrated story which explains how important the national or international standardization is, from which people in the developing countries will be able to understand Chapter 4 "Company Standardization", watching the on-the-spot film of "Assembly process of a sewing machine" and others, and thus they will really recognize the "importance of standardization" in Chapter 5 "Towards the Future".

It is usually rather difficult to obtain the permission of photographing the process of manufacture, due to the secrecy of a company, but Juki Corporation has been receiving overseas trainees and conducting their training and guidance for standardization as well as for "their education for assembly and maintenance of sewing machines".

In complete cooperation with their "Ohtawara Plant", we could take the pictures of the process of manufacture which composes the central part of video tape Vol. 2.

In addition to the video tapes Vol. 1 and Vol. 2, it is advisable to produce audio-visual aids at a rate of one every year under the following subjects:

Vol. 3 Quality Assurance and Quality System

Vol. 4 Statistical Methods

Vol. 5 Activity on QC Circles

Vol. 6 Total Quality Control (Company Management and Quality Control)

It is expected that the integrated effect of a series of Vol. 1 to Vol. 6 as well as that of education with each particular subject will help promote the popularization and recognition of each subject which will help the industrialization of developing countries and their economic development.

19 July 1991

Annex I

SEMINAR ON PROMOTION OF STANDARDIZATION AND QUALITY CONTROL - ACHIEVING COMPETITIVE QUALITY

TERMS OF REFERENCE FOR SUBCONTRACTING ORGANIZATION

1. INTRODUCTION

Worldwide developing countries are presently facing serious economic difficulties mainly due to critical deterioration of the world market for primary products and the external debt balance problems. Therefore, economic and technical co-operation activities should be focused on the development of export oriented industries. For this purpose, it is essential that the industrialized countries increase their direct investment in the developing countries and that a transfer of technology based on the experience of the former be promoted in order to develop and strengthen the industrial technology capacity in the developing countries.

To be successful in this endeavour, it would be necessary not only to increase the production capacity through strengthening technology development and application, installing new or expanding existing production lines, etc., but also to strengthen the basis for industrialization from a long-term perspective through development of basic technological capacity in the developing countries.

Standardization, quality management and quality control are essential elements for developing countries to achieve industrialization and strengthen international competitiveness of their products by improving quality and productivity through rationalized production processes. In addition, they are prerequisites to expand the world market and promote smooth transfer of technology from the industrialized to the developing countries. Therefore, they constitute the areas of strategic importance on which a particular emphasis should be placed to assist developing countries in order to promote their industrial development. However, many people, including government officials and professionals in developing countries, are still not aware of the significance and importance of these elements upon their industrialization efforts.

This is the reason that as part of the promotional programmes and projects of UNIDO, the Basic Technologies Unit of the Industrial Technology Promotion Division has started a cycle of seminars on the above mentioned subject in order to make countries, governments as well as industrialists and workers of the importance of quality control techniques, not only in the stage of final production, but all along the production process.

We have obtained financing from the Japanese Government for a regional programme that includes national activities. The first seminar was held in Bangkok, Thailand in January 1990 where one participant was invited from each ASEAN country. They showed great interest to have the same kind of activity carried out in their own countries. In this sense, we have decided together with the Japanese counterpart JSA-Japanese Standards Association/MITI-Ministry of International Trade and Industry to have the second seminar in Malaysia.

2. OBJECTIVES

The Seminar will consist of a pilot Programme that aims at creating and increasing awareness in the public and private sectors of developing countries of the advantage of standardization, quality control and quality management on achieving competitive quality, to encourage them to take actions in the different levels, by defining and establishing mechanisms of promoting industrialization and exports through standardization and quality control in developing countries.

In order to achieve this, the programme will:

- Provide the government officials and industry managers with assessed information on the significance and real meaning of standardization and quality control as support capacities for their own activities as well as their countries' industrial development, the rationalization of the production, import and export process, which must be included in their policies and plans, strategies and programmes along with human and financial resources.

- Expand the knowledge regarding practical techniques for standardization and quality control by audio visual training materials.

- Assessing the needs of developing countries (principally in the ASEAN region) and maping out action for standardization, metrology, quality control and other related disciplines to serve as engines of industrial growth.

Output 1

120 middle-class managers (may be government officials, executives, managers and engineers of enterprises) who are directly responsible for promoting and implementing standardization and quality control will receive practical and direct recommendations, envisaged by experiences in Japan and by UNIDO, towards the solutions of problems that they are facing in order to strengthen their competitiveness. (Roughly 120 participants to the seminar are expected.) The Malaysian participants will be selected by SIRIM and subcontractor. One participant will be selected from each other ASEAN country. National Standardization and Quality Control Organizations will be selected and invited by UNIDO

Activities for Output 1

- Preparatory activities: a) in Malaysia administrative organization of Seminar (Subcontractor - SIRIM, February - October 1991); b) in Japan contracting experts (Subcontractor, April - October 1991); in Vienna project co-ordination and study on UNIDO's experience in Standardization and Quality Control and related disciplines (UNIDO, February - September 1991).

- The seminar will be held in Malaysia in October 1991 and will be sponsored by UNIDO in co-ordination with the Government of Japan. The seminar is to promote and to transfer the techniques of standardization and quality control towards middle-class managers in Malaysia and ASEAN countries, who are responsible for promoting the standardization and quality control in enterprises.

Lectures will be presented in English and Japanese. (Text will be in English). (Subcontractor, MITI, UNIDO and SIRIM, 3rd week October 1991).

- In conjunction with the seminar, one full day will be devoted to a needs assessment of countries in the ASEAN region for standardization, metrology, quality control and related disciplines, to help develop and accelerate industrial growth. Together with identifying the needs, actions and strategies will also be identified. (UNIDO staff, 3rd week October 1991).

- A panel discussion is planned. Details will be worked out with Malaysian counterpart. (MITI, UNIDO, SIRIM, Subcontractor, October 1991).

- Post-seminar activities: a) assessment and evaluation of the results of the Seminar in Vienna done by UNIDO, MITI and Subcontractor, November 1991; b) preparation of a final report of the Seminar by Subcontractor, January 1992.

Output 2

20-30 high top managers of Government and private industrial enterprises will receive practical recommendations on the importance of the standardization and quality control and their role in the production process and in the managerial activities in order to strengthen their competitiveness.

Contents and methods will be worked out with Malaysian side.

Activity for Output 2

- Two days parallel seminar of 2-3 hours in the evening for high top managers. Lectures will be presented in English, Malaysian and Japanese. (Text will be in English.) (Subcontractor - SIRIM - UNIDO, October 1991).

Output 3

Summary report, including three case studies, of UNIDO's experience in technical assistance in the areas of standardization, metrology, quality control and related disciplines - (prepared by UNIDO).

Activities for Output 3

- A report summarizing UNIDO's technical assistance to date; and including three case studies, with greater details, on UNIDO's technical assistance in three developing countries. (UNIDO, February - September 1991).

Output 4

Audio-visual training materials for the transfer of practical techniques concerning standardization and quality control that will be utilized on a permanent basis by the countries and regional bodies, with a multiplier effect; and an assessment report on the impact of using the audio-visual training materials.

Activities for Output 4

- The preparation of audio-visual training materials to be distributed to developing countries that will illustrate practical standardization and quality control techniques in visual way, by the subcontracting institution (Subcontractor, February - September 1991);

- The preparation of audio-visual training materials in English (in the three different international systems PAL, SECAM, NTSC) that will be sent to UNIDO for promotional purposes, with distribution to standards institutes in selected countries (Subcontractor, February 1991 - February 1992);

- UNIDO should receive information on the impact of the audio-visual training material on the basis of which an assessment report will be made by UNIDO and MITI of Japan. This assessment report will constitute the basis for similar project development in the ASEAN countries as well as in other countries of the region (Subcontractor, February 1992).

Output 5

A report on the discussions during the seminar that will include, (i) the significance of standardization and quality control as supporting and essential activities of the industrial sector, (ii) a summary of the needs assessment of developing countries, with emphasis on the ASEAN region, and (iii) actions and strategies for meeting the needs, both internal and external, of developing countries in furthering industrial development with proper use of the disciplines of integrated standardization and quality control.

Activity for Output 5

- To prepare a report of the discussions and deliberations of the seminar covering the three points mentioned above (Subcontractor, February 1992).

The programme of the seminar will focus on the following issues:

(a) Total quality control (TQC). The experience of Japan on achieving industrialization and establishing an effective exports system through the introduction of total quality control technologies.

(b) Quality Control in small and medium scale industries.

(c) Aspects of Standards and Certification System (International/Regional/National) plant level.

(d) Outline of the significance of standardization and quality control in the development of national economy. Introduction of quality management to upgrade capabilities and induce productivity and competitiveness in the productive systems of developing countries.

(e) Introduction and implementation of industrial standardization and quality control on factory management. Brief case studies will be presented.

(f) Application of ISO - 900

(g) Utilization of audio visual material as a promotion instrument to support UNIDO on further dissemination of the Japanese experience on total quality control.

3. SCOPE OF WORK BY SUBCONTRACTING ORGANIZATION

A - The subcontracting organization will be directly responsible for coordinating and supervising local authorities for provision of facilities and Malaysian counterparts.

B - Preparation of working material on total quality control (TQC), quality control in Small and Medium Scale industries, Aspects of Standardization and Certification System and others related to industrial standardization and quality control as a promotional tool, with the clearance of UNIDO, to be mailed 2 weeks in advance to the 120 local participants and to the participants from other ASEAN countries, with specific information on the Japanese experience on promoting a firm basis for industrialization through standardization and quality control techniques.

C - Five lecturers (experts) from Japan, selected according to project objectives and programme (see attached schedule), qualified to promote the importance of rationalizing production processes in developing countries through standardization. The subcontractor must provide travelling and DSA costs.

D - Preparation of a volume of audio-visual training material in English, including a video tape in three international systems (PAL, SECAM, NTSC). One hundred copies of each system of PAL and NTSC and 50 copies of SECAM to be provided to UNIDO for application in other developing countries. There will be a specific lecture in the seminar on the utilization of this material on a permanent basis, by Government and regional bodies in developing countries, to support their industrialization efforts through the transfer of Japanese technology, know-how and experience in this field.

4. FACILITIES TO BE PROVIDED BY SUBCONTRACTING ORGANIZATION IN CO-ORDINATION WITH LOCAL AUTHORITIES

- Conference room with sitting accommodations for 120 people
- Interpretation services (English - Japanese)
- Translation of materials (English - Japanese)
- Photocopying services
- Typing of word-processing services (including secretaries or clerks)
- Microphones

- Audio-visual material: Projector, movie screen, video-tape player, etc.
- Tape recorders
- Podium for lecturers
- Registration desks and ID card distribution
- Catering services
- Hotel reservations
- Transportation services (Hotel - Conference location - Hotel)
- Miscellaneous services

5. EVALUATION

A report (5 - 10 pages) on the outcome of the seminar (with the organizer's and UNIDO's point of view) that will help UNIDO - MITI evaluate the results of this pilot project must be submitted by sub-contractor within two weeks after the conclusion of the seminar.

Annex 2

SEMINAR EVALUATION FORM

UNIDO Seminar

On

"Achieving Competitive Quality Through Standardization and Quality Control"

To enable the organizers to evaluate the success of this seminar and to plan future events would you please complete the following questionnaire and return it to the Secretariat before the end of the Seminar.

Please provide the following information about yourself:

☐ Government & State Enterprises

☐ Private Sectors

- ☐ Tiles & Sanitary Appliances
- ☐ Textiles
- ☐ Electric Cables & Conductors
- ☐ Paints & Chemical Products
- ☐ Iron, Steel & Metal Products
- ☐ Foods
- ☐ Plastics & Non-Ferrous Materials
- ☐ Concrete & Construction Materials
- ☐ Cosmetics
- ☐ Medical Equipment
- ☐ Machinery & Vehicles
- ☐ Electric Appliances
- ☐ Others (please specify) .....

Are you knowledgeable in standardization and quality control?

- ☐ Knowledgeable
- ☐ Some Knowledge
- ☐ None

1. Seminar Content

For each session, did the presentation adequately cover the subject?

Please tick Yes or No. If your answer is NO, please explain.

	Yes	No	
SESSION 1			
"Total Quality Control"			
Paper 1 : Total Quality Control (I)	☐	☐	_____
Paper 2 : Total Quality Control (II)	☐	☐	_____
SESSION 2			
"Vendor Total Quality Control"			
Paper 1 : Quality Control In Small & Medium Sized Industries (I)	☐	☐	_____
Paper 2 : Quality Control In Small & Medium Sized Industries (II)	☐	☐	_____
SESSION 3			
"Standards & International Certification Systems"			
Paper 1 : International Quality Certification Systems (IECQ)	☐	☐	_____
Paper 2 : Aspects of Standards and Certification System (International/Regional/ National)	☐	☐	_____
Paper 3 : The Need To Implement ISO 9000 In Malaysia	☐	☐	_____
Paper 4 : Assurance Activities (ISO 9000) In Factories	☐	☐	_____

Please state any further subjects which you would have liked to see included in the programme.

_____

_____

2. Please rate the relevance/usefulness of the Seminar to you.

☐ Very worthwhile ☐ Worthwhile

☐ Some value ☐ Little value

3. Please rate the quality of presentation of speakers (in general).

☐ Very good ☐ Good

☐ Average ☐ Poor

4. <u>Seminar Programme</u>

Are you satisfied with the following? Please tick Yes or No.

	Yes	No
- Documentation and papers	☐	☐
- Seminar timing	☐	☐
- Seminar duration	☐	☐
- Time allocated per session	☐	☐
- Number of participants	☐	☐
- Reception	☐	☐
- Venue	☐	☐
- Hotel service	☐	☐

5. Advance Information About The Seminar

Was there sufficient notice given about the Seminar?

☐ Yes ☐ No

6. Interpreters

Are you satisfied with the simultaneous interpretation given?

☐ Yes ☐ No

7. Please rate your overall satisfaction with the Seminar.

☐ Very good ☐ Good

☐ Average ☐ Poor

8. Other Comments

Please write below any further comments you may have which would help the organizers in the planning of similar events.

_____

_____

_____

_____

_____

_____

Please leave this evaluation form at the seminar reception desk on your way out.

Thank you.

Annex 3

SEMINAR EVALUATION FORM

UNIDO Seminar

On

"Achieving Competitive Quality Through Standardization and Quality Control"

To enable the organizers to evaluate the success of this seminar and to plan future events would you please complete the following questionnaire and return it to the Secretariat before the end of the Seminar.

Please provide the following information about yourself:

[25] Government & State Enterprises

[44] Private Sectors

- [1] Tiles & Sanitary Appliances
- [1] Textiles
- [2] Electric Cables & Conductors
- [1] Paints & Chemical Products
- [2] Iron, Steel & Metal Products
- [4] Foods
- [9] Plastics & Non-Ferrous Materials
- [1] Concrete & Construction Materials
- [-] Cosmetics
- [-] Medical Equipment
- [3] Machinery & Vehicles
- [15] Electric Appliances
- [7] Others (please specify) Agriculture, Electric Accessories, Timber Products, Medical Rubber Products, Building Construction, Battery Water Products, Auto Carpets

Are you knowledgeable in standardization and quality control?

- [31] Knowledgeable
- [37] Some Knowledge
- [1] None

Seminar Content

For each session, did the presentation adequately cover the subject?

Please tick Yes or No. If your answer is NO, please explain.

	Yes	No	
SESSION 1			
"Total Quality Control"			- Too basic/theoretical
Paper 1 : Total Quality Control (I)	62	4	- Not practical
Paper 2 : Total Quality Control (II)	64	3	- Too basic - Does not indicate how to implement
Paper 3 : Presentation of UNIDO Case Study	39	2	- Not practical - Not relevant to 1 participant
SESSION 2			- Insufficient details
"Vendor Total Quality Control"			
Paper 1 : Quality Control In Small & Medium Sized Industries (I)	64	2	- Scope too big
Paper 2 : Quality Control In Small & Medium Sized Industries (II)	66	0	- Very good presentation
SESSION 3			
"Standards & International Certification Systems"			
Paper 1 : International Quality Certification Systems (IECQ)	56	7	- Not relevant - Not detailed - unable to understand. - Difficult to follow talk. - Presentation needs improvement
Paper 2 : Aspects of Standards and Certification System (International/Regional/ National)	59	1	- Not relevant
Paper 3 : The Need To Implement ISO 9000 In Malaysia	62	2	- Greater feedback needed to be given to the public
Paper 4 : Assurance Activities (ISO 9000) In Factories	59	0	

Please state any further subjects which you would have liked to see included in the programme.

Please see Appendix A.

2. Please rate the relevance/usefulness of the Seminar to you.

22	Very worthwhile	36	Worthwhile
10	Some value	1	Little value

3. Please rate the quality of presentation of speakers (in general).

15	Very good	37	Good
16	Average	1	Poor

4. Seminar Programme

Are you satisfied with the following? Please tick Yes or No.

	Yes	No
- Documentation and papers	66	3
- Seminar timing	65	4
- Seminar duration	61	8
- Time allocated per session	57	11
- Number of participants	66	3
- Reception	66	2
- Venue	68	1
- Hotel service	67	2

5. Advance Information About The Seminar

Was there sufficient notice given about the Seminar?

47	Yes	17	No

6. Interpreters

Are you satisfied with the simultaneous interpretation given?

69	Yes	0	No

7. Please rate your overall satisfaction with the Seminar.

19	Very good	43	Good
7	Average	0	Poor

8. Other Comments

Please write below any further comments you may have which would help the organizers in the planning of similar events.

Please see Appendix B

Please leave this evaluation form at the seminar reception desk on your way out.

Thank you.

APPENDIX A

No	Please state any further subjects which you would have liked to see included in the programme
1	Quality in public service.
2	Quality control in management.
3	Presentation by a company which has successfully implemented ISO 9000.
4	Presentation by a local SMI which had problems on quality but had overcome them using TQC techniques.
5	More Malaysian case-studies.
6	More examples of factories QC systems.
7	Implementation of QC.
8	Training courses in QC.
9	Greater emphasis on QC subjects and its implementation.
10	Discussion on factors contributing to the failure of QCC and TQC in general.
11	Rational concepts and programmes in QC and its implementation.
12	Comparisons between different quality systems in the world giving advantages and disadvantages of such systems.
13	Greater in depth presentation of ISO 9000 and its relevance to Vision 2020.

APPENDIX B

No	Other Comments
1	Seminar speakers should have assistants to operate the transparency machine.
2	The topics should be adjusted to suit junior executives. At the moment, the topics are more suitable for top management.
3	Reduce total number of papers presented. Instead give more details.
4	Reduce the scope of each paper but improve practical implementation.
5	Presentation of most of the speakers not attractive enough. Should utilise OHP and slide projector more.
6	Copies of transparencies should be given to participants (2x)
7	Shorter lectures but more discussion sessions.
8	Seating arrangement too tight (1 person's view)
9	Would like to have longer periods for panel discussions.
10	Would like presentations to be in English (2 x).
11	Film/video show on actual methods of practising quality control by factories will be helpful.
12	More details on IECEE.
13	Some lectures can be presented in parallel sessions to enable interested parties only to attend thus allowing more in depth discussions.
14	Such Seminars should be advertised in newspapers.
15	Certificate of attendance should be presented to each participant.
16	More basis courses & QC practices directed to lower category of workers should be held.
17	More such seminars should be held.

1st day

SEMINAR ON
ACHIEVING COMPETITIVE QUALITY THROUGH STANDARDIZATION AND QUALITY CONTROL

Keynote Address

1) Situations and Issues Surrounding Industrial Standardization in Japan

Lecturer: Mr. Makoto Saito
Director General of Standards Department, AIST, MITI

2) The Challenges of Standardization & Quality Assurance in Malaysia

Lecturer: Dr. Ahmad Tajuddin Ali
Controller of SIRIM

SESSION I: TOTAL QUALITY CONTROL

Total Quality Control (I)

– Features of TQC and Deming Prize in Japan –

Lecturer: Prof. Yozo Mukawa
Honorary Professor of Chuo University

Total Quality Control (II)

– Basic Concept of TQC and its Application to the Management in the Company –

Lecturer: Mr. Masaru Sekiguchi
Director, General Manager of Quality Control Service Department,
Eiko Development Co., Ltd.

UNIDO Presentation of Case Studies

– UNIDO Technical Assistance in Quality, Standardization, and Metrology –

Lecturer: Dr. Kenneth S. Stephens
Senior Industrial Development Officer,
Institutional Infrastructure Branch, UNIDO

29th – 31st October 1991
The Regent of Kuala Lumpur

3

1st day
Oct. 29 – 31, 1991

Keynote Address

Situations and Issues Surrounding Industrial Standardization in Japan

by Makoto SAITO
Director General of Standards
Department, AIST, MITI

1. Foreword

Good morning.

Thank you very much for attending the UNIDO seminar. This seminar is held by UNIDO to promote and improve international standardization and quality control in the Asian region. The first meeting was held in January, last year in Bangkok, Thailand; this is the second meeting. In view of the fact that this seminar has a very important meaning for the Asian region, the Japanese government has been cooperating across the board, including fund assistance and dispatching of a group of lecturers.

For three days specialists from Japan and Malaysia will talk about the meaning, effects and specific situations of industrial standardization and quality control drawing on their experiences in Japan and Malaysia. Dr. Tajuddin, controller of SIRIM and I will play roles in starting this seminar.

First, I wish to talk about the direction in which industrial standardization of Japan will take in the future.

Let us now consider the concept of responses of Japan in the field of international standardization.

2. International Developments

The recent rapid adjustments in East-West relations, along with the development of economic globalization and interregional cooperation, and the intensification of many other problems on a global scale, have added to the complexity and fluidity of the international situation. And as the responsibility of Japan as a major economic power grows ever greater, Japan's expanding role in the support and strengthening of the free trade system is having a major influence on efforts to promote industrial standardization.

The integration of the European market in 1992 requires that member nations address the important issue of a uniform basic certification system. The proposal that Europe adopt the international standards Functioning as European standards has added impetus to the international standardization movement.

Japan has followed the GATT standards code in its efforts to internationalize its industrial standards, however, the new pace of international standardization has set us the task of more

seriously than ever before wrestling with the harmonization of the JIS system when more with the international standardization systems, and actively participating in the establishment of international standards.

3. The Significance of International Standardization

The intent of international standardization is the removal of technical barriers to trade, the establishment of a foundation for international scientific and technical cooperation, and the facilitation of a foundation for industrial development by developing nations. Among those countries that use them, international standards are an international public asset from which all benefit alike. In addition, there are an increasing number of fields such as the OSI in information technology, in which international standardization has become essential.

Considering Japan's economic and technological achievements, this nation must not maintain the status quo, but must formulate a new philosophy appropriate to the significance of international standardization, with which to guide the Japanese nation as a whole in a positive move toward international standardization.

Japan has often tended to take a position of passive participation in deliberations on international standards while other countries propose drafts of standards. Japan has seldom presented proposals or taken the secretariat role in conducting meetings. This nation is now being asked to become an "information transmitter" participating actively in the work of developing international standards.

4. Leadership in Harmonizing International Standards

We have shown the need to break with a "focus on domestic standards" from the standpoint of taking active participation in international standards-development. But from another viewpoint, we must also recognize and endorse the role of standards in creating an environment for a transparent and open Japanese market.

Even though the market in Japan for such products may not be fully developed, it can be envisaged that by harmonizing JIS standards with international standards we can create a market for such products and processes rather than reflecting only the situation of Japan's current domestic market.

5. International Harmonization of Certification Systems

In addition to the harmonization of standards, the matter of an internationally harmonized certification system is of global importance. The JIS marking system certifies the conformity of products to JIS standards based on an examination of the factory quality assurance system as same as MS marking system in Malaysia. The method of factory examination has always differed depending on the type of certification system used, and it has been difficult to conceive of any type of international harmonization.

International standards for quality assurance (the ISO 9000 series) were established in 1987, and they have been adopted as national standards in more than 40 countries. Furthermore, about 30 counties have introduced the assessment and registration scheme based on the ISO 9000 series. In order to set up in Japan an assessment and registration scheme based on the ISO 9000 series, which is one of the themes of this seminar, discussions are now going on in JISC (or the Japanese Industrial Standards Committee). Details of these discussion will be given at this

seminar. The ISO 9000 series, and the factory examination method of JIS marking system have the common basic requirements as factory examination methods. Accordingly, with the introduction in many countries of assessment and registration scheme based on the ISO 9000 series, we must now consider using the results of those schemes for the JIS marking system.

6. Expanded Cooperation with Developing Countries in Standardization and Quality Control

Next, I wish to talk about cooperation with developing countries in standardization and quality control. Standardization and the concept of quality control closely related to it are the foundations of industrialization. Developing countries have recently shown great interest in our success in promoting industries that are internationally competitive through constant promotion of industrial standardization. As a result their requests for our cooperation in the fields of industrial standardization and quality control have been increasing. We think that our cooperation will contribute to promoting their industrial foundation, improving their international competitiveness and expanding their exports and that it will also allow their environments to draw investment from Japan. We wish to reply positively to their requests.

The arrangement of an assessment and registration scheme based on the ISO 9000 series about which I have just talked provides a "passport into the international market;" and its proper management is desired internationally. The ISO 9000 series if promoted, introduced and firmly established and if implemented by developing countries will enable them to obtain real trust of users and consumers worldwide. Japan wishes to actively cooperate with them, utilizing our experience in the fields of industrial standardization and quality control.

I have talked about Japanese response to international industrial standardization, next, I wish to talk about Japanese response to national needs in Industrialization.

7. Achieving a Comfortable and Rewarding Lifestyle

Consumer goods have long received attention as one of the critical fields of industrial standardization in relation to improvements in standards of living. Recently, however, national attention has been focused on the question of how to turn the benefits of economic growth to the improvement of the quality of life of its citizens, even to the point of altering the structure of our society. The role of industrial standardization has attracted attention in this regard.

In case of Japan, the JIS system operates with the aim of enhancing the lives of Japanese citizens by providing excellence and safety in manufactured products. The interpretation of "excellence" has changed since years past when efficiency in manufacturing was often given priority over other concerns. Now, however, the emphasis has changed from "wealth in goods" to "wealth in spirit" or "time to enjoy life." And it is proper to respond to this change in social needs by emphasizing benefit to the consumer in such terms as safety, convenience, and enjoyment.

And from a similar point of view, the JIS is encountering significant challenges in responding to the needs of the medical and social welfare fields as Japan's population ages.

8. Promoting the Development and Introduction of New Technology

One of the important roles of standardization in relation to new technologies is in providing a supporting foundation through the standardization of terminology, testing and evaluation methods. Therefore, it is important that standardization activities in each field maintain a close contact with research and development efforts, and make a timely response to technological advances.

Standardization of technologies in the research and development phase must be done in a way that does not hinder their progress, but should serve the advancement of research and development by establishing guidelines early in the development process.

Standardization efforts must continually watch the direction of technological development, and make proper, timely responses focused on areas where standardization is needed.

In encouraging the introduction of new technology, standards must be developed for products and evaluation methods with future potential base on the needs of users and consumers. In so doing, it is especially important to assure product compatibility.

As technological advances become more rapid in such newer fields as information technology, new materials, automation and integration like factory automation (FA), and biotechnology, the JIS system must take a more timely role and lead in promoting the development and spreading of new technology while maintaining an international outlook.

9. Response to Global Environmental Issues

At last, I wish to talk about our response to global environmental issues.

Global environmental issues, are extremely important and are currently being actively addressed in many ways. In the area of standards, action is being taken through the development of a high-purity CO_2 gas, along with standard techniques for measuring it, used for integrated, high-accuracy testing of the earth's environment.

Besides the above, standardization of products and measuring methods for energy saving, standardization for development and diffusion of electric power generation using new energy sources, standardization to promote the introduction of substitute materials for environment-related materials such as Freon gas are considered necessary.

Furthermore, to promote recycling of resources it is important to standardize products which can be recycled, set up standard markings for recycling products that can be recycled, and to standardize products which can be reused. In addition, it is also important to set up standards for product that take into consideration disposal methods and creation of waste materials.

A special meeting of SAGE (or Strategic Advisory Group on Environment) has been set up by ISO and IEC, and measures to cope with environmental issues across the board are beginning to be discussed.

Japan wishes to play an active role concerning these issues together with the domestic and overseas needs previously discussed.

10. Conclusion

I have talked about the direction in which Japan's industrial standardization will take in the future.

It is a hard job to implement standardization and quality control, but once they are implemented, I think you will all receive benefits directly from them.

Now, I wish to conclude my lecture, expecting this three-day seminar will be useful for your daily activities. Let us hear next from Dr. Tajuddin, controller SIRIM, who has made a big contribution to the opening of this seminar.

1st day
Oct. 29 – 31, 1991

Keynote Address

The Challenges of Standardization & Quality Assurance in Malaysia

by Ahmad Tajuddin Ali
Controller of SIRIM

1st day
Oct. 29 - 31, 1991

Total Quality Control (I)

– Features of TQC and Deming Prize in Japan –

by Yozo MUKAWA
Honorary Professor of
Chuo University

1. The History of Quality Control in Japan

Quality control in Japan began after the end of the Second World War.

Introduced from the United States, it was particularly through the guidance of Dr. W. Edward Deming that it became rapidly accepted by large and small businesses alike.

Laws for the promotion of industrial standardization (related to the Japanese Industrial Standards: JIS) as well as the JIS mark certification system also played important roles in the evolution of the quality control concept in Japan.

At the beginning of the introduction of the quality control in Japan, it tended to application of statistical methods which is not the true aim of quality control, and at that time, emphasis of inspection was considered important in companies.

By the guidance of Dr. Deming at 1950, the true aim of quality control has became to be known and at the same time the importance of production control has begun to be recognized. Through these changes and developments of quality control, qualities of products have been improved gradually. That is to say, "Quality is not assured by emphasis of inspection, but built-in quality should be done during production process." This view has been penetrated.

The Japanese-style quality control began to draw attention shortly before 1960 and it gave rise to what is today known as company-wide quality control (CWQC), or often referred to as total quality control (TQC).

In JIS Z 8101, "Glossary of Terms Used in Quality Control", CWQC is defined a part of definition on quality control as follows:

> A system of means whereby the qualities of products or services are produced economically to meet the requirements of the purchaser.
>
> "Quality control" is sometimes called "QC" for sort.
>
> In addition, since modern quality control adopts statistical techniques, it is sometimes especially called *tokeiteki hinshitsu kanri* ("statistical quality control", and "SQC" for short).
>
> In order to perform quality control effectively, throughout all phases of the enterprise activities such as market survey, research and development, planning of product, design, production readiness, procurement and subcontract, manufacture, inspection, sales and after sales servicing as well as finance, personnel affairs and indoctrination, whole personnel including from the executives down to the managers, foremen and workers are required to participate and collaborate.

The quality control activities conducted in such way is called *zenshateki hinshitsu kanri* ("company-wide quality control", and "CWQC" for short) or *sogoteki hinshitsu kanri* ("total quality control", and "TQC" for short).

QC circles were first introduced in 1962 and developed rapidly thereafter. However, these QC circles refer to the activity taking place at the lower levels of organization within a company and although they make an extremely valuable contribution to CWQC, they should not be confused with CWQC itself.

The number of QC circles and QC circle members in Japan which were registered at QC circle secretariat are 331,261 and 2,573,022 respectively as of 1991.6.30. Furthermore, the number of unregistered QC circles seems to be double or triple.

QC seminars and meetings for executives and managers are actively organized. Now in most companies, TQC has became administration of company itself.

In this way, quality control started at production departments in manufacturing industries, it has became company-wide activities as TQC and further it is becoming group-wide TQC including associated companies. This movement is spreading over the construction, service and software industries.

YEAR	ITEM	Cnanges in activity	Target industry
1924	Research on QC begins. (W. A. Shewhart)		
1931	W. A. Shewhart: "The Economic Control of Quality of Manufactured Products" is published.		
1941 – 42	ASA Z1 - 1, 2.3 is enacted.	QC emphasing inspection Type mainly composed of SQC	
1945	World War II ends.		
1946	QC is introduced by the staff of GHQ.		
1948	QC seminars begin in Japan.		
1949	The law, Japanese Industrial Standard (JIS) is enacted.		
1950	W. E. Deming's first visit to Japan – holds or 8-day course in quality control.		
1950	"Statistical Quality Control" (magazine) is launched.		
1951	Deming Prize is established.		
1951	The first quality control congress is held.		QC in manufacturing
1953	JIS Z 9001 General Rules for Sampling Inspection Procedures are established.		
1954	J. M. Juran's First visit to Japan – holds a 10-day management training seminar.		
1954	JIS Z 9021 Quality Control Chart Method is enacted.		
1958	The first National Conference on Standardization is held.	QC emphasizing management of manufacturing process Basic type of QC	
1958	November and December become campaign periods for Promotion of Industrial Standardization.		
1960	November is designated as "Quality Month".		
1960	"Quality Control for the Foreman" (magazine) is launched.		
1962	The first QC circles are formed.		
1962	QC Circle Headquarters are established.		
1962	The first foremen's congress is held.		TQC in manufacturing
1963	The first top management conference is held.	Company-wide comprising all corporate divisions Participation by the whole work force (Japanese style)	
1965	The first quality control symposium (QCS) is held.		TQC in the construction industry
1967	The first national Q-S conference is held.		
1968	Promulgation of the Basic Consumer Protection Law.		TQC in the service industry
1969	The International Conference on Quality Control (ICQC'69 Tokyo) is held.		
1970	The Japanese Society for Quality Control is established.		TQC in the software industry
1978	The First International Conference on QC Circles is held.		
1987	The International Conference on Quality Control (ICQC'87 Tokyo) is held.		

2. Characteristics of Company-Wide Quality Control in Japan

Since 1965, Quality Control Symposiums (QCS) have been held in Japan twice a year and people from academia, QC managers and leaders in the field of quality control have participated.

The International Conference on Quality Control (ICQC) was held in Tokyo for the first time in 1969. On that occasion, the Ninth Quality Control Symposium was held on the theme of "Problems and Characteristics of Quality Control in Japan". This symposium dealt with the following six topics:

(1) Company-wide quality control;

(2) QC circle activities;

(3) Quality control audits;

(4) Utilization of statistical methods;

(5) QC education and training;

(6) Activities for promoting quality control nationwide.

When the International Conference on Quality Control was held again in Tokyo in 1987, the Quality Control Symposium in June dealt with the same theme and the following ten topics:

(1) President-led QC Activities in which All Departments and All Personnel Participate

- The QC activities of many enterprises have been taken place under the leadership of their president (top executive).
- "Quality" is sometimes construed to have a broad meaning that includes "costs", "deliveries", and even "job qualities" or the equivalent.
- Group-wide activities have been initiated in subsidiary, associated, and cooperative companies in conjunction with their parent enterprise.

(2) Top Priority Consistently Assigned to Quality by Management

- In the management of enterprises, it is generally accepted that the consistent support of such concepts as "top priority to quality" and "quality first" eventually assures long range profits.
- The importance of top management's utmost concern for quality has been widely recognized.

(3) Policy Dissemination and Control by Delegation

- Presidential policy has often been disseminated by delegating its implementation to individual departments and other hierarchical levels.
- This method of management is not applicable to only quality but management in general.
- The accurate PDCA cycling has been understood as essential for successful policy implementation.

(4) QC Audits and their Implementation

- The process of auditing the QC implementation progress status and using the audit findings in future enhancement strategies has gained popularity.

- Normally, the top executive participates in auditing activities.
- Besides intra-company audits, examination by a neutral organization (such as Deming awards, JIS plant awards, etc.) have also contributed to the QC promotion of enterprises by virtue of their widely acknowledged authority.

(5) Quality Assurance Activities Ranging from Planning and Development to Sales and Servicing

- Integrated quality assurance activities have frequently been engaged in which cross intra-company boundaries. "QA organizational charts" stipulating the role of each individual department have proven to be helpful.
- Particular emphasis has been placed on the "quality deployment" and "design reviews" at developmental and designing stages.

(6) QC Circle Activities

- QC circle activities are engaged in as a segment of TQC.
- "QC circle regulations" and "basic management of QC circle activities" have been established as the basic concept for QC circle activities, and particular emphasis placed on a humanity affirming philosophy.

(7) QC Education and Training

- Education and training of all the personnel ranging from the top management down to front-line employees is carried out in accordance with their professional level and function.
- Physical and group discussions are often part of education and training to cultivate habits for independent learning.

(8) Development and Implementation of QC Techniques

- Unique techniques have been developed and employed for the development of new products and the assurance of quality.
- Simple and easy-to-perform techniques are being effectively employed as major tools for QC circle activities.
- Academic and industrial societies have cooperated to make major contributions in the development and implementation of QC techniques.

(9) Extension of Applications from Manufacturing to Other Industries

- The scope of QC applications has been extended from manufacturing industries and departments to office work, sales. and service industries.
- The industries of recent application include construction and banking, hotels, department stores, super-markets, retail stores, hospitals, and so on.

(10) Nationwide QC Promotion Activities

- Promotion activities at a national level have made permanent achievements, as evidenced by the designations of November as quality month and October as standardization month.
- With the Union of Japanese Scientists and Engineers and Standards Association playing the central role, various events are planned and held, and books and magazines published.

- Those organizations mentioned above are private sector-intensive, but the government sector-intensive JIS generating and listing organizations also contribute significantly to QC promotion.
- The QC education of consumers is also being carried out with the support of governmental, academic, and industrial societies.

3. Checklist for the Deming Application Prize

The Deming Application Prize is awarded to a company which is recognized to have achieved outstanding results in applying total quality control.

The attached checklist can be used for evaluating qualification for this prize.

4. Conclusion

Checklist for the Deming Application Prize

ITEM	PARTICULARS
1. POLICY	(1) Policies pursued for management, quality, and quality control (2) Method of establishing policies (3) Justifiability and consistency of policies (4) Utilization of statistical methods (5) Transmission and diffusion of policies (6) Review of policies and the results achieved (7) Relationship between policies and long-and short-term planning
2. ORGANIZATION AND ITS MANAGEMENT	(1) Explicitness of the scopes of authority and responsibility (2) Appropriateness of delegations of authority (3) Interdivisional cooperation (4) Committees and their activities (5) Utilization of staff (6) Utilization of QC Circle activities (7) Quality control diagnosis
3. EDUCATION AND DISSEMINATION	(1) Education programs and results (2) Quality-and control-consciousness, degrees of understanding of quality control (3) Teaching of statistical concepts and methods, and the extent of their dissemination (4) Grasp of the effectiveness of quality control (5) Education of related company (particularly those in the same group, subcontractors, consignees, and distributers) (6) QC Circle activities (7) System of suggesting ways of improvements and its actual conditions
4. COLLECTION, DISSEMINATION AND USE OF INFORMATION ON QUALITY	(1) Collection of external information (2) Transmission of information between divisions (3) Speed of information transmission (use of computers) (4) Data processing, statistical analysis of information and utilization of the results
5. ANALYSIS	(1) Selection of key problems and themes (2) Propriety of the analytical approach (3) Utilization of statistical methods (4) Linkage with proper technology (5) Quality analysis, process analysis (6) Utilization of analytical results (7) Assertiveness of improvement suggestions

ITEM	PARTICULARS
6. STANDARDIZATION	(1) Systematization of standards (2) Method of establishing, revising, and abolishing standards (3) Outcome of the establishment, revision, or abolition of standards (4) Contents of the standards (5) Utilization of statistical methods (6) Accumulation of technology (7) Utilization of standards
7. CONTROL	(1) Systems for the control of quality and such related matters as cost and quantity (2) Control items and control points (3) Utilization of such statistical control methods as control charts and other statistical concepts (4) Contribution to performace of QC Circle activities (5) Actual conditions of control activities (6) State of matters under control
8. QUALITY ASSURANCE	(1) Procedure for the development of new products and services (analysis and upgrading of quality, checking of design reliability, and other properties) (2) Safety and immunity from product liability (3) Process design, process and analysis, and process control and improvement (4) Process capability (5) Instrumentation, gauging, testing, and inspecting (6) Equipment maintenance, and control of subcontracting, purchasing, and services (7) Quality assurance system and its audit (8) Utilization of statistical methods (9) Evaluation and audit of quality (10) Actual state of quality assurance
9. RESULTS	(1) Measurement of results (2) Substantive results in quality, services, delivery time, cost, profits, safety, environment, etc. (3) Intangible results (4) Measures for overcoming defects
10. PLANNING FOR THE FUTURE	(1) Grasp of the present state of affairs and the concreteness of the plan (2) Measures for overcoming defects (3) Plans for further advances (4) Linkage with the long-term plans

1st day
Oct. 29 – 31, 1991

Total Quality Control (II)

– Basic Concept of TQC and Its Application to the Management in the Company –

by Masaru SEKIGUCHI
Director of Eiko Development Co., Ltd.
Past General Manager of Quality Control Division,
The Furukawa Electric Co., Ltd.

1. Introduction

In order to understand correctly, promote and make effective use of quality control undertaken in Japan at present, I wish to think of it, arranging it as follows:

First of all, I would like you to understand correctly the basis of the concept of Japan's quality control. Then, we should study a methodology as a means to implement quality control leading to eventual success, and also understand its correct and efficient way of use to maintain and improve quality as well as where it is to be used.

Further, from the standpoint of quality assurance, whether the quality control is applied to the entire production and service system in good balance, and whether it is correctly connected to quality assurance which is the ultimate target of quality control should be evaluated for continuous improvement in products.

Finally, companies should continue to develop and contribute not only to the people who are working there but to the development of the society and the national economy, international harmonization and cooperation.

On the above grounds, Japan's quality control lays the reason for the existing of companies not on the pursuit of profits, but on conformity to the needs of users as well as respect for humanity in the basic concept of management. It should also be understood that development of innovative technology has been challenged and efforts to raise the level of quality of the output of companies' activities made.

If we understand the contents of Japan's quality control by a superficial observation, we are liable to make a wrong judgment that it is to conduct QC circle activities or it is a mere spiritual movement. We should not forget that quality control performed up to now in Japan has been combined with the concept of management of companies and therefore has created large effects.

2. Quality

Superior quality of products can be defined without big mistakes as follows:

1) Products have small dispersion in their performance and utility,

2) Reliable delivery and no confusion or discrepancies,

3) Performance and utility continue economically during their expected life cycle.

The same also can be said about services.

1) There is no dispersion in services depending on persons, days or places,

2) Services are provided within the expected time, and

3) Services meet their prices and their utility is satisfactory.

When we think like the above, quality is that of **outputs**, and quality of products, services, information, energy and all other outputs is subject to assessment of quality.

The word "**quality**" is generally included in two meanings. One is the "quality of design" and the other is "quality of conformity". If the quality of design and that of conformity are mixed up, our thinking will be confused. Good quality from the stand-point of consumers is good quality of conformity to the expectation of attraction and reliability which consumers have to the contents which manufacturers have promised by their specifications and catalogs. When the quality of conformity is good, consumers will be satisfied. The quality of design determines the level of performance and utility, indication the tecanical level or the level of value added. If the technical level and the level of value added are raised by raising the quality of design, costs will be increased in many cases.

On the other hand, the quality of conformity is assessed by whether there is dispersion in the quality and utility of products and services, not by the technical level and value added. When the quality of conformity is raised, therefore, it is not directly connected to the increase of costs. It is known from past experience that its rise certainly reduced costs. The reason is that, if "dispersion" is reduced, the probability of products and services to come within the specification limits increases, when work is performed in processing aiming at the level of quality to be achieved, the probability of getting nonconforming products is reduced and resulting in less defectives. This means a decrease in losses. If this state is materialized and can be maintained, it is possible to hold 100% inspection to a minimum and assurance of quality by sampling inspection becomes feasible. If this state is achieved, the cost of inspection will naturally go down, and positive effects will be given to delivery time. Although expenses may go up temporarily for improvement of facilities, education and training, they can be covered by profits derived from the decrease of defectives which have been taking place daily and improvement of productivity due to shortening of delivery time by reduction of lead time. Supply of products and services with international competitiveness will be realized.

If we disregard quality and try to improve productivity by the speeding up of production lines and reduce costs by changing raw materials alone, products and services with international competitiveness can never be brought up. Unless we can satisfy the needs of our customers, we shall lose them and companies will not be able to develop.

Further, if we only concentrate on raising the level of the quality of design and neglect the quality of conformity, customers will find dispersion in products and services, which may be found good or bad depending on days and persons, and we shall not be able to get the trust of our customers, and as a result, we shall lose international competitiveness.

We should, therefore, take quality as the largest managerial concern, giving the highest priority to elimination of dispersion of quality, and after the concept of quality has been firmly established in companies, we should think of improvement of productivity, reduction of costs and shortening of delivery time based on the above grounds.

The same can be said about safety and health. Safety and health are basic items directly connected to the happiness of people and are important items about which everybody should have his or her concern all the time. Morale is low at work places where they are neglected, and god thinking cannot be expected to be made in such work places; therefore, products and services of good quality cannot be expected. Efforts should be made concerning environment, safety, and health in the same way as quality.

3. Control

Good quality of the process to create quality of outputs is a precondition to expect products and services of good quality. In Japan's quality control, the concept of control is understood as the PDCA cycle. Control is considered to implement planning, doing, checking and action (PDCA) for improving quality of the process and to maintain and spiral up quality of outputs. The word "control" which we use does not include the concept of merely judging acceptance or rejection by inspections or that of regulating and tightening. The concept of control in the word "quality control" which we talk about should rather be understood as "management". The cycle of PDCA has recently been called management cycle, it is the same concept as control cycle.

As I have mentioned above, quality control should be understood as rotation of the PDCA cycle on quality.

4. Standardization

Standardization secures the basis of quality control.

When standards are imperfect, judgment by unwritten rules and common sense is naturally required, and criteria to be observed will be different depending on persons, and as a result, big differences will be caused. In other words, quality of products and services will decrease.

What is the worst is that distrust will be caused among workers by discord of recognition of unwritten rules and common sense by individual persons and human relations will be jeopardized. As a result, suspicious minds are created among workers and the feeling of work places will become dark. When the above develops to problems among departments, sectionalism will be created, interaction will be hampered, smooth conveyance of information will be lost, and intangible serious negative effects will be caused in daily work.

When standardization is determined by exchanging opinions fully by those concerned and obtaining mutual understanding, a consensus will be created among them to observe and maintain standards, and if recognition and authorization are obtained from responsible persons, responsibility and authority concerning the standards will be clarified and a mode to observe them will be stabilized. A mode of mutual trust will be created and a bright feeling will return to work places. As a result, good effects will be made to quality of products and services.

Standardization is a feature of quality control in Japan and a very important element from the standpoint of respect for humanity.

What has been specified in standards should be conveyed thoroughly to all the workers through bill boards, circulating leaflets, meetings, etc. and conveyed securely to successors by

systematic education and training. The results of improvement should be reflected promptly in the standards to raise the level of their contents. The standards will, then, continue to be effective as standards always alive. For the means to achieve the above OJT and OFF-JT should be properly implemented, and workers should be correctly and repeatedly educated concerning the contents of the standards.

In order to make the standards always work efficiently as living standards, the following are required:

1) Full exchange of opinion of those concerned,

2) Reflection to the contents of the standards,

3) Recognition based on the responsibility and authority of responsible persons,

4) Thorough notification to all the members,

5) Secure conveyance to successors by systematic education and training, and

6) Implementation of improvement and reflection to the standards.

It is impossible to maintain the standards, if even one of these processes is neglected.

Of the means to make workers observe the standards, easiness to observe is the most important. To realize the largest effects they should be made in such a way that their violation is absolutely impossible to make. People make errors sometimes unconsciously. They error due to decrease of concentration by fatigue, misjudgment by a hallucination or an incorrect memory and wrong recognition of objective facts by a preconception always happens in every field. Prevention of errors by use of jigs and elimination of human errors by automation are most effective. In these cases we should think of elimination of human errors by check and control of jigs and check, maintenance and repair of automatic equipment.

The means to be taken next is to find the signes of abnormal conditions by our five senses to prevent errors. Hearing, seeing and touching are used in many cases, but smelling and tasting are also made in special cases. When our five senses are used, it is necessary to make objective judgment possible by making limitation samples. Particularly, when the visual sense is used, actual goods, graphs, drawings, color classification, sketches, pictures, cartoons, colors and switching on and off of lights, etc. should be used for easy application by users.

5. Basic Principles and Promotion System of Quality Control

Quality control is practiced based on the following principles and promotion system in Japan.

① Quality First ..... Not short term profit first

*To promote "Quality First" management

* To decide design quality, considering customers' needs and the international situation

*To evaluate management from the long-term view

② Customer-orientation ..... Not producer-orientation
Be considerate to others

*Quality First based on the idea of "Market-in" (customer-orientation)

*To produce products and services that satisfy and delight customers

*To provide products and services that meet customers' needs at an economical price

*To put the first priority on quality, while keeping balance with cost and delivery

*To regard quality as quality of total output

③ The following processes are our customers also ..... Do away with sectionalism

*To consider the following processes which receive your output as customers

*Staff has to provide service to line section, considering what service will be good for the line section.

*Accounting section has to give data and facts to line section, considering which data will benefit the line section for cost control and profit control.

*Based on facts and data, the following process has to make reasonable requests to the preceding process.

*All the employees have to be involved in activities with a service spirit

④ Use data and facts ..... Application of statistical methods

*To take action after recognizing facts clearly, describing facts in data, and assuming and judging by statistical methods

*To go to the actual place (where countermeasures are needed), observe the actual situation carefully and take realistic actions

*To continue to rotate PDCA cycle based on facts

*To apply problem solving methods (QC story)

*To make effective use of QC technique (Pay attention to dispersion. Use stratification thoroughly.)

*Statistical methods are the foundation of quality control.

*To make use of data and facts for management

⑤ Thoroughgoing standardization

*Attach importance to the process (A good result comes from a good process.)

*To maintain and reproduce good conditions

*To prevent recurrence of bad conditions

*To make standardization a model for education

⑥ Management that respect for humanity

*Human-centered management

*To delegate authority substantially

*To have employees feel their work is meaningful (See note)

*To give employees clear-cut objectives or purposes

*To have employees be responsible for their work and give them places where they can give full play to their abilities in a way the results can be known

*To have employees think by themselves independently to draw out their creativity and have them plan and implement their work (Management to have employees display their limitless abilities)

*To appreciate employees' efforts exerted in the process of achievement and praise results of their work

*Praise not only results but also good processes.

⑦ Cross-function management ..... Control by function

*To establish a firm management structure by combining control with divisions and committees according to function

*Committees by function are standing committees. The committees are held regularly, decides policy, sets concrete targets under the responsibility of a manager of each division and takes action.

*The committees always discuss high level management-related matters concerning the whole company and decide policy.

Note:

< What is "meaningful"? >

- Pleasure which one feels when his very exsistence is useful for society
- Satisfaction which one feels when he is recognized by others
- A sense of achievement which one feels when his effort finally bear fruits
- A sense of fulfillment which one feels when his ability is widened
- Happiness which one feels when his dream is realized and the success is accompanied by a promising future

6. Presentation of Problem Solving Means

Quality control presents a useful means of solving problems. Importance is attached to how the cycle of PDCA is securely and efficiently rotated in quality control. For this purpose methods for solving problems by means of QC techniques have been proposed. The need of implementing the analysis based on the facts facilitated the development of 7 QC tools and other statistical techniques. To come up new ideas and to achieve systematic approach with problem solving in the planning and developing state, 7 management tools for QC (N7) and quality deployment to be effectively use. Experimental design, multivariate analysis, design review, FMEA and FTA have been used effectively.

What ever good methods are proposed, however, nothing can be done when there is no awareness of the problems. As frequently heard in quality control activities in Japan, "It is a problem that there is no problem." The meaning of this proverb is, "How hard you may try to apply the QC methods, nothing can be done when there is no such awareness of the problem on your own job." It is necessary for us to recognize problems correctly as our own problems, clarify what to be done by each of us for the solution, approach the substance of problems by quality control approach, and find effective methods of solution. In addition, "What must be done by myself" should be clearly indicated.

7. Management by Policy

The company policy is the integration of target and means. The company president announces to the whole company an annual management policy which puts priority on quality based on management philosophy and medium- and long-term planning In order to achieve it, each echelon and department of the company sets up specific targets and means, implements them, checks results, and takes necessary actions. In other words, management by policy means involving the whole company in rotating PDCA cycle.

Daily management serves as the foundation of management by policy. The president's policy will be deployed into more concrete items which will be placed clearly in the daily work of employees. Then a specific implementation plan is made, implemented and checked daily. The president's policy will be expressed in specific figures as the result of daily work. Its progress and result will be checked, reviewed and collected at each section and each department, and will be reported to top management. The final result will be incorporated into the following year's policy.

8. Quality Control Diagnosis

8.1 Diagnosis by the President

What is most important in QC activities is that the company president or the person in charge of each section should recognize the importance of quality control properly and take leadership in promoting the activities. Diagnosis by the president is one of the very important concrete measures to promote QC. The president himself goes to each section and receive reports about QC activities from the person in charge (eg. factory manager, general manager).

The following constitute the major items of the diagnosis.

① How the president's policy has been broken down at each section, taking problems of a section into consideration.

② What kind of QC activities have been planned for ① .

③ To what extent QC activities have been implemented.

④ What kind of problems have been produced after implementation.

⑤ How to take action against the problems.

⑥ What are troubles in carrying out QC activities.

Advantages of the diagnosis are as follows:

① The diagnoses will make it clear that the president himself is interested in quality control and will help make QC activities more active.

② The president himself will be able to confirm problems of each section.

③ As president and the person in charge of each section can spend a long time talking with each other, they can communicate their thoughts thoroughly.

④ As the president will express his intention and decide the matter on the spot, countermeasures will be taken quickly and easily.

8.2 Mutual Diagnosis of Quality Control

The in-house mutual diagnosis of quality control is very effective for a method to clarify issues by diagnosing the state of implementation of quality control and take measures in the early stage.

A diagnosing team consisting of representatives of the head office and factories visits a factory other than their own factories and diagnoses the state of implementation of quality control based on the check list of the predetermined diagnosing items. Before visiting those concerned should be notified and make preparations. The items to be checked with priority in the mutual diagnosis of quality control are decided centering on priority items decided in the quality control policy of the fiscal year, and explanations should be requested to the state of implementing improvement for defective items found in the previous year. The main purposes of the mutual diagnosis of quality control are:

1) Review of standards and their secure implementation,
2) Mutual enlightenment of those who diagnose and those who are diagnosed,
3) Quality control education of managers, and
4) Grasp of the actual state of the quality control capability of the whole company.

9. Education and Training of QC

"QC starts with education and ends with education." is a phrase said by Dr. Kaoru Ishikawa, an emeritus professor of the University of Tokyo. This can be rephrased "Education is the most important factor in QC. QC has to start with education and education should be continuously carried out." Factors indispensable for corporate management are men, goods, money, information and trust, among which "men" should be classed as the most important. In order for each employee to understand the social responsibility of a company properly and to be motivated to take action in compliance with the president's policy, top management has to put priority on human resource development and provide employees with well-planned training and education continuously. When each employee has an appropriate understanding of quality to be conscious of his responsibility, and thinks and acts based on that responsibility, the foundation of corporate development will be secured.

QC education should be continuously and repeatedly carried out. Every year new employees join a company, while talented senior employees have to retire unavoidably. Therefore, it is the seniors' duty and responsibility to hand down their experience to younger employees through education and training. OJT (= On the Job Training) carried out in the daily work is the center of QC education and training. OJT, however, is not sufficient to fully understand quality control. Providing employees with OFF-JT, such as participation of QC seminars held inside and outside of the company, is also necessary to foster employees with a wider perspective, advanced knowledge and a sense of consciousness. In particular, education to managers and supervisors who are influential as leaders in enterprises is of great importance.

In order to make company-wide QC successful, top management including the president who decides the company's basic management philosophy has to take initiative in taking part in QC seminars and conferences. Top management must take the lead in studying and understanding QC.

QC education and training should be given in the following areas.

① Philosophy

② Understanding QC techniques and its application

③ Evaluation and promotion system

These three factors are common to all echalons of the company, although where to put priority may depend on to whom education and training are given. At the same time, through education and training, consciousness toward the importance of "standardization" should be implanted thoroughly in the whole company as the backbone of QC.

10. QC Circle Activities

One of the biggest characteristics of quality control of Japan is QC circles. QC circles were born and brought up in Japan. They feature small group activities. As one of the reasons for the economic development of Japan, improvement of productivity of companies is pointed out, and one of the big factors to support it is the activities of QC circles, which are conducted with the vector coordinating with the implementation of TQC. The basic principles are clearly stated in the QC circle policy as follows:

1) Display human capabilities fully and eventually draw out infinite possibilities.

2) Respect for humanity and build a worthwhile to live, and happy bright workshop,

3) Contribute to the improvement and development of the enterprise,

(By "QC CIRCLE KORYO" – General Principles of the QC Circle – JUSE*) The policy states that the first priority is given to men who aim at the establishment of harmonious work places where all the persons can work happily every day, with their own efforts and mutual cooperation.

After achieving the above, the essential capacity of men, the "power to think" is drawn out and brought up, and their creativity and power of execution are further enhanced. By doing so, the scope of the capability of men is unlimitedly enlarged.

As a result, each person thinks and acts to satisfy the requirements of customers with the coordinated vector, the constitution of a company is further improved, and its further development can be expected."

Men working in a company should obey what has been decided in company standards as its members, but they also must have the capability to improve the way of working. They grow up by recognizing and recommending the use of their capability. It is men that support a company, and the capability of each person who works there is reflected in the constitution of the company. When there are many companies with a strong constitution, international competitiveness is enhanced, and the national economic power is strengthened.

QC activities are now being conducted not only in manufacturing industries but in service industries. In Japan about 2,600,000 persons are working for control and improvement of work places and creation of bright work places by QC circle activities.

One of the factors having promoted development of QC circles to the present level is the fact that foremen who are supervisors in the workship have formed groups with workers under them and made reading circles and studied the magazine "Workship and QC" (the present "QC Circle") published by JUSE* in 1962.

* JUSE – The Union of Japanese Scientists and Engineers

Education of quality control should be given not only to managers, engineers and staff but to persons in the workshop who are actually manufacturing products and those who supply services in the front line. Unless the latter are made to understand correctly quality control, provided with zeal to think, and bring up their capability of solving problems, products and service of good quality cannot be continuously made and supplied. It is necessary to create environments where people have zeal to work patiently for the solution of problems by expressing the facts correctly in data and using QC methods and QC stories. To realize the above, managers, supervisors and leaders have the responsibility to give their utmost consideration to cooperating with each other, educating and training workers, giving them tools and arranging their environments.

QC circles respect autonomy, which brings up the sense of responsibility and promotes development and growth of capability. The themes taken up by QC circles are not limited to improvement of the quality of products. Thy cover safety, facilities, costs, productivity, 5Ss, delivery time, office work, information, service and other daily problems close to us as well as solution of problems which requires cooperation among circles. All the persons should play their own roles for self enlightenment, have a feeling that they should contribute to the achievement of the purposes, have communication with other companies, exchange information with different industries, try to realize mutual development and make efforts for successful management of quality control.

As QC circles are, after all, part of TQC, however, they should be managed on the precondition to harmonize with TQC.

The most important thing to QC circles is not to make assessment on the basis of results alone, but to implant in all the members the concept of weighing up the good process of work and bring up a mind in each person to take good care of customers, to settle the practices of company respect for humanity.

When the above become possible, productivity will be enhanced as a result, and the constitution of a company with strong international competitiveness will be assured.

1st day
Oct. 29 - 31, 1991

UNIDO Presentation of Case Studies
– UNIDO Technical Assistance in Quality, Standardization, and Metrology –

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UNIDO has been engaged in an extensive and comprehensive programme of technical assistance to developing countries in the disciplines of Quality, Standardization, and Metrology since its inception in 1967. This has provided valuable developmental and catalytic inputs to the relevant organizations, institutes, and enterprises of recipient governments. This paper describes this assistance and experience, first in general terms and later by way of brief summaries and case studies of three countries.

Since its inception in 1967 UNIDO has been providing technical assistance in the subject disciplines (often referred to as QSM) to developing countries in fulfilling its UN charter. The designation, QSM, is a shortened revision of a much broader set of disciplines that include the subjects of: (1) **QUALITY** in its broadest sense from Total Quality Management (TQM) to Statistical Quality Control/Process Control (SQC/SPC), Quality Systems and Quality Systems Certification and Registration (for example, to the ISO 9000 series), Product Certification and Marking, and all other ramifications of Quality. This includes Quality Circles (team participation), Quality Function Deployment and systems of manufacture that combine with Quality to achieve synergistic effects such as Just-In-Time/Total Quality Control (JIT/TQC); (2) **STANDARDIZATION** to a large degree in the sense of ISO's ***Integrated Standardization***; and (3) **METROLOGY** in the sense of (a) ***Legal***, embracing weights and measures, (b) ***Industrial***, including calibration, testing, standard reference materials, etc., and (c) ***Scientific***, including national and international primary, reference, and working standards (etalons), and traceability regimes. These disciplines further include import/export inspection, laboratory accreditation (for testing, calibration, and metrology), consumer information/protection (and satisfaction) programmes, informative labelling, products liability, standards information, documentation, and public relations/promotion, national quality campaigns and awards, etc. Different designations for these disciplines are used by different groups. MSTQ is used (by the World Bank, for example) to denote programmes of Metrology, Standards, Testing, and Quality, which is also meant to encompass all disciplines mentioned above.

QUALITY - The Driving Force

With the recent emergence of **QUALITY** as a significant discipline and goal through which technical, economic, and social progress has been made, it can be seen to represent the binding force, the raison d'etre, for the existence of all related disciplines. That is, in a very real sense it can be argued that **QUALITY** describes all of these disciplines which are, in fact, ***Quality Driven.***

Standards are prepared and promulgated not just to become unused documents sitting on a shelf -- but to serve as a basis of uniformity and consistency to achieve an economic quality. Measurements are planned, made, and controlled by calibration and traceability, not just to satisfy a curiosity -- but to facilitate innovation, improvement, and control. Tests are carried out, not merely to provide some assurance to a buyer of a finite lot -- but to feedback results for design and process improvement with long term benefits to the enterprise, to the nation, and international community.

The views expressed are those of the author and do not necessarily represent those of UNIDO/UNDP. This paper was prepared initially for presentation at a seminar on *"Achieving Competitive Quality through Standardization and Quality Control"*, jointly conducted by UNIDO, the Japanese Standards Association, and the Standards and Industrial Research Institute of Malaysia and held in Kuala Lumpur, Oct. 29 - 31, 1991.

Quality, as interpreted by UNIDO's assistance, represents a significant government - business - management strategy that should permeate the entire national (regional and international) fibre. This includes government, associations, corporations, and enterprises (from the largest to the smallest). It embraces the concepts and methodologies of all of the disciplines mentioned above.

It must also be understood that the goals and benefits of the Quality disciplines go far beyond the mere definition, control and/or improvement of the quality of the final product and/or service (however noble that may be) -- but include ***reduction in***: scrap; waste; repair/rework; costs; raw material, in-process, and final product inventory; excess inspection and processing; supplier rejections; customer complaints -- throughout every stage of operation. These goals must also include customer satisfaction and innovation as driving forces for product/service improvement and control.

A broad and comprehensive definition of **QUALITY** is provided by Wadsworth, Stephens and Godfrey (1986) and is shown in Figure 1. It illustrates quality's ever expanding influence on all aspects of our lives.

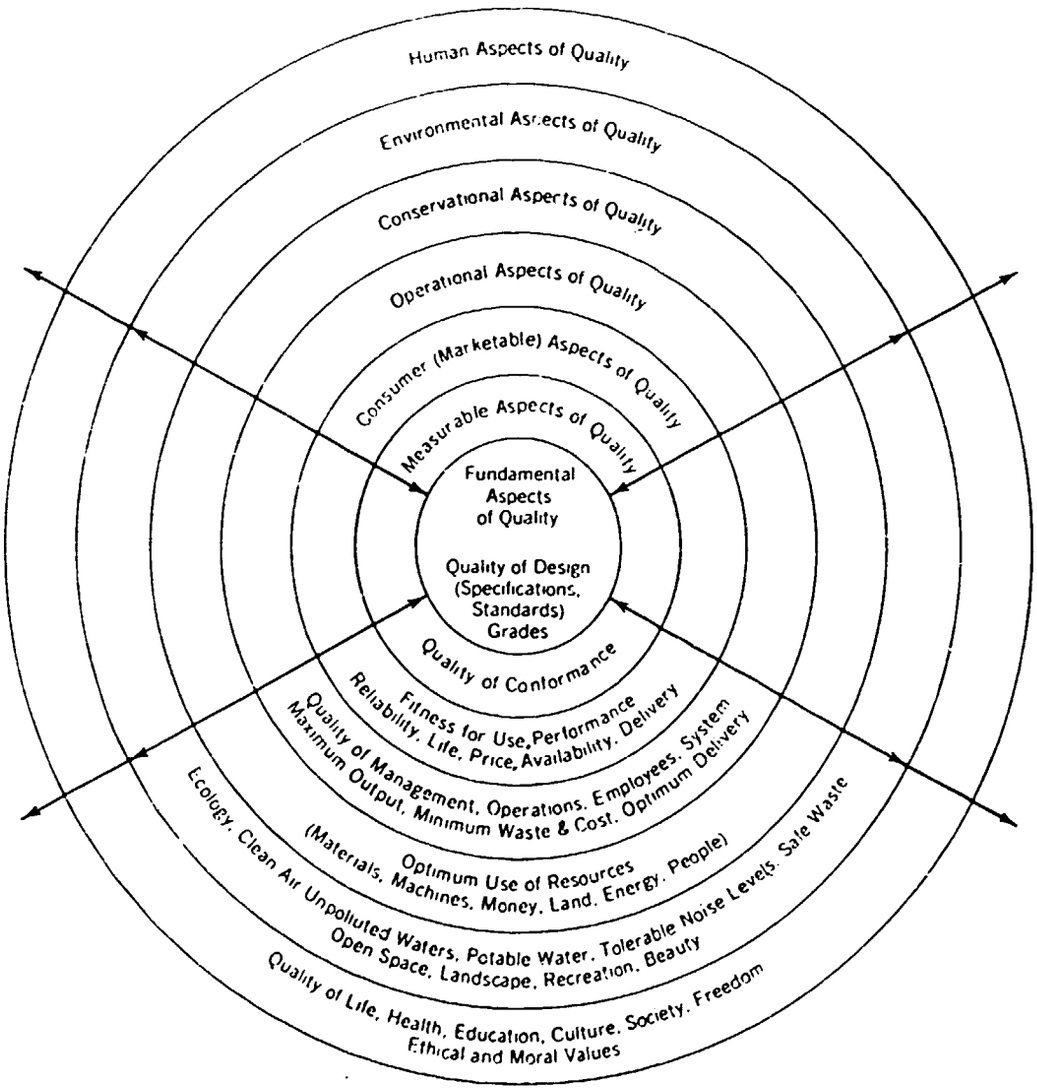

Figure 1. Quality and Its Expanding Influence[1]

1 An adaptation and expansion from a paper b[illegible] M. Fawzi (1978).

QUALITY is emerging as one of the most important disciplines and strategies for development -- recognized by developing and developed nations (and communities of nations). Developing countries seeking economic growth are striving to develop and expand their exports of value-added goods. This requires the improvement of the quality of locally manufactured products (and the associated processes and systems) in order to be able to compete in international markets. On the other hand, the demand of the people of the developing countries for higher quality, reliability, and safety of goods locally produced or imported has been increasing.

UNIDO'S Technical Assistance

In the face of these pressing needs, UNIDO, since its creation, has been providing technical assistance to developing countries in establishing, developing, and strengthening the QUALITY disciplines. Many have concentrated on infrastructure for standardization, metrology, and quality systems through the design and undertaking of technical cooperation projects and activities at the national, regional, and international levels. This has included strengthening existing, and/or setting up new, national and sectoral institutions such as standardization, certification, and quality control bureaus; and metrology and testing laboratories. Such organizations are intended to provide service to local industries in the quality disciplines. Direct assistance to enterprises has also been offered to plan, control, and improve the quality of their processes, products, operations, personnel, and customer relations, via total quality management, quality systems, and statistical process control consultancy and training.

Wherever feasible and possible UNIDO has promoted an ***integrated approach*** with the recognition that these disciplines are mutually supportive, complementary, and even synergistic.

In the area of METROLOGY a mini-thematic evaluation of UNDP - Financed, UNIDO- Executed projects of technical assistance in Metrology was recently carried out[2]. The evaluation study consisted of a desk study, limited field visits, and an expert/evaluator group meeting. The data base revealed that some sixty-nine projects concerning metrology have been implemented at an expenditure of approximately $30 million. The extensive report emanating from this evaluation provides some valuable insights in project design, formulation, implementation, and sustainability. It also provides guidelines for developing future technical assistance projects in this discipline. Some excerpts follow that are relevant for the consideration of developing countries in establishing, improving, and/or modernizing their metrology base.

> "Despite the short comings identified, the US $30 million plus invested in metrology projects by the UNDP to date appears, in the main, to have been well-spent. The NMCs have established the elements of a basic metrology system and are receiving continued Government support. Those recipient countries which have established an operational national metrology network find themselves better positioned to deal with the new competitive conditions being created by the formation and expansion of regional economic and political confederations which eliminate trade, investment, and other economic barriers among themselves while establishing common trade policies and standards with the rest of the world. The stakes, i.e., both the risks and benefits, are rapidly being raised with implications for countries at all levels of development".

> "In limited cases, it is possible to isolate and trace or measure the causal effect or impact of metrology services on intended beneficiaries and development goals, e.g., the ability to assess the performance of quality and testing labs is a prerequisite to recognition of their results by importers and overcoming technical barriers to trade. In most significant cases, however, particularly in relationship to macro-level development goals, it is difficult or impossible to separate metrology from standards, quality assurance, pricing policies, etc. In brief, metrology is a *necessary but insufficient* condition for solving problems and achieving goals. Without an appropriate metrology base, a country cannot operate in an organized and effective manner in today's modern world. The challenge for UNDP lies, during the project formulation process, to assist effectively the requesting government in determining the purpose(s), level, capabilities, and approach appropriate for establishing, modernizing, and/or improving a national metrology network and its linkage to a national plan including standards, quality control and similar functions involved in industrialization".

> "UNDP, in cooperation with UNIDO and other concerned executing agencies, should prepare for and support a new or next phase of national and regional metrological development which, building on the basic capabilities already created, will involve increasing the range and accuracy of measurements and integrating metrology with quality assurance, standardization, and industrial production management as well as other sector priority programs".

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2. Report on the Evaluation of UNDP-Financed and UNIDO-Executed Projects of Technical Assistance in Metrology, Central Evaluation Office, Bureau for Programme Policy and Evaluation, United Nations Development Programme, New York, 18 September 1990.

UNIDO's programme of technical assistance also promotes a regional approach to development to exploit sharing of systems, expertise, and facilities among countries of a region. In fact, objectives of this approach include: (1) reducing technical barriers, (2) promoting regional commercial exchanges, (3) assisting participation in international activities, (4) sharing facilities/capabilities, and (5) cooperating on information, technical assistance, policies, joint ventures, etc. In conjunction with a joint UNIDO/ISO project a workshop was recently held in Geneva to elaborate on these concepts. Some excerpts from the report[3] of this workshop follow to illustrate significant areas of worthwhile cooperation and future technical assistance.

> "To achieve harmonization of standards at the national, regional and international levels, programmes should be implemented to strengthen the standardization activities in the developing regions...."
>
> "Of universal recognition during the deliberations of the workshop was the fact that standardizing bodies throughout the world share a common need for INFORMATION - and for a systematic approach to the management of that information. Hence, a need exists for software and compatible computer systems for this "SQM-IMS" (Standardization and Quality Management - Information Management System) function".
>
> "It is recognized that reliable measuring and testing capabilities should be available in industries and the testing and certification bodies and that developing countries, especially small and distant ones, are experiencing considerable difficulties in providing the necessary support for these capabilities in terms of maintenance and calibration/traceability to recognized measurement standards. It is also recognized that the provision of calibration and maintenance equipment together with the necessary environmental conditions and highly trained personnel needed for their operation is costly and it would, therefore, be advisable to organize this activity at the regional level with one concentrated facility in one of the countries of the region or with a small number of distributed facilities that complement each other in the countries of the region...."
>
> "It is universally recognized that quality of products is one of the main factors that could enable developing countries to become competitive in the "mega markets" of Europe, North America, and Asia".
>
> "To achieve quality of products, quality practitioners in developing countries should become familiar with recognized quality principles and techniques. This can be realized through extensive quality training programmes..."
>
> "Regional standardization bodies (where existent) and, otherwise, groups of countries with common interests, should consider the mutual recognition of national certification systems and test results in order to promote the elimination of trade barriers, facilitate regional commercial exchanges (within and outside the region), promote the sharing of facilities and capabilities, and cooperate on information, technical assistance, etc. Where necessary, technical assistance may be sought to develop the programme of mutual recognition and exchange".

UNIDO's programmes in these disciplines are directed at the ***Transfer of Quality Technology (TQT)***. See Stephens (1987) in the references. Too often, especially in developing countries, there is a lack of understanding and importance attached to the "soft" aspects of technology and technology transfer. **QUALITY** is one of these soft aspects – and too often overlooked or taken for granted in the transfer and acquisition of technology of the "hard" variety. The benefits of the proper approach to **QUALITY** and the ***Transfer of Quality Technology*** are: (1) Improved Quality of Products and Services, (2) Increased Productivity, (3) Reduced Costs, (4) Improved Marketability, (5) Reduced Consumer Prices, (6) Improved Delivery & Availability, (7) Improved Management of Enterprises, resulting in (8) ***ECONOMIC PROSPERITY***.

The world has seen, with very vivid results, especially during the last two decades, the phenomenal socio-economic progress of enterprises, corporations, and nations through the ***Transfer of Quality Technology***. Continued technical assistance in ***TQT*** is seen as vital to an increasing number of developing countries with varying requirements and needs.

UNIDO's Vast Experience In These Disciplines

Mentioned above was the execution by UNIDO's QSM unit of some 69 projects of $30 million (of UNDP funded assistance) in the metrology discipline, mainly over the period of 1972 to 1990. In the last year (1990/1991) of activities of UNIDO's QSM programme element, within the Industrial Institutions and Services Division of the Department of Industrial Operations, in varying degrees of implementation (some closing out,

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3 Report on *WORKSHOP ON THE ELABORATION OF CONCEPTS OF TECHNICAL ASSISTANCE PROJECTS BASED ON THE REGIONAL APPROACH TO STANDARDIZATION, QUALITY CONTROL, AND METROLOGY ACTIVITIES IN DEVELOPING COUNTRIES*, Geneva, Switzerland, 4-6 December 1990.

some newly approved), technical assistance was rendered to 33 countries, two regions and one international organization by way of 47 projects totalling $29.8 million, covering a very broad range of QSM disciplines. Of these projects, 31 were funded by UNDP at a level of $28.2 million, vividly demonstrating the UNDP/UNIDO partnership for technical assistance to developing countries in the QSM disciplines.

Space and time do not permit the description of all of these projects or of the assistance rendered to all of the countries. However, to help illustrate the nature of the technical assistance, brief summaries for three countries are presented below.

THE GENERAL DIRECTORATE FOR STANDARDS, METROLOGY AND QUALITY CONTROL (GDSMQC) -- VIETNAM

An earlier paper by the author, Stephens (1988), details earlier assistance rendered to Vietnam in standardization and related disciplines. This assistance has continued and is updated here. A project document, Assistance to the National Network of Standardization, Metrology, Quality Testing and Calibration Services -- Phase III (DP/VIE/86/037), was approved in March 1988 by Government, UNDP and UNIDO. Its immediate objectives were to complete the establishment of the national networks (with respect to standardization and testing) by developing facilities for new areas and increasing the level of services provided by old and new areas. The geographical areas of concentration for this project were: (1) Centre I in Hanoi especially with respect to electrical and electronic, engineering, rubber, textile, paper, food, and chemical industries in the 18 northern provinces; (2) Centre II in Da Nang with respect to engineering, textile, rubber, and electrical industries in 4 central provinces -- as well as to improve facilities in force, hardness, electrical, temperature, mass, and pressure measurements; (3) Haiphong City Branch with respect to engineering and food industries in Quang Ninh and Thai Binh provinces; (4) Thanh Hoa Provincial Branch with respect to food and mechanical industries in Ha Nam Ninh and Nghe Tinh provinces; (5) Nghia Binh Provincial Branch with respect to agriculture, sea-products, forestry, and cattle breeding in the Gai Lai Kon Tum province; and (6) Hau Giang Province Branch with respect to food, sea-products, and agricultural industries in 6 provinces of the Mekong River Delta. The project provided initially for expertise by way of a Chief Technical Adviser (CTA) post for 24 working months and subcontractor service for 35 working months of specialized consultants in rubber, paint, paper, electrical and electronic, food and physico-chemical products, and microbiological testing, and standardization. It further provided (initially) for 132 working months of overseas training fellowships made up of 44 fellowships of three working months each in mechanical testing; rubber, textile, paint and paper testing; electrical and electronic testing; metrology; food testing; physico-chemical testing; microbiological testing; and standardization and quality control. Training by way of study tours abroad for directors and deputies was also provided for 14 persons of one month duration each. The project also provided for equipment procurement for each of the six geographical areas (mentioned above) as well as specific procurement of items for the Centre for Standardization and Quality. A total project budget of $1.7 million was approved initially.

Project Implementation

Project implementation, to date, has been extensive but has had to undergo numerous changes in the original design of the project -- mainly due to inadequate cost estimations (on all components) and equipment specifications. The CTA assignment, implemented in three split missions, has been completed. Other expert services have been reduced to 11 working months for five consultants only in rubber, textile, physico-chemical testing, food and microbiological testing, and mechanical testing, the first three of which have been completed. Thirty-seven of forty-two (reduced by two) fellowships have been placed and the remaining 5 under process. These have involved programmes in Australia, India, UK, Bangladesh, South Korea, Netherlands, Germany, Philippines, Malaysia, and Italy. This component of the project provides valuable exposure, training, and motivation to the local staff to carry on and improve their work. One unfortunate development was the necessity to reduce the duration of most fellowships in order to accommodate all fellows under the programme. Three study tours were conducted for directors and deputies. One group of four visited South Korea for 15 days; a second group of 5 made visits to the Philippines, Thailand, and Malaysia for 31 days; and a third group of 4 visited Australia, New Zealand, and the Philippines for 29 days. Another group of 3 is planned for implementation with visits to Japan. A large amount of equipment has been provided to the various geographical areas for testing of relevant products. Testing services are now being rendered to factories to support activities for stabilizing the quality of products. The project is expected to increase testing capabilities from 9,700 tests (per annum) to 26,000. As of December 1990 the level was 18,884 and is expected to reach the target of 26,000 tests by the end of 1991.

An extensive programme of internal short-term training courses, including pre-fellowship training, was carried out by the project in conjunction with GDSMQC and associated Provincial Branches. Subjects included English language for fellowship nominees; testing methods and procedures (in the identified specialty disciplines), quality management, product certification, good laboratory management practices, lab accreditation, metrology, etc. Seminars were also conducted specifically for industries by the Centre for Standardization and Quality. These related to such products as cement, coal, tea, coffee, foodstuffs, sea-products, and bicycles.

During the project a standard and catalogue library was established and an information service has been organized. Computer and publishing centres have been set up. The training section in GDSMQC, in Centre I and in CSQ (Hanoi) were equipped. A Testing Data Base has been established that can be updated regularly (e.g. monthly) with new information on the testing activity of Centre I. It is planned to link this with the Certification Marks Data Base to provide technical committees with information on licensees covered under each Vietnamese standard specification. The Management Information Report will also be improved to permit periodical evaluation and monitoring of the financial performance of the testing programmes (branch/subcentre/centre). The system can be improved further to generate on demand a report on the income from each product or each field of testing lab activity during the year.

To ensure the proper functioning of the national network of testing capacities, at least 300 documents and standards were elaborated anew or updated (in collaboration with the CSQ). Particular attention was given to the standard specification and test standards for foodstuffs, light industry products, chemicals, electromechanical goods, etc., as well as to the regulations and guides on certification of conformity, accreditation of testing labs, and procedures for transferring international standards into national standards. Among the normative documents prepared (in final or draft form) are: (1) Metrology Act (issued 6 July 1990), (2) regulations on metrology, (3) Act on Product Quality (issued 27 December 1990 with enforcement begun by 1 July 1991), (4) regulation on preparation and implementation of national (TCVN) standards, (5) regulation on certification of conformity to TCVNs, (6) requirements for national standards used for certification of conformity (based on ISO guide No. 7), (7) regulations on Accreditation of Testing Laboratories (issued on 23 Jan 1989), (8) procedures for (7) (issued on 25 Jan 1989), (9) regulation on Technical Competence of Testing Laboratories (based on ISO guide No. 25 - issued on 31 May 1989), (10) regulation on License for Product Quality Inspector (issued on 23 Jan 1989), (11) Guidance and Procedures for Transferring International Standards into National Standards (issued on 22 May 1989), and (12) regulation on Organization and Activities of Technical Committees for Preparation of National (TCVN) Standards (issued on 5 May 1990).

Government Initiatives and Sustainability

UN technical assistance is typically concerned with Government's involvement and sustainability of the counterpart organizations. Since the start of country programmes (CPs) for Vietnam in 1977, the Government has included in every CP at least one project for GDSMQC. So far, there have been seven such projects (including DP/VIE/86/037). In the 4th CP (1992-96) Government is planning to include three projects, including Phase II of the National Metrology Centre, and two pertaining to maintenance and repair of testing and measuring instruments.

Experience has shown that Government has never spared any effort to meet its obligations for the implementation of technical assistance projects whether related to staffing, construction, etc. A striking example is the construction of an elaborate building to house the equipment to be provided by a project whose document has not yet been submitted for approval. In the present project Government started to provide inputs including staffing, construction, etc., before the start of project implementation.

An area of sustainability that must receive some attention by Government is the provision of sufficient foreign currency to allow continual procurement and stocking of the requisite accessories, spares, and consumables required to sustain and maintain the extensive equipment provided under the UN technical assistance.

Other important initiatives that have been noted during the present period of technical assistance are: (1) the formation of the Vietnamese Standards Association (VINASTAS), and (2) an affiliate Consumer Organization (VINACON). Both organizations provide very good fora and means to the promotion of the cause of standardization, metrology, quality control, consumer protection, and related disciplines. VINACON is

expected to be of particular importance in the realization and implementation of Article 25 of the new Ordinance on Product Quality (described subsequently).

Ordinance on Product Quality

Especially significant among the normative documents listed above is the Act or Ordinance on Product Quality issued on 27 December 1990. The Ordinance introduces radical changes and marks a significant turning point in SMQ activities in the national endeavor to ensure the healthy growth of the national economy. Among other aspects of the new ordinance, five stand out as significant, namely,

1. Responsibility for quality is placed on the producers (or sellers) of products (Article 2).

2. The rights and interests of consumers are emphasized (Article 2). Consumers are given the right to be informed, to expect a guarantee, and to be compensated for damages (Article 25).

3. The Standards System provides for both voluntary and compulsory standards, with the State encouraging the implementation of voluntary standards (Articles 12 and 13).

4. GDSMQC is the authorized agency for certification marking (Articles 16 and 19), as well as certification of quality assurance systems (Articles 17 and 19), and accreditation of testing laboratories (Articles 18 and 19).

5. Production organizations and individual producers are obliged to organize quality control to ensure that finished products conform to the registered or proclaimed quality (Article 21).

This lays a firm foundation upon which to build a sound quality programme at the individual enterprise level and at the national and international level. It paves the way for implementation of the ISO 9000 series for quality systems. It also places great responsibility on organizations such as GDSMQC to be prepared technically and administratively to provide the requisite services and establish the necessary infrastructure. The UN technical assistance programmes have and are contributing to this preparation, but a great deal more needs to be done.

Future Technical Assistance

As mentioned above under Government Initiatives and Sustainability, there is every indication that projects pertaining to the National Metrology Centre and to maintenance and repair of testing and measuring instruments will be requested for implementation. A strong programme of metrology, including calibration service to industry, is a necessary infrastructure to support a quality programme at the enterprise and national levels. Metrology is essential for ensuring a high quality of testing activities and metrological facilities, standards, and systems provide testing labs with the means to upgrade other technical competence. This in turn is a pre-requisite for a programme of accreditation of testing laboratories. It has been recommended by the present project that the project formulated as DP/VIE/88/013, Strengthening of the National Metrology Centre - Phase II, be approved and implemented.

Equipment deteriorates with time and use. It is often used in conditions far from ideal and treated with little care. Consequently, faults develop that not only can put apparatus out of action, but can also make it unsafe to use and can cause major disasters. Even under the best conditions continued use can result in reduced accuracy, efficiency, and reliability. Proper maintenance, repair, and calibration are both cost effective and quality effective. Hence, it has also been recommended by the present project that high priority be given to a project (or two) aimed at strengthening the Instrumentation Service Centre (ISC) in the South of Vietnam and that similar facilities be developed in the North.

In view of the passing of the Ordinance on Product Quality and its comprehensive nature and potential for a significant quality effort at enterprise, institutional, and national levels, it is also recommended that high priority should be given to include in the Fourth Country Programme a project for the Assistance to GDSMQC in the Transition to the New Economic Policy. It is envisaged that such a project of technical assistance should adequately cover the following fields.

* Standardization
* Certification Marking
* Certification of Quality Systems
* Enterprise Consultation on Quality Systems
* Laboratory Accreditation
* An Education and Training Centre
* A Technical Information and Documentation Centre.

UNIDO is an able and willing partner in helping to further create and implement the infrastructure, as discussed above, for making further giant strides in quality planning, control, and improvement which, when properly applied, become engines of economical growth.

THE NEPAL BUREAU OF STANDARDS AND METROLOGY (NBSM)

Early Establishment of the Nepal Institute of Standards (NIS)

As early as 1974 Government (hereafter referred to as HMG) established a new Industrial Policy with a view to create a more congenial atmosphere for industrial development. This included the Nepal Institute of Standards (NIS) for testing and controlling standards of raw materials and finished goods and HMG specifically assigned to NIS the functions: (1) to determine standards in the production process, (2) to determine standards of quality of products and to certify the quality, (3) to conduct research and organize seminars, and (4) to issue trade marks as "Mark of Excellence" for high quality products.

The Nepal Council for Standards (NCS) was established by executive order (2033-5-15 of August 31, 1976) originally consisting of nineteen members, and by HMG Order 2034 consisted of eight members representing various Ministries, the Federation of Nepalese Industry and Commerce, and the Tribhuvan University. In November 1976 the Secretary of NIS was deputed to study the organization and work of the Indian Standards Institution and in April 1977 to attend a training programme in the Organization of Standardization System in Moscow. Based on these visits a procedure was proposed for the formulation of standards, which was duly approved by the NCS. Work began in 1977/78 on an initial programme of 35 items recommended by a sub-committee of NCS.

By the end of 1977 NIS had acquired its own offices in rented accommodation and the staff complement had increased to 24 (from 3 initially) of which 7 were technically qualified and involved in standards formulation. Subjects chosen for initial national standards included: (a) burnt clay bricks, (b) animal ghee, (c) edible oil, (d) toilet soap, (e) ink, (f) matches, (g) ginger, (h) biscuits, (i) bread, (j) agricultural lime, (k) leather, and (l) flour.

Early UNIDO Assistance

A mission to Kathmandu by a UNIDO staff member in June/ July 1977 was carried out to: (1) review and assess the requirements for standardization and quality control in light of the perspectives for economic and industrial development under the Fifth Development Plan, (2) advise and assist the Government authorities in structuring and planning the National Standards Institute, and (3) advise the Government on external assistance that could be helpful to establish a national system of standardization and quality control, including product certification. Among other things this mission assisted in the preparation of a draft Standards Act establishing the Nepal Institute of Standards (NIS) under the Ministry of Industry and Commerce with responsibility for the organization, coordination, and administration of standardization and certification marking activities in the country.

A Project Document (DP/NEP/77/001) was formulated following the UNIDO mission and signed by HMG, UNIDO and UNDP (as funding agency) in April and June 1978. This provided technical assistance to NIS: (1) a Chief Technical Adviser (CTA) on Standardization and Quality Control for 18 months, (2) an Expert on Information for Standardization for 5 months, (3) ad hoc Consultants for 10 working months, (4) some 38 working months of overseas training fellowships, and (5) a small equipment component, for a total initial budget of US $259,550.

The first CTA joined the project to begin implementation in April 1979. By this time NIS staffing had reached 31 with 15 professionally qualified and 10 involved in standardization. It was recognized that in order to implement standards and maintain surveillance of Certification Schemes NIS would need access to laboratories and testing facilities. However, budgets did not exist for such capital investment and NIS was instructed to use facilities already existing within the Ministries and Departments of HMG. Work conducted during this first year period included: (1) survey of NIS with respect to organization, facilities, activities, relationships with other organizations both internally (in Nepal) and internationally, and development plans; (2) review of NIS situation with respect to the Fifth Development Plan: national objectives, regional objectives, requirements for standards for international trade, import substitution, public health and safety, and consumer protection; (3) programmes for NIS in standards preparation, testing and Quality Assurance Schemes, consumer advisory and education, standards information centre and service, preparation and publication of general information on standards, and training of staff; and (4) recommended involvement of NIS in related international standardization bodies. During this period a QA programme for Ghee Production was formulated. Draft schemes, services and regulations for the Quality Certification programme of NIS were also formulated. Seminars were conducted. Equipment for reproduction, printing and training was procured.

A second CTA was assigned to the project in September 1981 for one year. During this formative period further progress was made in reorganizing NIS, expanding the promulgation of standards, identifying deficiencies to be dealt with by HMG and NIS, extending UN assistance, and developing a long term plan. The Standardization (Certification - Mark) Act, 2037 (Act No. 10 of 2037) was promulgated in September 1981. It provided a necessary (previously lacking) statutory base to formally constitute: (a) the Nepal Council for Standards (NCS), and (b) the ***Nepal Bureau of Standards (NBS)*** in place of NIS. It laid down coherent functions for NCS and NBS. Deficiencies in the system and infrastructure, impeding standards formulation and certification, included: (1) lack of data and information, (2) delays in testing (by other laboratories not controlled by NBS), inability of labs to conduct all required tests, and lack of uniformity in testing techniques, (3) difficulties in applying foreign standards to local knowledge and experience, and (4) lack of appreciation for standards and the paucity of qualified persons to form standards committees.

A project revision in 1983 provided for the service of an Expert in Planning and Organization of Testing Laboratories – with the recognition that an owned/controlled testing lab was essential for further standardization and certification progress. The expert commenced a three month assignment in November 1983. By this time NBS had already approved some 300 standards and received some 25 applications for quality certification marks from manufacturers. During this period Government allocated some 6000 m^2 of land for the construction of a new standards building on the outskirts of Kathmandu. The building reserved the lower floor for testing laboratories, with plans for expansion to separate labs on the available grounds.

Comprehensive studies revealed that about 30% of the standards (and an equal percent of the industries) dealt with food, followed by organic fibrous materials, building materials, and technical products such as soaps, dyes, etc. External (to NBS) testing facilities for food existed at the Faculty of Agriculture of Tribhuvan University and in the Royal Drugs Research Lab. Testing for fibrous materials was virtually non-existent. Some good facilities existed in the Faculty of Engineering of Tribhuvan University for building materials testing. A new metallographic and chemical analytical lab for metals had been established recently. Priorities for testing facilities for NBS were determined as follows: (1) testing of food and products from agriculture and forestry, (2) calibration laboratory, (3) specialized performance tests on commodities, and (4) materials testing. The project provided a budget of only $53,000 with a counterpart contribution of $13,000. A limited equipment list was drawn up and orders placed, with delivery in August of 1984 and installation in a building provided by the Dept. for Mines and Geology.

The report of the Lab Expert outlined basic equipment lists for various labs totaling some $1.1 million, with support equipment of $0.4 million and estimated building costs at $1.7 million. He proposed the assignment of some 10 experts for a total of 138 work/months in such disciplines as (1) laboratory buildings, (2) calibration, (3) food testing, (4) physical testing, (5) electrical and electronic testing, (6) materials testing and metallography, (7) instrumental analysis, (8) environmental testing, (9) corrosion testing, and (10) textile testing. He further proposed overseas fellowships for 10 persons for 3 work/months each in similar disciplines.

The last expert under the initial technical assistance project was fielded in May 1984 on a four month assignment -- an Expert on Information for Standardization. His duties were to establish professional procedures appropriate to Press and newspaper articles and releases, publications, displays, lectures, and all

media for disseminating information about standardization, certification, and quality control, the object being wider appreciation of the advantages (quality and economy) of these disciplines in government and industry. Toward the end of this experts assignment he was requested to formulate a large-scale draft project document for expanded technical assistance.

Training of staff on overseas programmes during this formative period of development and growth of NBS included: (1) work study tour of 5 months, to BSI and ISO, (2) a second work study tour at BSI for 4 months and attendance of the SIDA/UNIDO Quality Control Course in Sweden, (3) two fellowships of 5 months each at the Indian Standards Institute, (4) a two week programme for the director of NBS to participate in the ISO/UNIDO Conference in Brazil, and (5) two fellowships of 3 months each to the Quality Control Course in the Netherlands.

Extended UNIDO Assistance

Larger scale project assistance for NBS was begun with the formulation (in 1984) and approval of a new project document (DP/NEP/84/031), initially approved in August 1986 by HMG, UNDP, and UNIDO. It provided initially (1987-1989) for: (1) expertise -- a Project Coordinator and Expert on Certification and Quality Systems for 30 months, a Standardization Expert for 12 months, and five short term Consultants for a total of 34 work/months, (2) overseas fellowships for 22 persons, covering 13 subjects for a total of 98 work/months, and study tours for 4 work/months, and (3) equipment for instrumental analysis; fibre, yarn and related testing; paint testing; calibration; materials testing; acoustical measurement; special performance testing; velocity testing; and workshop; with a planned total budget of $855,240. The project provided for an overall budget of $1,740,050. Technical assistance is a dynamic process. There is an incubation period from prior assistance that matures over time to expand absorptive capacity, change priorities, and enlarge horizons. The process from formulation, to approval, to implementation is often slow and encumbered. On reflection, the frequent criticism of project design by evaluators is often done without understanding this dynamic process. Fortunately, the UN system of technical assistance provides mechanisms for review, redesign, extension, phasing, etc. In fact, with approval in 1986 of this phase of assistance to NBS was a request by UNDP for the assigned CTA to review and fine tune the project to meet the maturing, expanding responsibilities and activities of NBS. While there was general agreement on the project objectives and the importance of NBS in Nepal's industrialization efforts, there were reservations regarding overall project design. The reservations expressed the need for adequate planning that might be done best through a phased step by step approach. The CTA was requested to: (1) define HMG's overall plan, inputs and actions with respect to these disciplines, (2) reassess laboratory needs, including manpower and equipment, (3) develop a staffing plan for NBS with HMG concurrence, (4) develop linkages between project objectives, outputs, and inputs, and (5) establish a realistic work plan and budget to reflect the phased approach.

National Industrial & Economic Developments

It was also during this period that HMG was active in new and dynamic actions greatly influencing the NBS and its role in industrial development in Nepal. A commitment was being manifested in the construction of laboratory buildings for NBS. The Seventh 5-year Development Plan (1985-1990) was being implemented, incidentally, with support from a UNDP/UNIDO project, Industrial Planning (DP/NEP/86/005). Other important guidelines for economic development were provided in the Programme for the Fulfillment of Basic Needs (1985-2000) and by the New Economic Policy, adopted in October 1987. The main elements of this policy were: (1) decreased regulation, including a liberalization of industrial licensing; (2) elimination of discriminatory protection of various industries; (3) privatization, including existing major enterprises; and (4) recognition of foreign investment in supplementing the domestic sources of finance and of securing technology. There was also a rationalization of the tariff structure and a rendering of trade policy more production oriented, more simplified procedures for import of raw materials for industrial production, and the elimination of most export controls. One action taken that was to complicate the growth and strength of the Standards Bureau was the policy of gradual increases in the salaries paid to qualified personnel in the private sector relative to those paid in the public sector.

A decision was also taken by HMG at this time to amalgamate the Nepal Bureau of Standards and the Department of Weights and Measures (DWM) into one department with the new title, Nepal Bureau of Standards and Metrology (NBSM). With this move six regional offices of the former DWM were brought under the management of NBSM to permit expansion of activities in these branch offices from weights and

measures only to standardization and quality control activities. With the added responsibility for Metrology under NBSM a Consultant on Metrology was fielded under the implementation of the new project from November 1987 to January 1988. Besides the CTA this was the only consultant fielded under the project in 1987. This mission assessed the capabilities of the Metrological Division of NBSM and developed a framework for a future National Metrology Centre in terms of equipment, laboratory construction and staffing. It further assisted, and provided training to, the ongoing work on mass, volume, length and other measures. A taximeter stand was also put into operation.

In-Depth Evaluation

Shortly after the start-up of the new project (in June 1988) UNDP fielded an in-depth project evaluation mission to: (1) determine whether implemented activities to date had contributed to the achievements of the project objectives, (2) identify factors that may have facilitated or deterred the achievements of the project's immediate and long term objectives, and (3) formulate recommendations for future activities and necessary adjustments in project implementation. The evaluation team prepared an extensive report with a framework for a major project revision to be carried out by the CTA, whose assignment was extended for a further contiguous period of 18 months. The evaluation mission found the project to be managed properly and that activities and expenditures to date had been fully justified. They evaluated the equipment requisition lists prepared by the short-term consultants (discussed subsequently) and found them technically justified – recommending that the equipment be procured in order of priority. The mission did uncover some problems related to the construction of the laboratory building with respect to insulation against water and humidity, safety from fire, environment, and waste water disposal. They strongly recommended correction of these faults. They recommended that HMG take all measures to ensure timely availability in terms of quantity and quality of staff necessary to operate the laboratories – with forecasted increases from a level of 32 (in 1988) to a total of 72 expected to be required in 1989/90.

Short-Term Consultants

Following the Consultant on Metrology, 1988 saw the scheduling and fielding of seven short-term consultants/experts as well as the start-up of the posting of the Expert in Standardization for a one year assignment. Sharing overlapping assignments were the following experts: (1) Expert in Textile and Light Industry Products Testing, (2) Expert in Food Testing, (3) Expert in Chemical Testing & Instrumental Chemical Analysis, and (4) Expert in Testing of Building Materials. They were able to confer and agree with the national authorities on distribution of the laboratories by technical discipline. With respect to their respective expertise these experts: (1) provided on-the-job training to the staff of NBSM, (2) assessed the needs and specified equipment required for the testing laboratories, (3) provided suggestions to NBSM management for organization, staffing, procedures, operations, and policies, and (4) provided valuable consulting to a range of related industries. They prepared extensive reports setting out their observations, findings, and recommendations.

Another group of short-term consultants/experts sharing overlapping assignments during the second half of 1988 were: (1) Expert in Mechanical Testing, (2) Expert in Electrical Testing, (3) Consultant in Public Relations, and (4) a return mission of the Expert in Chemical Testing & Instrumental Chemical Analysis. A number of these assignments also overlapped with the Expert on Standardization and, of course, with the CTA. Unique to this expertise was the Consultant on Public Relations – actually representing a return mission of an assignment on the earlier assistance in 1984 on Information for Standardization. A continuing problem for many standards bureaus, including NBSM, is the lack of public (even industrial) awareness of their existence, their work, their responsibilities, and their service to the community. The task of overcoming this problem is often overlooked and otherwise slighted. NBSM has had the benefit of limited (short-term) advice in this area and must be vigilant to maintain and expand their image with the public and direct clientele.

Current Project Assistance

Following these developments, as related above, an extensive revision of the project and associated project document was carried out. This was approved by UNDP in July 1990 representing an increase of $789,769 over the previous revision to a total budget of $2,623,953. Approximately half of these inputs had already been provided through 1989. This revision was made to reflect the recommendations of the in-depth project evaluation and to better meet the current needs and priorities of NBSM and HMG.

The complexity and extensive nature of the project is reflected somewhat by the number of expected outputs in the project document -- eighteen. These include establishment of five major laboratories, a standards formulation section, a computer section, a public relations, information and publication section, six regional offices upgraded, and the metrology section upgraded. They also include trained engineers (60) in testing and standards formulation and implementation, and two trained computer operators. Other outputs pertain to reports on subjects such as maintenance and repair services of NBSM's instruments, national requirements for metrology, and adequacy of legislation with the socio-economic needs for quality. Still other outputs look for numerical results with respect to awarding of certification to at least 25 factories and carrying out at least 10 Quality Assessment Programmes (QAP). Plans for the coordination of testing laboratories, establishment of Good Laboratory Practices (GLPs), establishment of an Internal Standards System. (INS) for NBSM, and assessment of information at national and international levels on the current development of standardization and quality control, are additional outputs to be completed. An active programme of implementation to complete these outputs and a periodic project performance evaluation programme to monitor progress, make adjustments, and signal new emphasis are being pursued continually.

Additional short-term consultants/experts have been fielded beyond the group mentioned above for 1988. During 1990/1991 seven short-term consultants/experts visited the project to provide further training and advisory services to NBSM and Government. These included return missions of the Metrology, Electrical, Mechanical, and Public Relations Consultants. Three new consultants covering Leather, Pre-Shipment Inspection and Laboratory Accreditation were fielded. Other international expertize during this period included the Standardization Expert through May 1990, and the CTA through Feb 1990 with short-term return missions over June-Sept. 1990 and again from Feb.-Apr. 1991. This has provided NBSM with a fairly continual flow of new ideas, assistance in setting up and operating laboratory equipment, and valuable on-the-job training for NBSM staff and management.

The project also provided the services of three nationally recruited experts on Electricity Installation in the Laboratories, Ground Water Insulation and Waste Water Treatment, and Air Conditioning. These subjects had been identified as problem areas during the in-depth evaluation and by the international experts.

As of August 1991 the professional staff of NBSM had grown to 51. By mid 1991 twenty-eight staff members had undergone overseas training fellowships under the project for a total of some 96 work/months. Additionally, seven study tours were conducted (from 1987-1990) for NBSM (and HMG) management, four in institution management and one each in standardization, quality control, and certification. Thirteen officers of NBSM have also been trained on standardization in India under the Colombo Plan, and others are scheduled.

Extensive equipment has been provided under the project to NBSM for the five major testing laboratories, metrology section, computer section, and public relations, information, and publications section.

The project is being implemented on a modular approach that allows for measuring progress and directing efforts. This approach in itself represents instruction to the management of NBSM in carrying out progressive tasks. A great deal of success has been achieved in implementing the project and its influence and effect on the establishment of the Nepal Bureau of Standards and Metrology (NBSM). Like any major undertaking (especially in the developing world and in the public sector) there are chronic problems to be dealt with and gradually overcome. Much has still to be done. Management improvements are necessary and will be abetted by implementation/utilization of operational guidelines prepared under the project. Construction of the building (delayed by many factors) must be completed, water and electricity services must be assured, efficiency of work must be increased, adequate staffing policy and incentives for staff must be implemented, provision of sufficient staff and of operational funds must be made.

Emphasis for the next period of assistance will center on: (1) planning and implementing quality assessment programmes addressing substantial economic, technical or social problems of the country, (2) initiating and pursuing quality monitoring programmes of basic products, (3) increasing the number and effectiveness of tests and better use of the data obtained from tests to improve quality and to improve standards, and (4) enhancing public awareness on quality and greater appreciation and use of the services of NBSM.

Development Objectives

The joint (tripartite) efforts of HMG, UNDP, and UNIDO have and are continuing to contribute to the accomplishment of the development objectives of the project as stated in the project document.

"The development objective of this project is to contribute to improve the quality of industrial products through standardization, quality control, and certification procedures in order to rationalize the expansion of *industry* sought by His Majesty's Government and expressed in its Industrial Policy (1984), more recently in the Seventh 5-year Development Plan (1985-1990), and in the New Economic Policy which was adopted in October 1987, and to provide *consumers* with commodities of reliable quality and fulfill Basic Needs Programme of HMG (1985-2000) also in respect of providing appropriate quality goods and services."

"Further, to achieve the utmost economy in the use of raw materials, components and subassemblies which are largely imported; to introduce economies in public expenditure on industrial goods; to increase export potential and thereby assisting the Industrial Development of Nepal."

THE MAURITIUS STANDARDS BUREAU

The tiny 2000 square kilometre island country of Mauritius in the Indian Ocean some 1200 miles off the coast of Eastern Africa became independent within the Commonwealth on March 12, 1968. At that time it had a weak, single-product (sugar) economy. Its economy suffered from its small domestic market (approximately one million), shortages of natural resources and funds, and backward technology.

Since independence Mauritius has gradually shaken off economic backwardness and has diversified its economy. Space does not permit an extensive exposé on measures taken -- but of significance is the broadening of its industrial, investment, and tourism base. In December 1970, an Export Processing Zone scheme was set up to promote export-oriented industries. Early exports comprised textiles, garments, electronic components, toys, and jewelry. Investors came from France, Britain, Germany, India, Pakistan, Hong Kong, Japan, Australia, South Africa, and the United States. Mauritius has elevated its Wool Garment Exports to a level among the top five in the World.

This development has required an industrial infrastructure. Significant in this infrastructure is the Mauritius Standards Bureau.

Early Development and UN Assistance

As early as April 1972 a project document was approved to provide, "Technical Assistance to Industrial Development Services", DP/MAR/72/002. Included in this project was the service of an Expert on Standardization, initially fielded in January 1973. A Section was set up in the Ministry of Commerce and Industry for the purpose of establishing standards for certain local products and to help local industries in all aspects of quality control. Technical Committees were organized with representation from the different Ministries, the University of Mauritius, manufacturers, consumers, testing stations, and consultants. This was the forerunner of the Mauritius Standards Bureau.

An early activity by the Expert on Standardization was the preparation of a draft for the Mauritius Standards Act that was based on similar Acts in Jamaica and the Republic of South Africa. With respect to metrology (in particular, weights and measures) regulation was based on the Weights and Measures Ordinance of 1 May 1878. A Standards Bureau building was already on the drawing board to be located near the School of Technology at the University. Tenders for the construction of the building were opened in January 1974 and construction was begun in July 1974. The completed building was handed over to the Ministry in December 1975. Installation of the laboratory equipment (provided under DP/MAR/72/002) was completed in January 1976. As early as September 1973 a representative of the International Wool Mark (IWS) visited Mauritius and discussed the possible testing by the laboratory (of MSB) on behalf of IWS. In December 1973 the first counterpart for the Standardization Expert was appointed – now the Director of MSB.

The Standards Bill was published in the Government Gazette of Mauritius, No. 15, dated 1 March 1975 and enacted as the Standards Act 1975 on 10 April 1975. It officially established the Mauritius Standards Bureau.

A small, but important, parallel effort and assistance was provided to Mauritius by a second UN project during this early period of development. This was a small Special Industrial Services project, SI/MAR/72/007, Metrology and Metrication. Initiation was as early as November 1972 on a request from the Ministry of Economic Planning. It called for the provision of two consultants, Consultant in Planning and Organization of Metrological Laboratories, and Consultant in Metric Systems Introduction. The project was implemented

by way of a contract between UNIDO and the Cranfield Institute of Technology with assignments by the consultants in Mauritius over Jan-April 1975. It resulted in attaching the Metrology Laboratory to the MSB. A draft ordinance (Act) was prepared as the Metrics Weights & Measures Bill to replace the Weights and Measures Ordinance of 1 May 1878, and included the Systeme International d'Unites (SI) as the legal system of measurement in Mauritius.

A further milestone under DP/MAR/72/002 was the appointment of a Consultant on Organization and Equipping of Quality Control and Testing Laboratories -- later changed to Chief Technical Adviser/Standardization Team Leader for an initial period of 7 March - 22 May 1976. This mission helped to consolidate the now fledgling MSB. It was also during this period that the Director of MSB was appointed.

These developments subsequently led to the formulation and approval in Nov./Dec. 1976 of DP/MAR/75/008, Assistance to the Mauritius Standards Bureau. The immediate objectives of the project were,

"(i) To develop existing and establish new facilities for testing according to standards at the MSB.
(ii) To establish local standards.
(iii) To start quality control and other testing activities in order to upgrade the level of product quality to a standard consistent with international, foreign or local standards.
(iv) To broaden testing, quality control and standardization activities into fields of technology as yet not covered in the country.
(v) To set-up and maintain technical documentation."

The project made provision for: (1) a Standards Bureau Adviser for 12 work/months in 4 split missions of 3 months each, and 16 work/months of sectoral consultants in fields such as textile, chemical/paints, and mechanical; (2) overseas training fellowships for staff of MSB for a total of 30 work/months; and (3) equipment items for testing and metrology. A total budget of $266,600 was approved. The first mission under this new project took place over Feb.-April 1977. Progress noted was: (1) allocation by Government of the necessary budget and funds for full operation of the Bureau, (2) placement of orders by Government for the complementary equipment (to that provided by the UN), and (3) finalizing of installation of equipment in the laboratories. During this period the Standards Council was appointed and the standardization programme of technical committees revitalized. Negotiations were also continued with the IWS to appoint an expert to train local counterparts in the sampling, testing, and reporting for the Wool Mark programme. An expert began the assignment in October 1977. A return mission of the Standards Bureau Adviser took place over Sept. 1977-Feb. 1978. The formative stage of MBS was very much underway. An Expert on Paint Testing was appointed in November 1977 for three months. The MSB Certification Marking regulations were drafted and prepared for legislation. Designs for the MSB logo were proposed. Testing activities were increased, with appointment of additional staff in textiles, paint, chemicals, mechanical, and electrical. The draft Metrology Act was reviewed and revised and the metrology lab prepared to meet the new Bill and regulations. Work on standards preparation and approval was continued. By May 1978 the project had been revised upward to a budget of $433,748.

A return mission of the Expert on Paint Testing was implemented over July-Sept. 1978. Additionally, an Expert in Food and Analytical Chemistry began a twelve month assignment in July 1978. In July 1979 a UNDP/UNIDO Review Mission was fielded to review progress and developments and make recommendations for further directions for MSB and further assistance by UNDP/UNIDO. It was recommended that a CTA be assigned for a period of twelve months, that an Expert in Quality Control be assigned for six months, and that ten work/months of expert service (ad hoc) be reserved for specific technical needs. A training programme for MSB staff was proposed, being 10 work/months in Standards Bureau Management, Standardization, Quality Control, and Testing. The Bureau was considered to be reasonably well equipped from earlier assistance and Government procurement. An auxiliary equipment acquisition of $25,000 for the next three year period was proposed. It was further recommended that a working relationship be established between MSB and the Singapore Institute of Standards and Industrial Research (SISIR).

UNDP decided to discontinue DP/MAR/75/008 at year end 1979 and continue assistance to MSB under a new project, DP/MAR/80/001, for which an advance authorization was given to UNIDO in May 1980. This project initially provided for: (1) a Standards Bureau Adviser for 12 work/months, an Expert in Quality Control for 12 work/months, ar ' 10 work/months of ad hoc Consultants, (2) fellowship funds of $27,843, and (3) an equipment budget of $49,599, for a total budget of $277,584.

The author of this paper assumed the post of Expert in Quality Control commencing on 11 July 1980. Assigned duties were: (1) assist in developing and promoting the Quality Certification Scheme of the MSB, (2) conduct quality control courses for the staff of the MSB and for industry, (3) train the staff of MSB in evaluating quality control systems and providing quality consultancy services to industry, and (4) promote quality consciousness among the Mauritian industries through the organization of Quality Control seminars and lectures. As the only member of the international team present at the time, additional duties were assumed on the project administration (preparation of project document), equipment and fellowship coordination, standards preparation, etc. The assignment covered the period of July 1980 - Jan. 1981 and July 1981 - Feb. 1982, with a split mission to Thailand (TISI) over Jan-June 1981, including a four month extension in Mauritius. Under direct assistance from the project (including the earlier ones) and specifically during the expert's assignment, MSB emerged from a mere collection of laboratories with ineffectual standards preparation and implementation to a more comprehensive standards body encompassing more of the essential elements of an integrated standards approach, namely: (1) standardization (with more effectual preparation and promulgation of standards designed for implementation); (2) quality certification, (3) quality control promotion, consultation, and training; (4) industrial and legal metrology; (5) product testing for control, assessment, and standards development; (6) export inspection; and (7) applied research for standardization and quality control.

This period saw the establishment and growth of the MSB Certification Marking Scheme with instructions, guidelines, and forms. Detailed assessments and assistance was carried out in seven factories for the MSB Certification Mark License. This included Schemes of Quality Control, Inspection and Testing for these seven factories. A programme of Training/Consulting Workshops (See Stephens (1991)) was conducted. This resulted in consultations with 36 factories on quality control systems and extended to in-depth studies in two factories. See Stephens (1982a).

The project document, DP/MAR/80/001, was approved in November/December 1980. An Advisor in Legal Metrology was fielded for a 3 month assignment (subsequently extended to 7 months) to organize the Weights and Measures Division, to continue work on the draft regulation for the Metric Weights and Measures Bill, to develop a system of surveillance to control measures that have been calibrated and are in service, and to advise on measuring instruments. An extensive report was prepared and submitted containing a revised draft for the proposed legislative Bill. This expert also returned to Mauritius to implement his proposal under British Technical Cooperation. A Standards Advisor was also recruited under the project, with the additional experience of Public Relations. This resulted in an improvement of the image of MSB in the community at large. Following this UN assistance MSB was considered to have matured to the point of self-sufficiency under Government support.

A Maturing Standards Bureau

By the end of 1986 MSB had a staff of 45, of which there were 10 professionals and 12 technicians. A full range of Standards Bureau activities were underway. A total of 55 Mauritian Standards had been issued, five drafts had been approved, and work was in progress on 16 draft proposals. Six Standards Committees and 18 subcommittees with a membership of 143 had held 64 meetings during the year.

Certification licenses under Mauricert, the certification scheme of MSB, were renewed for six companies, newly issued to two companies, and two companies had entered the pre-licensing phase.

MSB has continued organizing and conducting Quality Control Workshops. The fifth such workshop was held from July to November 1986. Workshops held in 1984, 1985 and 1986 were entirely organized and conducted by staff of MSB in conjunction with staff from the Central Statistical Office (since departure of the UNIDO Expert on Quality Control in February 1982). A total of 34 persons from 31 industries attended the 5th Workshop, bringing to a total of 150 participants from 98 manufacturing industries/export service organizations that had participated in the five workshops organized by MSB. An in-house training programme on Statistical Quality Control was conducted in a Spinning Mill.

MSB holds correspondent membership in ISO, and membership in the African Regional Organization for Standardization (ARSO). It's correspondent membership in the International Organization for Legal Metrology (OIML) was transferred to the Ministry of Trade and Shipping, taking responsibility for legal metrology. The International System of Units (SI) Act 1984 became fully operational on 1 July 1986. All units for weights and measures in use in Mauritius must now conform to the SI Act.

The textile laboratory continued to provide testing service to the International Wool Secretariat -- with products from some 40 IWS licensees tested for quality performance. One testing job was part of a world-wide inter-laboratory comparison programme of IWS. Overall, MSB performed 538 test jobs for 102 clients in industry, trade, Government, and other organizations. The Director and staff maintain an active participation at seminars and conferences. Under study by MSB were measures to enhance the status of standards as an instrument to improve the efficiency and competitiveness of Mauritian firms and of promoting quality. These measures consisted of: (1) further encouragement of Mauricert, (2) linking requirements in public purchasing to existing Mauritian Standards rather than technical specifications particular to the purchases, and (3) greater use of standards in laws and regulations.

Further Assistance to MSB

After approximately six years since the last UN assistance, a new technical assistance project was approved in July 1988, as DP/MAR/88/001, Assistance to the Mauritius Standards Bureau. It provides for: (1) 3 work/months of international expertise made up of a one month assignment of an Expert in Computerized Statistical Quality Control, a one month assignment of an Expert in Quality Control in the Textile Industry, and short-term consultants to rehabilitate the Leco Analyzer and identification of special equipment, (2) fourteen work/months of overseas training fellowships in the areas of analytical chemistry, textiles, and management information systems, and (3) equipment purchases of an Uster evenness tester, an Atomic Absorption Spectrophotometer (AAS) and high pressure liquid chromatograph (HPLC), and computer equipment (and software). The immediate objectives of the project were to expand the activities of MSB in the fields of quality control, certification and testing, and to strengthen MSB's role as the national testing centre of the country to respond fully to the present requirements of industrial growth. Development of a computer - oriented SQC and management information system, and reinforcement of textile and chemical analysis testing activities were part of these objectives. A total budget of $177,650 was initially approved.

Three experts were fielded under this new project assistance to MSB. An Expert in Quality Control in the Textile Industry spent one week (in June 1989) to survey equipment requirements and prepare a study tour programme for an MBS staff member. A second assignment over April - May 1990 involved training of MSB staff in the use of the Uster evenness tester, modification of test reports and forms, preparation of a quality manual, and of a calibration programme, and general training in the field of textile testing. A second Expert on Computerized Statistical Quality Control was fielded for a one week mission (in June 1989) to assess specific requirements for computer equipment, software, and staff training. His second mission was in October 1989 and mainly consisted of training of staff and some factory personnel on Statistical Quality Control/Process Control (SQC/SPC) including use of computer software. A third Expert in Computer Equipment was fielded for 10 days in August 1989 to provide advice on computer equipment suitable for MSB's operation especially with respect to a Management Information System.

The project has been completed. Output 3 involving the AAS and HPLC did not materialize due to shortage of funds -- with diversion of funds to complete the testing capacity of yarns quality. Manufacturing firms are now benefiting from access to specialized testing services in the textile sector and from training and consultancy in the area of Statistical Quality Control.

The maturity of MSB should now lead to technical cooperation between developing countries since MSB is able to serve a catalytic role in promoting integrated standardization in countries participating in the Indian Ocean Commission. It can also serve as a model to those countries in the African region that have not yet established national standards bodies. Already we are sending staff from the Uganda National Standards Bureau, under a UNDP/UNIDO project, to MSB for training and exposure.

Mauritius has experienced unprecedented economic progress especially since 1983. The manufacturing sector has been growing at a very rapid pace with exports exceeding all expectations. Efforts to industrialize the country have paid off immensely. United Nations Assistance to the Mauritius Standards Bureau has played a significant part in these accomplishments.

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2nd day

SEMINAR ON
ACHIEVING COMPETITIVE QUALITY THROUGH STANDARDIZATION AND QUALITY CONTROL

SESSION II: VENDOR TOTAL QUALITY CONTROL

Quality Control in Small & Medium-sized Industries (I)

– Introduction of Quality Control System and Its Achievement in a Japanese Small and Medium-sized Company –

Lecturer: Mr. Sadaki Ishiwata
Director of Engineering Department,
Shinagawa Electric Wire Co., Ltd.

Quality Control in Small & Medium-sized Industries (II)

– Quality Control at Matsushita Industrial Corp. Sdn. Bhd. (MAICO) –

Lecturer: Mr. Tin Check Ping
Assistant Manager of Quality Control Section,
Matsushita Industrial Corp. Sdn. Bhd. (MAICO)

Panel Discussion:

Implementation of Quality Control in Small & Medium-sized Industries

Leader: Prof. Yozo Mukawa

Panelists: Mr. Masaru Sekiguchi, Dr. Kenneth S. Stephens, Mr. Sadaki Ishiwata, Mr. Tin Check Ping, Mr. Abdullah Ali

A Malaysian Expert is scheduled to participate.

SESSION III: STANDARDS & INTERNATIONAL CERTIFICATION SYSTEMS

International Electrotechnical Commission Quality Certification System (IECQ)

– Voluntary Third Party System for Electronic Components Based on ISO 9000 Series –

Lecturer: Mr. Yuji Gomi
Director of Inspection Division,
Reliability Center for Electronic Components of Japan

29th – 31st October 1991
The Regent of Kuala Lumpur

2nd day
Oct. 29 – 31, 1991

Quality Control in Small & Medium-sized Industries (I)

– Introduction of Quality Control System and Its Achievement in a Japanese Small-and Medium-sized Company –

by Sadaki ISHIWATA
Director of Engineering Department,
Shinagawa Electric Wire Co., Ltd.

1. Introduction

In respect with introduction of quality control system in a Japanese small-and medium-sized company, I would like to start from introduction of our company briefly to you.

Our company manufactures mainly wires and cables for general application and is one of medium sized companies with 200 employees.

On the main reason why an company has decided to introduce quality control system and the current situation thereof in our company, especially on our OJT and small circle activities, I am pleased to make a following summarized report.

2. Historic events in our company, and introduction and development of our quality control system

The main reason for our company to introduce quality control system and its development in 1949, Industrial Standardization Act was promulgated and approval system on display of JIS mark was brought in.

Our company, taking advantage thereof, has decided to systematically introduce quality control system.

It began with our attendance to the seminar on "quality control and standardization" hosted by Japanese Standards Association in 1953, aiming that we would obtain an approval for a qualified factory to display JIS mark and produce, through study of quality control system, the products which satisfy customers needs and so on.

Thereafter, we have replaced with our quality control system through internal education, attendance to seminars outside our company strengthening the activities of the related committees inside our company.

As the results of these activities, in 1990 we had a honour to win an award of the chairman of Industrial Technology Institute of MITI.

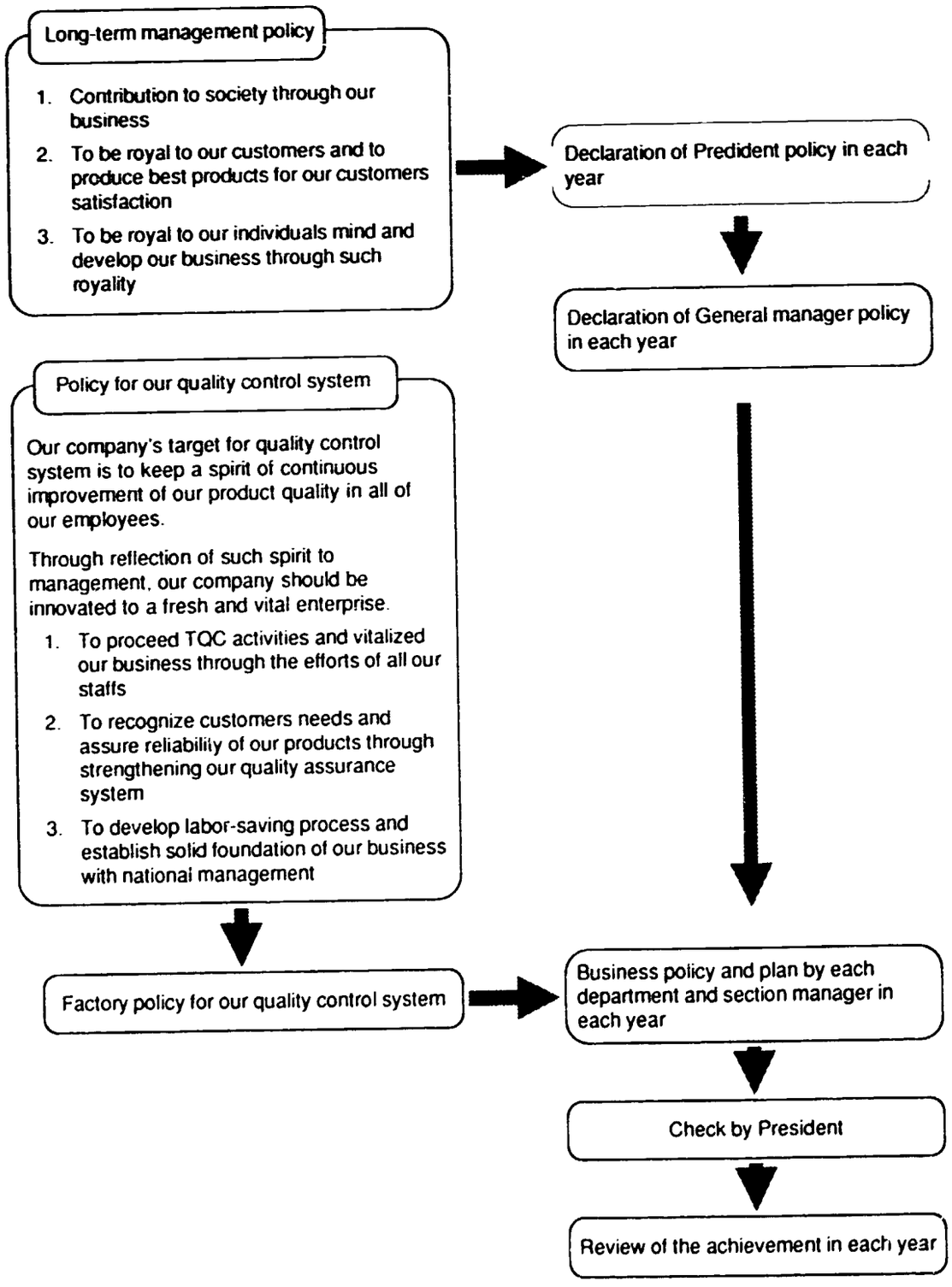
The main chronological events of our company for introduction, qualification and awards concerning our quality control system are shown below in Fig. 1.

Fig. 1 Historic events in our company, and introduction and development of our quality control system

Promulgation of industrial standardization act, start of approval system on display of JIS mark '49	1940's	'42	Incorporation of Shinagawa Electric Wire Co., Ltd.
	1950's	'53	Attendance to the seminar on quality control and standardization (hosted by Japanese Standards Association)
Approval for JIS mark display on 600V Low-voltage cables for automobile '55		'54	Establishment of a quality control committee
Approval for JIS mark display on PVC insulated flexible Cords '59			
Approval for JIS mark display on 600V grade PVC insulated wires '63	1960's	'53	Introduction of improvement proposal system
Authorized factory for UL, CSA '65		'65	Incorporation of a subsidiary by separating automobile wire division
		'68	Formation of QC circle
Approval for JIS mark display on outdoor weatherproof PVC insulated Wires and PVC insulated drop service wires and 600V grade PVC insulated and sheathed cables '71	1970's	'70	Introduction of QC test at production processes
Director's award of Tokyo Industry and Commerce for a best industrially standardized factory '80	1980's	'81	Admission to JIS Conference (Quality Control and standardization research committee)
Director's award of Tokyo Industry and Commerce for a best energy-saving factory '87		'85	Kick-off our TQC activity
		'87	Visit of a director of Korean Industrial development bureau in intercharge of standardization between Japan and Korea (hosted by Industrial technology Institute)
		'89	Group visit of managers from MITI for their training purpose (hosted by Industrial Technology Institute)
Chairman's award of Industrial Technology Institute of MITI for a best industry standardized factory '90	1990's		

3. Our company's policy and its development

Fig. 2 Company's policy and its development

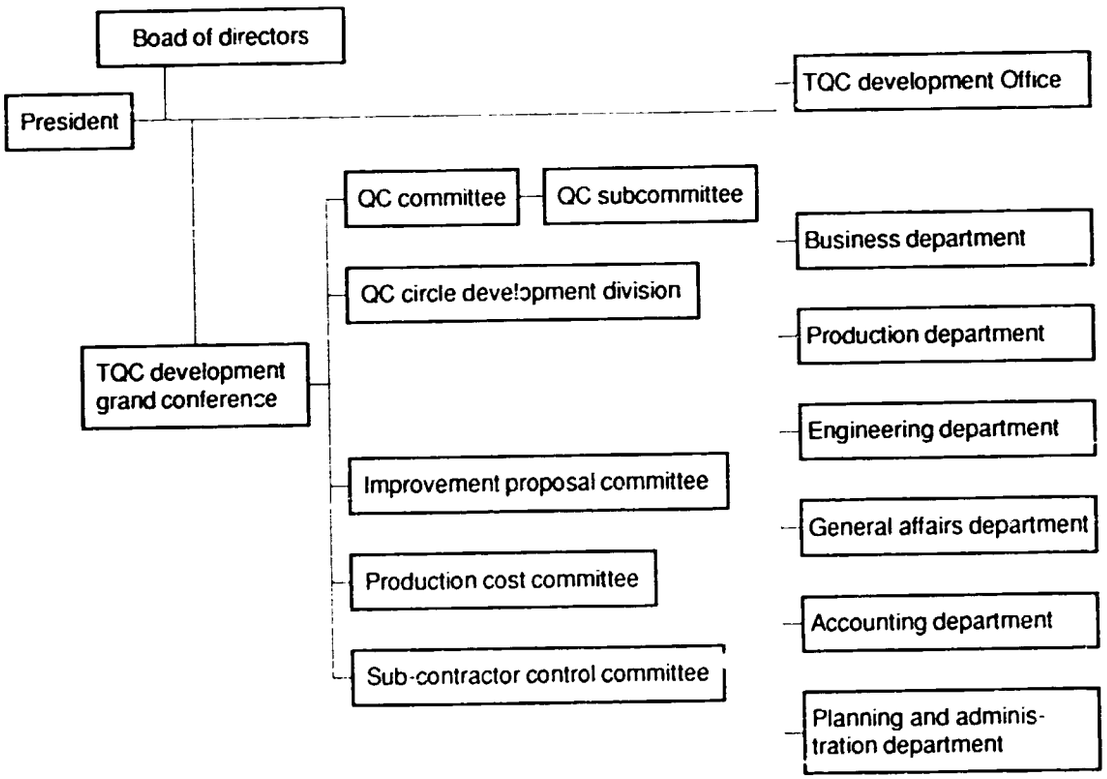


4. Quality control committees and conferences

A plan, its discussion and coordination for our total quality control system are made by our TQC development office and each issues linked thereto are discussed and performed by each of our related subcommittees.

We always keep in our mind to improve our quality assurance system, decrease our production cost and control properly performance of our sub-contractors. We are pleased to show our organization chart for our committees of quality control system in Fig. 3. below.

Fig. 3 Our QC committees



5. Internal Standardization

In order to proceed our quality control efficiently, the internal company regulations on rational standardization of every commodities, every work and every assignment are formulated and under these regulations we try to improve our standardization in all aspects of our business.

Discussion and development of our standardization are performed by inter our QC committee.

5-1 Our standardization system

In respect of our standardization, the followings are separately stipulated in our internal regulations and internal standards.

Fig. 4 Our standardization system

Items stipulated	Internal regulation	Internal standards
Items concerning fundamental policy for top management and concerning organization-responsibility-authority. others	1. Regulations in details on these items mentioned in the left. 2. These interpretation and sub-items under these regulations.	
Items concerning how to proceed each job assignment and its exercise procedure others	1. Regulations of these details or procedures for its exercise. 2. These interpretation and its procedures under these regulations	1. Stipulations on the standards of products-materials-equipments, etc. 2. Stipulations on the technical standards 3. Stipulations on the standardization of operation and job process.

5-2 Internal standards

A variety of our internal standards and main matters stipulated thereunder are listed below in Fig. 5.

Fig. 5 Variety of internal standards

Classification	Internal standards	Main stipulations
Products	Product standards	Quality, materials, size, mark, test method, package, etc. of our final product and semi-finished product.
	Inspection standards	Each items to be inspected, inspection system and criteria of pass or rejection for final and interim inspection of our product and acceptance inspection of sub-contracted goods.
Materials	Purchase standards	Structure, size, component, quality, test method package, etc. of materials.
	Acceptance standards	Acceptance inspection system for structure, size, quality, etc. of materials in every order lots.
Production	Production operation standards	Operating condition for production worker.
	Process control order sheet	Items to be checked, time, criteria, of decision and treatment after inspection at each production process for production worker.
	Inspection work standards	Inspection method etc. of product, semi-finished product and materials for inspection worker.
	Storing standards	Handling, storing, package, transportation, etc. of materials and products for workers at material warehouse and product warehouse.
Equipment	Equipment standards	Structure, quality and test method for machine, tool and measuring equipment, etc.
	Maintenance standards	Acceptance inspection method, inspection method maintenance, preservation method of machine, tool measuring equipment and apparatus for worker in charge of maintenance and user equipment.
Engineering	Engineering standards	Engineering standards such as design, production, test, engineering work, etc. for engineer and technician.
Sub-contract	Sub-contract order sheet	Quality, structure, materials, size, mark, test methods, package, etc. of sub-contracted goods, parts and fixtures for sub-contractor and supplier of parts and fixture, etc.

6. Education and Training

6-1 Quality control training

Quality control training plans in overall are discussed and made by our QC committee and TQC development office and more detailed QC training plans in each department are discussed and made by our QC sub-committee and TQC administration office.

❀ Fundamental policy for quality control training

Quality control education and training are separately performed according to the plan in consideration of fundamental spirit of quality control and its statistic method. The purpose of such training lies in eventual application of quality control to the daily business of our staffs.

① Continuous attendance to QC seminars outside our company is made according to our plans since our introduction of quality control system. Through such seminars, our staffs at every rank of our company become familiar with the spirit and mechanism of quality control system.

② Quality control seminars inside our company, where outside lecturers are invited or those who attended to outside quality control seminars become lecturers in turn, are held once or twice a year for the leaders of our QC circles, who become familiar with the mechanism of quality control system.

③ Engineering staffs are trained to learn through our quality control training process improvement and cost mind.

④ Workers are trained principally by our OJT through their daily business for improvement of their technics. However, sometimes they are gathered to our inside seminars, etc. to learn basic knowledge and mechanism.

6-2 General education

① Education of freshmen

Our General affairs dept. is in charge of this education and makes 6 month's training work safety, quality control system, QC circle activity and sometimes send them to outside seminars.

② Control technology training

In each concerned department, various control technology training covering IE, VA, TPM, QC mechanism, OA, etc. are performed sometimes through attendance to outside seminars or lectures.

③ Training of workers

In exact comprehension of each worker's technical level and for the purpose of cultivation of multi-talented workers and reasonable job rotation, training of our workers are performed through OJT, attendance to outside training meetings and internal education.

④ Standardized operation manual

Standardized operation manual has been prepared to proceed assignment of our staffs smoothly at each of our production process. Additionally the operation procedure easily understandable by any worker is displayed at each job site and the checkpoints in each operation are observed during such operation.

Examples of our operation procedure are shown in Fig. 7.

❀ Training system for quality control

Fig. 6 Chart on training system for Quality control

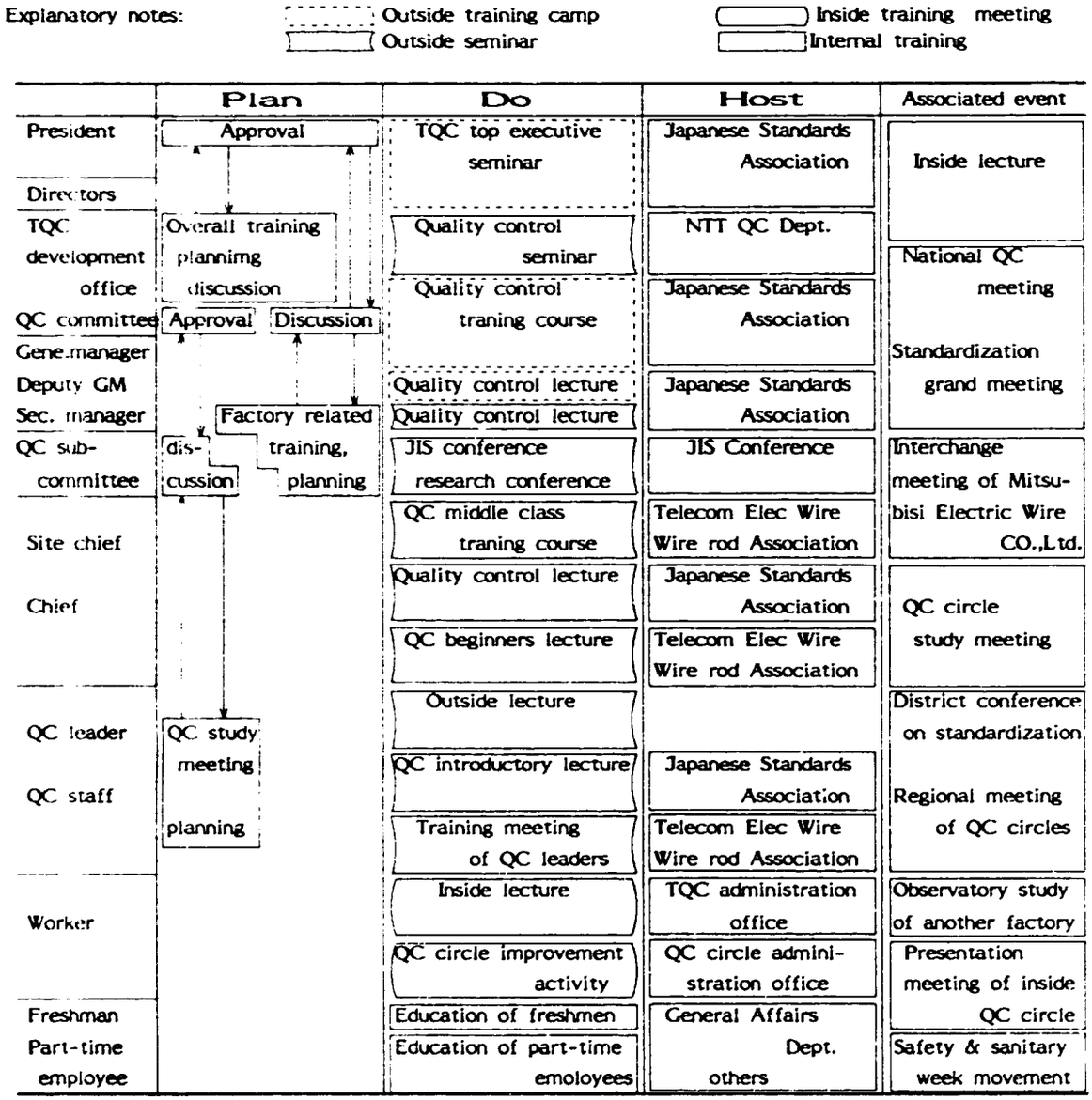
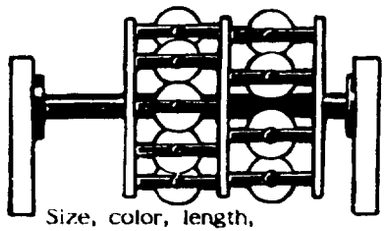


Fig. 7 Operation manual

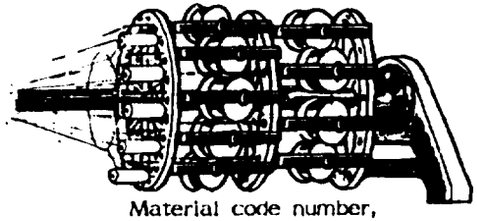
Operation manual for stranding process (checkpoint)

① To suspend a core on stranding



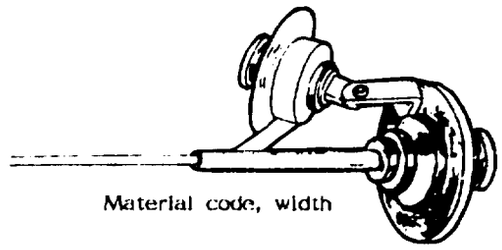
Size, color, length,
at each production number

② To suspend filler on filler hanger



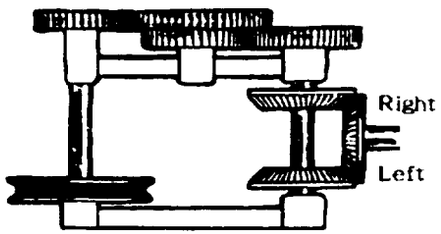
Material code number,
size code, holding number

③ To suspend tape on tape-head



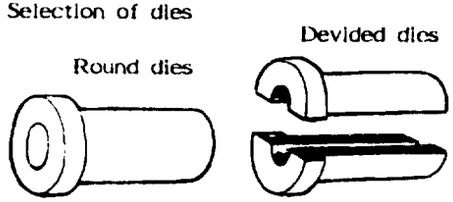
Material code, width

④ To set pitch · twisting direction



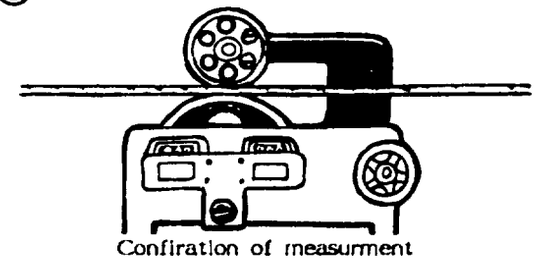
Less than designated pitch on gear list

⑤ Selection of dies



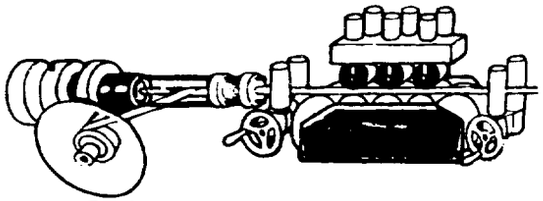
Finished overall diameter ~ +0.5 range

⑥ To set measurment



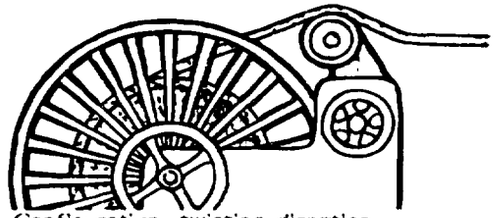
Confiration of measurment
point, zero point

⑦ First check at the point of measuring device



Configuration, twisting direction,
filler, tape, pitch, overall dimeter

⑧ Second check at the point of rooling drum



Configuration, twisting direction,
filler, tape, pitch, overall dimeter

⑨ Joint

- To joint at least one of them by jute
- To roll a iron wire
- To display in red colour

7. Development of our quality control activities

7-1 QC circle activities

In development of our quality control system it is first and absolute requirement that all the staffs of our company have recognized the necessity of quality assurance.

Furthermore, we must perform efficiently our quality control activities at each production phase including design, production, inspection and delivery in consideration of ful-fillment of users needs.

As one of our quality control system, all the staffs of our company are performing voluntarily QC circle activities. This voluntary activities started from the formation of QC circles at each job site in 1968 and today 20 circles are in full action.

The achievements are applied to their daily business and contributed well to assurance of job safety, improvement of operation at each process, rationalization of such operation and finally decrease of our production cost.

① Fundamental policy for our QC circle activity

1. To create pleasant and cheerful working environment
2. To perform our assignment efficiently and comfortably
3. To create our assignment worth performing

For accomplishment of these

To think and perform altogether

This is QC circle activity

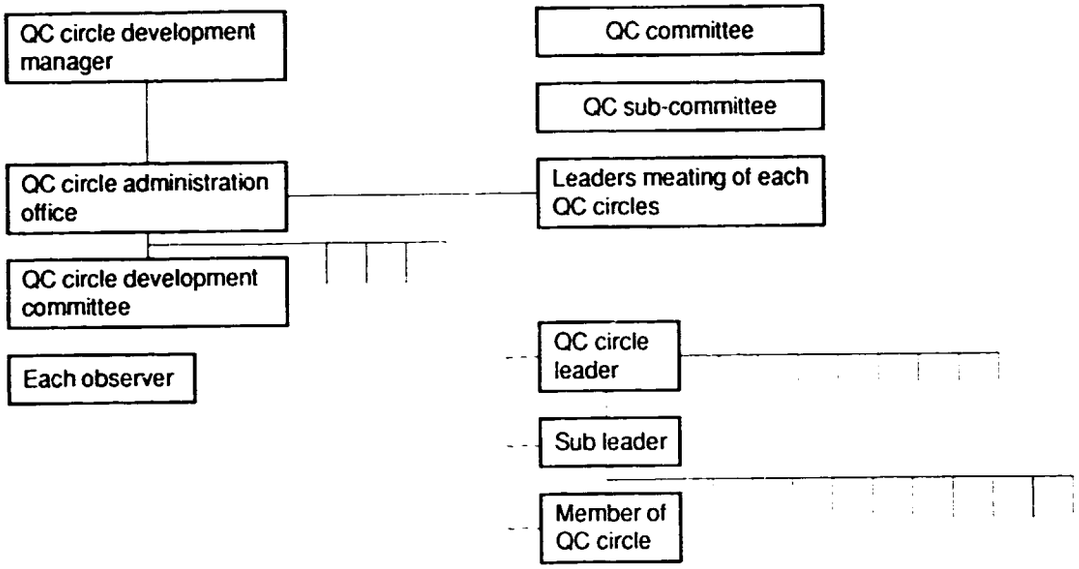
② Purpose

1. Through our QC circle activities to obtain more knowledge and enhance individuals ability of research, progress, improvement and so on.
2. To lean leadership in higher rank through the activities as a leader or sub-leader of a QC circles.
3. To obtain the knowledge concerning the spirit and mechanism of quality control system and so on.
4. To increase in-and-out flow of informations in each job site and improve our human-relationship.
5. To learn individually better quality control mind through QC circle activities.
6. To catch the issues to be improved at our own job site through grand meeting of QC circles, leaders meeting of each QC circles held more than once a month and through study of other job sites.
7. To achieve the target setout for prosperity of our business and improve our business results.

③ Management

Management of our QC circles are made under the organization listed in Fig. 8.

Fig. 8 Organization chart of our QC circle



1. QC circle administration office, QC circle development committee

   QC circle administration office generally administrate our QC circle activities and each member of QC circle development committee plays his role as a advisor in developing our QC circle activities.

   Our QC circle activities are developed through leaders meetings of each QC circle under our guideline of QC activity shown in Fig. 9 below.

Fig. 9 Guideline of our QC activity

1. Selection of theme	Through discussion of each issues, to decide a proper theme.
2. Recognition of current situation	What is our current situation! to collect the related data to analyze these data
3. Set out a target	To set out a proper target for development of our QC activities
4. Analysis of influential factors	After recognition of current situation to reach issues to be improved What kind of factors has influential effect on such issues?
5. Counter plan and its development	To offer creative ideas each other To discuss counter plans in realistic way and to develop these In case of failure, to start again discussion
6. Measuring our achievement	To measure our achievement under our counterplans To compare it with our target figures To compare our achievement with the figures before counter plans.
7. Support achievement	To continue to maintain such achievement To standardize such achievement
8. Accoumplishment of theme self-evaluation by a leader of QC circle	6 checkpoints in reading chart ① Team work ② Level of QC circle activities ③ Self-development of a leader ④ Utilization level of QC methods ⑤ Good selection of each theme ⑥ Degree of achievement of target

2. Leaders meetings of each QC circle

Leaders meeting of each QC circle is gathered by QC circle administration office once a month at a place and time designated by that office. Each leader, through such meetings, recognize the progress of the activities of other QC circles and through exchange of their opinions improve their ability.

Selection of each theme is made independently by each QC circle and reported to our QC circle administration office. Throughout their activities, their section manager, site chief and member of development committee become observers and play their roles as advisors to their circle activities.

After setout of their target and also after accomplishment of their theme a report on their activities is submitted to QC circle administration office.

3. Presentation

An inside grand meeting of our QC circles is held once a year (November) and presentation of their achievement is made in an aggressive manner. An award is honored to a best QC circle.

Our QC circle selected from award winning circles join to an outside presentation meeting once or twice a year and through such meeting a leader and each member of such QC circle improve their activities and abilities.

4. Attendance to a regional meeting of QC circles

We are attending to intercharge meetings, presentation meetings and other meetings of QC circles at Saitama region in Kantoh district and through observation of the QC circle activities in other companies try to improve our own activities.

7-2 Improvement proposal system

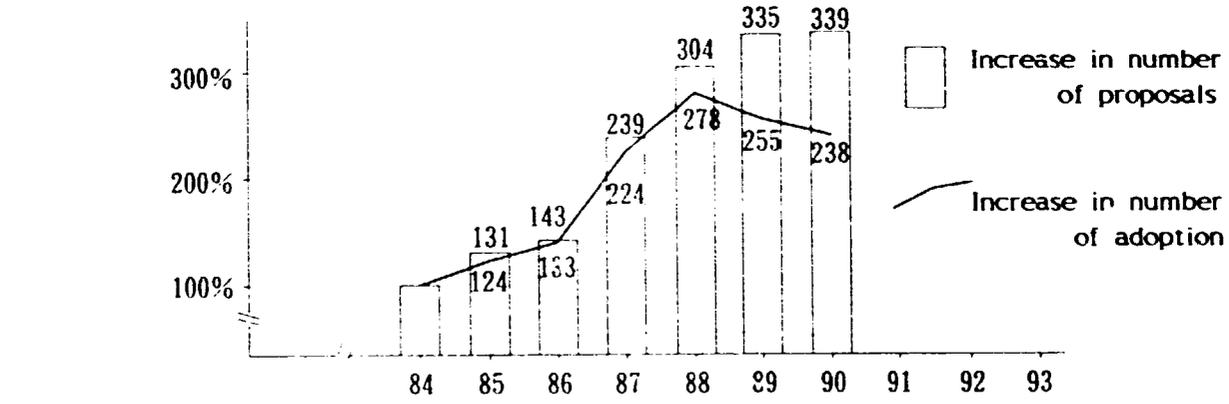
In 1963 we have made an internal regulations on improvement proposal system, aiming for development of our staffs mind to improve their job assignment by a certain incentive to their creative proposal and also for efficient performance of each assignment and rationalization of our management.

An improvement proposal can be made by any of our employees and submitted in a given form to our general affairs section.

Our improvement proposal adoption committee decides through discussion to adopt or not and gives awards once a every 6 months according to their level of excellency.

All the items offered in such improvement proposal are displayed internally in order to be recognized by all the staffs of our company and thus we are trying to develop such system horizontally in our company.

Fig. 10 Change in number of proposals



Increase in percentage assuming the figures in 1984 is 100%

8. Maintenance and management of production equipment·inspection equipment

8-1 Production equipment

Management of our production equipment is regulated by equipment management regulation. Management and maintenance under such regulations are as follows.

① Management assignment

In charge	Job assignment	In charge	Job assignment
Production department manager	1. Selection of equipment management plan 2. Decision of improvement, abandonment of machine 3. Supervision of management of equipment 4. Planning of construction of equipment 5. Decision of production repairing of machine, tool	Production section manager	1. Preparation of equipment list 2. Design, production of machine, tool 3. Layout, improvement of equipment, analysis of breakdown, repair 4. Maintenance of equipment, tool 5. Preparation of purchase of materials, tool

② Situation for management

1. Preparation of equipment list

Name of major production equipment, m[illegible]ame of manufacturer, date of production, fixtures and fittings, related department name and so on are described in our equipment list and main chronological records of improvement repairs and also described and this list is kept in a concerned production section under the responsibility of production section manager.

2. Daily inspection

For each production equipment a staff in charge of handling must be named.

Such staff must inspect the equipment at the beginning of every office hour and confirm the equipment is in order.

In case of out of order, he must report through his supervisor to maintenance department for its repair or correction.

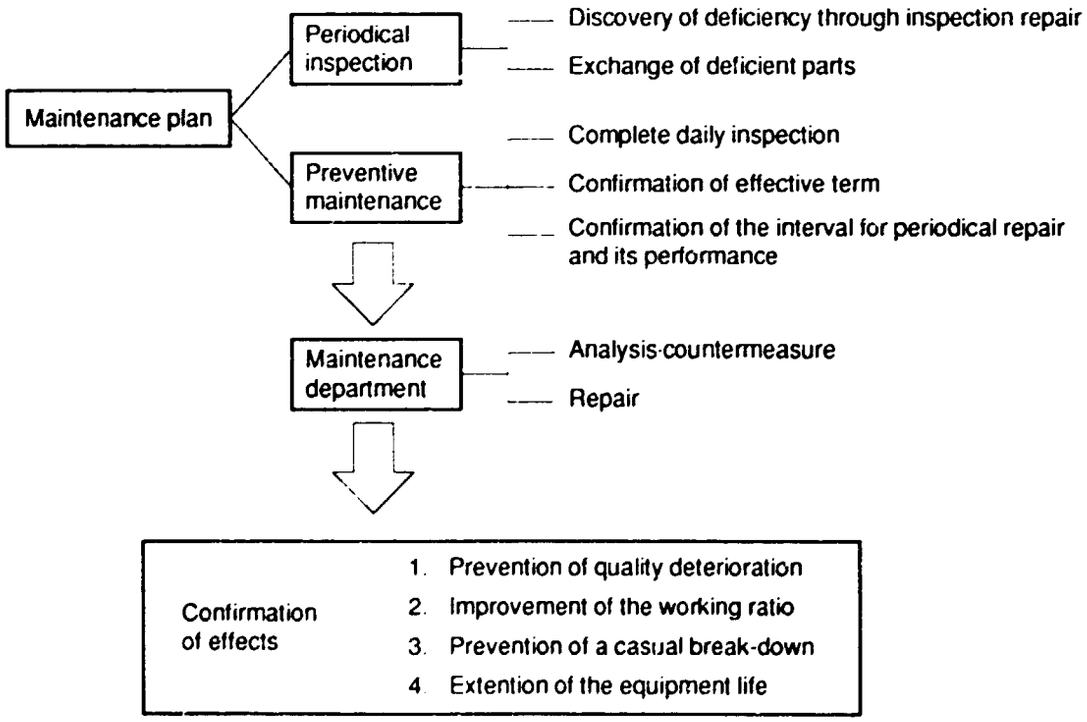
3. Periodical inspection

Periodical inspection of production equipment must be made at same interval for same kind of equipment under the responsibility of each production section manager. Inspection results are kept in the records of a periodical inspection sheet.

In case of deficiency, abnormality, repair or correction is made.

4. Preventive maintenance

To prevent a casual break-down or quality deterioration of our products by super-annuation or wear of our tools, etc., major repairs or corrections including its dismantlement or disassemblement are made at a certain interval for each kind of machines. In respect of mechanical tools, excellent results of preventive maintenance are achieved through limiting of their product life.

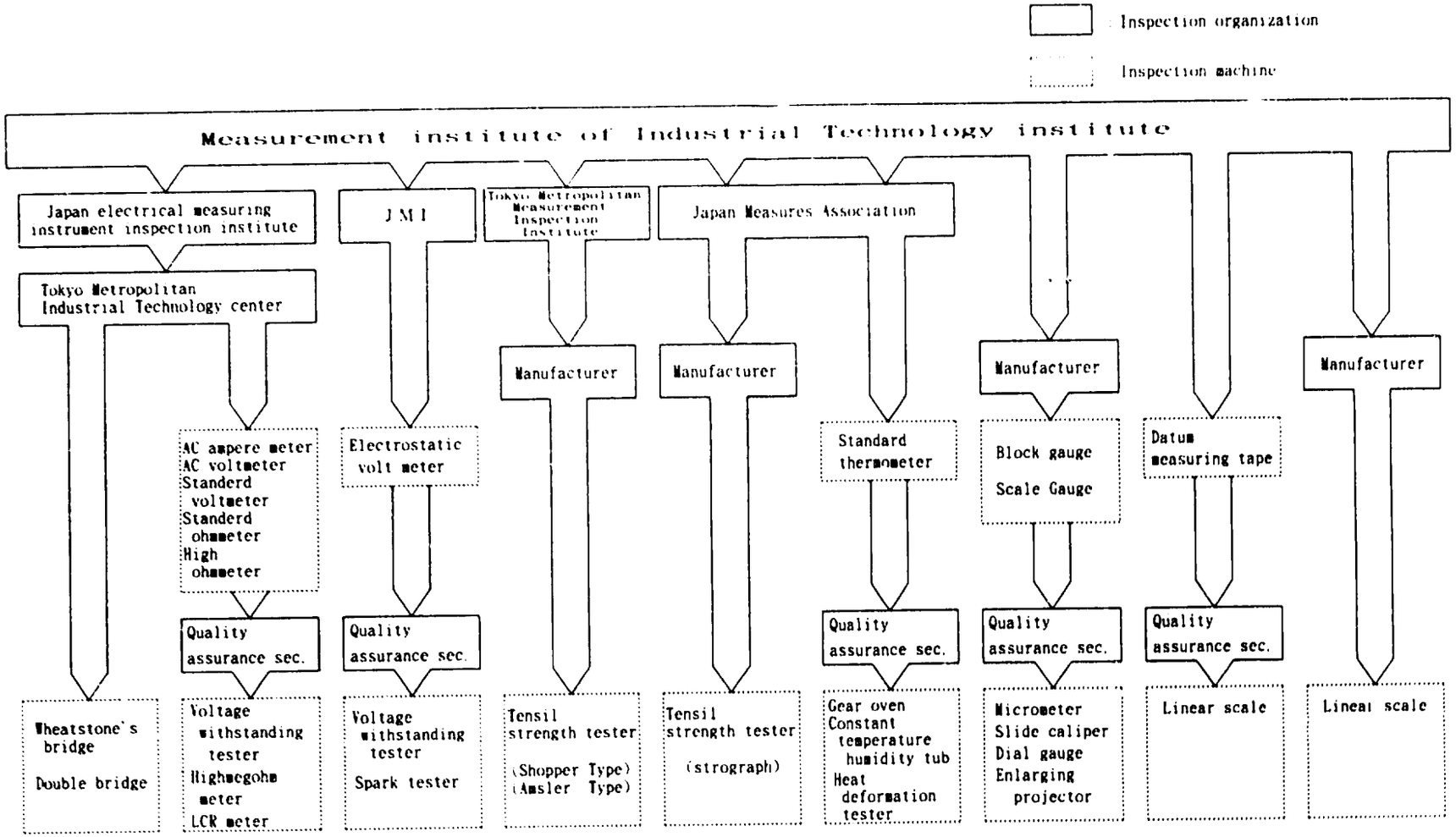


8-2 Inspection equipment

Management of our inspection equipment is regulated under an internal inspection equipment management regulations, and its traceability is shown in Fig. 11 below.

❀ Inspection equipment traceability

Fig. 11 Systematic chart of inspection equipment traceability



9. Control of our cooperative companies

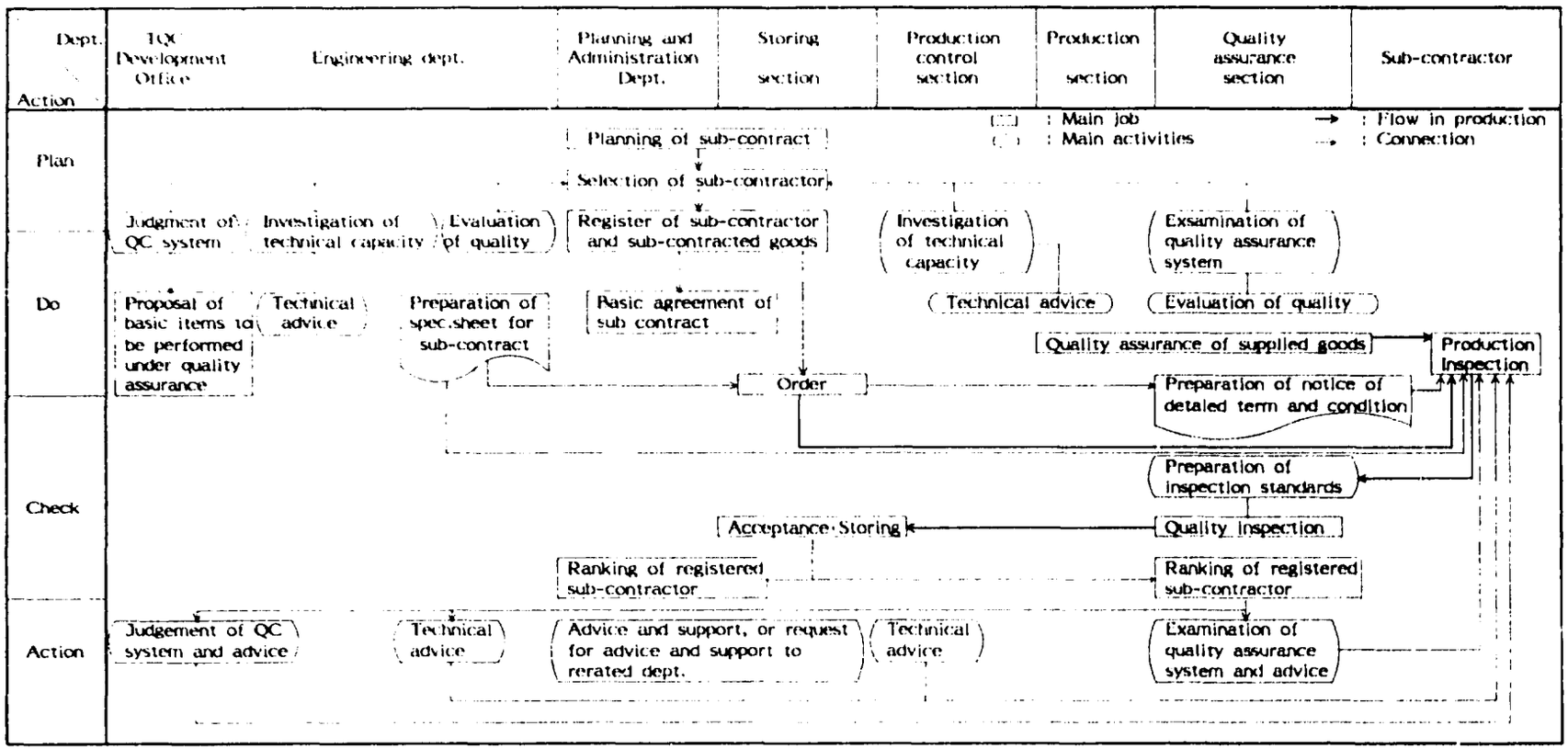
9-1 Control of sub-contracted goods

In respect of sub-contracted goods, we will make a decision thereof in consideration of internal situation under production plan, technical situation and situation under our capacity of equipment.

Selection of sub-contractors and their control are stipulated in other regulations.

Systematic chart for control of our sub-contract is shown in Fig. 12.

Fig. 12 Systematic chart for control of sub-contract



9-2 QC check of cooperative companies

Through our judgment of the level of quality control system in our cooperative companies when we offer our sub-contract and advice or instruction of necessary measures to strengthen their quality assurance of the products under our sub-contracts according to our judgment, our QC check of the cooperative companies aiming for level-up of their quality control system is continuously performed.

10. Quality assurance

Apart from the basic quality assurance system of our company which is separately regulated, the quality assurance guideline of our company at each phase of design, inspection, distribution, saler (including market research) and so on is listed below.

10-1 Quality design

In order to make proper quality design, we are always keeping access to market informations of new products and an analyze whether we can assure qualitative and quantitative achievement or whether we have not made a design mistake in consideration of our administrative situation at each factory, its capacity in each process and under proper production cost mind.

Thus we concentrate in making our own and differentiated quality design in continuous consideration of our inspection results at process as well.

10-2 Production process

At each production process, proper control items and control points suitable to its production capacity are set out.

Through internal check, interim inspection and supervision of own process we will assure our quality and pass our quality assurance at a certain phase to our next process, keeping in our mind the spirit of "to fabricate every possible products of better quality in own process".

10-3 Inspection

At our inspection, we try to understand fully each standards and its examination method and try to reach a correct and independent judgment.

We never try to make a judgment intentionally in favor of producers or in favor of users.

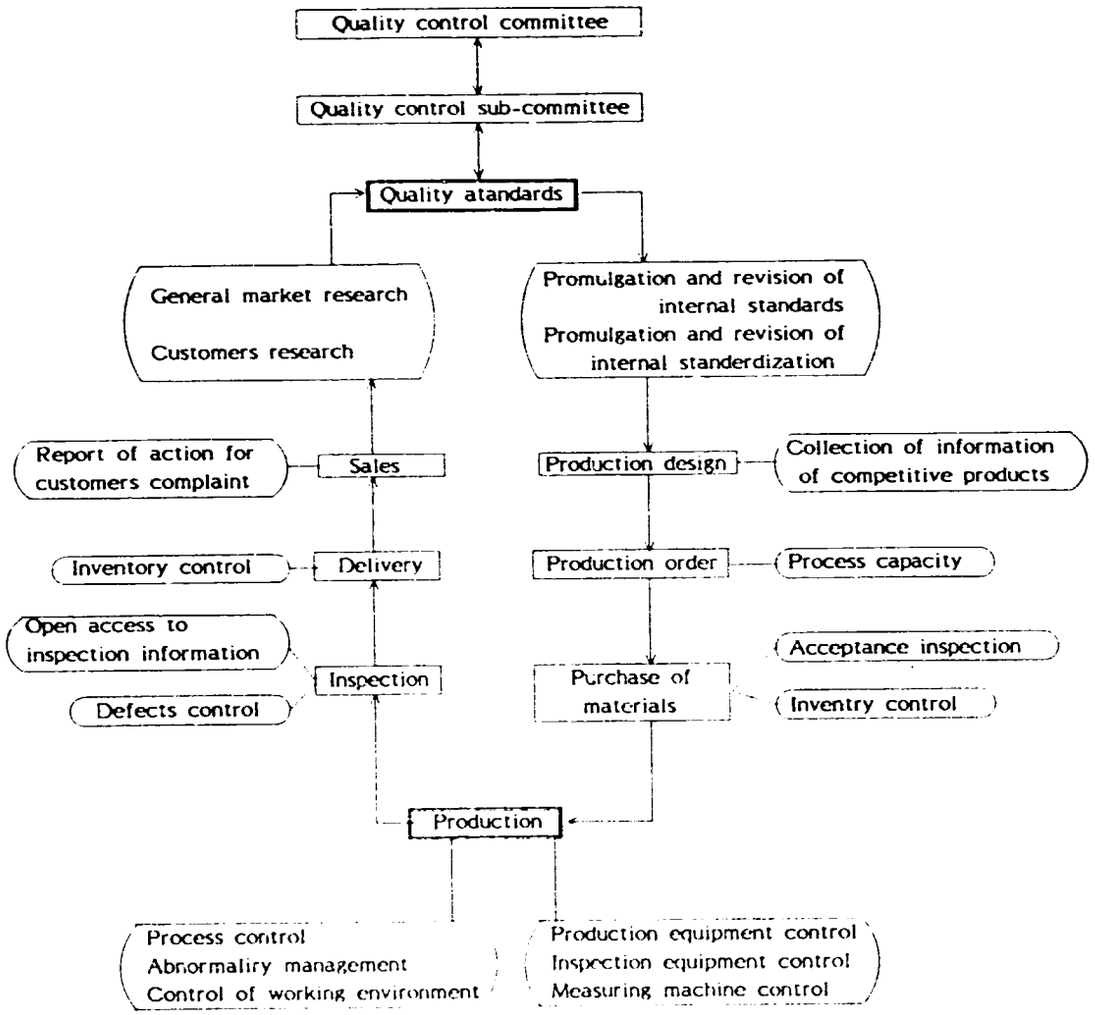
Because inspection should contribute to better quality assurance of our final products, we try to reach more reasonable assurance method through supervision of quality inspection at each production process.

10-4 Market research

Intensive collection of information concerning quality spread in contemporary market plays an important role in our quality assurance system because we can acquire such information or trends as are not noticed inside our company.

We try to collect as much as possible information concerning customers complaint of quality defects in our products, concerning the benefits of our products to satisfy our customers needs and concerning the increase of our market-share of our products and try to feed-back such information for practical use in related departments such as design, production, inspection and so on.

Fig. 13 Quality assurance cycle



11. Control of required quality by our customers and reliability

Most of our products are those to be fabricated into our customers systematical products.

Due to that fact, high reliability including these matters listed below must be required.

① To recognize exact quality required by our customers.

② To achieve higher reliability than requested by our customers standards.

③ To comprehend various properties in our product and product life and to reflect those to out design.

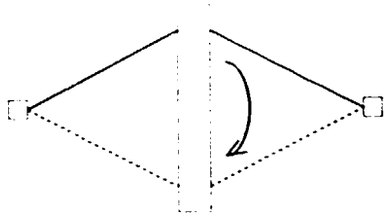
④ Prevention of customers claim through intensive quality inspection and research of customers fabrication process of our products.

⑤ To collect information of customers claim and to improve quality accordingly.

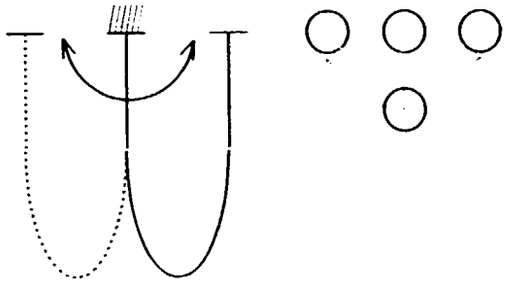
For one of examples in our pursuit of such reliability, our own valuation method for movable property in industrial robots cable is shown in Fig. 14.

Fig. 14 Bending test

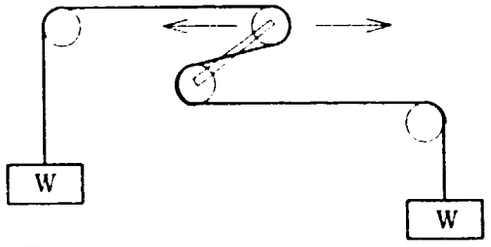
1) Rolling test



2) Rotation test

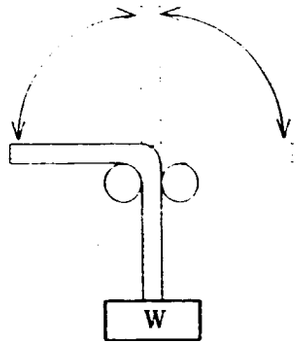


3) Stroking test

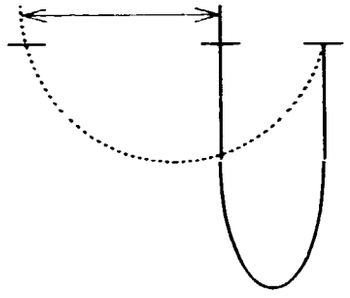


W : load

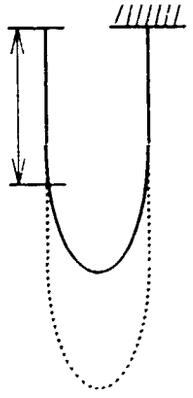
4) Bending test



5) Opening and shutting test



6) Up and down test



12. Achievement

The followings are our main achievement through our internal standardization and quality control.

12-1 Achievement through internal standardization

① Decrease of materials cost

We have succeeded in decreasing our materials cost partially and simplifying our inventory control, etc. through unifying the grade of our main materials, vinyl chloride compound after careful discussion at our cost decrease committee.

Considering these merits, we have reviewed and standardized our design sheet.

② Decrease of extrusion coating materials

We have made a study of numerical thickness of wire coating at each process by our quality assurance section, which is controlled under our products standards.

According to the data thus obtained, we have set out in our design sheet, the band range for actual coating thickness which never deviates from the requires standards.

Eventually we have succeeded in decreasing actual coating quantity in total.

12-2 Achievement through quality control

In pursuing better quality control, we must begin with innovation of all our staffs mind for strict quality assurance.

In order to promote such innovation, efficient quality control activity at every phase of production including design, production, inspection and delivery is required under consideration of users needs and their satisfaction.

① Attendance to educational events

All our staffs are aggressively attending to policy announcement morning meeting called by our president, OJT, external QC education, observation study of other factories and try to enhance their mind for quality control.

② Quality assurance and movement for decrease in number of customers claim

We are developing at each of our production process a quality control activities toward decrease of abnormality in production process and abolition of customers claim, keeping in our mind the spirit of "next process should be our customers" and the spirit of voluntary control.

③ Target management for quality control at each job site

We set out realistic target for safety and sanitation, quality improvement, equipment maintenance, morality improvement and so on once a month at each job site and display the self-valuation of our achievement of such target on the board at each job site.

Thus we try to heighten quality control mind of each of our staffs.

④ Vitalization of our small group activity

In respect of our QC circle activities, our staffs make a presentation each other on their activities once a month under administration of leaders meeting of each QC circles and its executive office.

Through such action, our QC circles are competing each other in better achievement and try to make at least some improvement at each of their own job site.

Thus through these activities, communication our staffs in their job site is stimulated to better flow.

Furthermore, improvement proposal system contributes year by year to improve their mind and sometimes a great success has been achieved through a relatively minor proposal.

Main improvement is displayed at its own job site and can be noticed by all of our concerned staffs.

12-3 Confirmation of effects

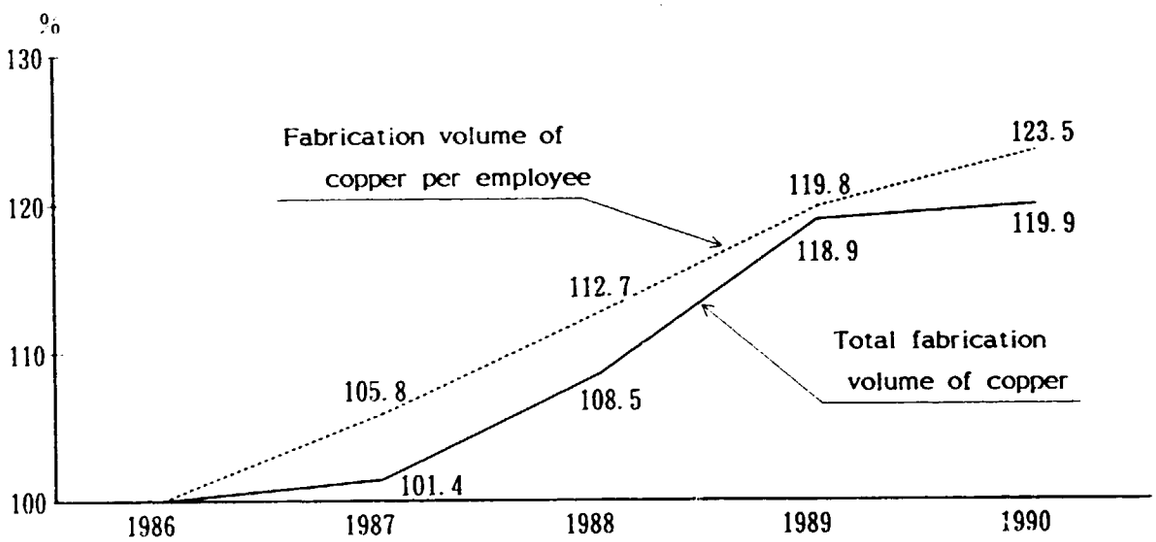
① Change of productivity per employee

In Japanese small-and medium-sized companies, there is a specific problem for labor shortage.

To solve this problem even slightly, we are trying to make an efficient management through introduction of quality control.

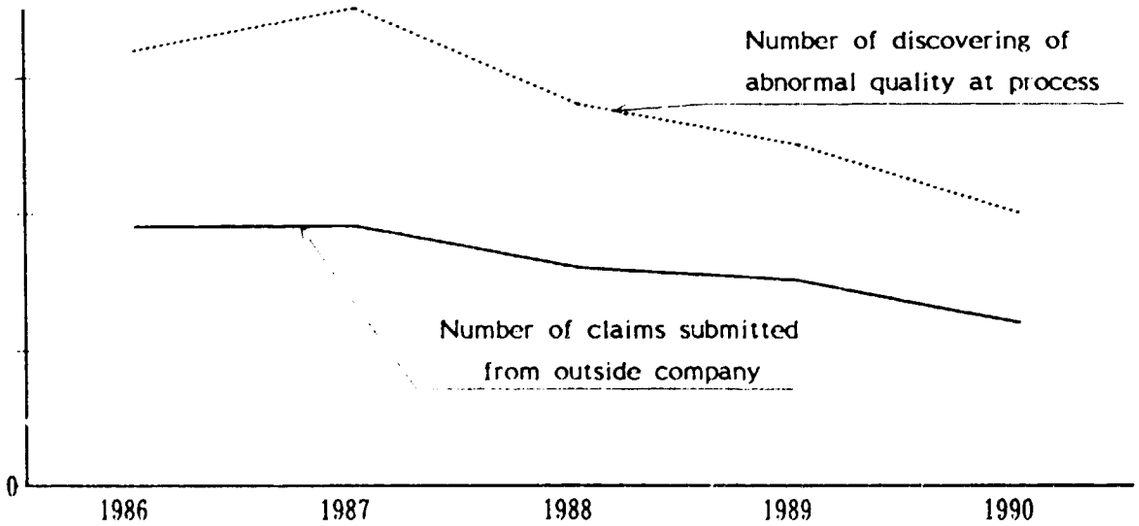
As a result of this quality control, productivity per employee are increasing steadily and its increase ratio exceeds that of total production volume.

Fig. 15 Change of productivity per employee



② Change in number of claims and discovery of abnormal quality at process

Fig. 16 Change in number of claims and discovery of abnormal quality at process



2nd day
Oct. 29 – 31, 1991

Quality Control in Small & Medium-sized Industries (II)

– Quality Control at Matsushita Industrial Corp. Sdn. Bhd. (MAICO) –

by Tin Check Ping
Assistant Manager of Quality
Control Section, Matsushita
Industrial Corp. Sdn. Bhd. (MAICO)

CONTENTS

1.0 Introduction

Matsushita Industrial Corp. Sdn. Bhd. (MAICO) was established in Malaysia in 1972 by Matsushita Electric Industrial Co. Ltd. (MEI) Japan to manufacture and export window type room air-conditioner for the world market. The initial annual production of 100,000 units has grown to more than one million units making MAICO one of the world's largest manufacturers. Malaysia is now the 2nd largest exporter of room air-conditioner in the world next to Japan.

A major portion of these room air-conditioners are supplied under the brand name of NATIONAL PANASONIC and QUASAR and are distributed to more than 120 countries all over the world including severely competitive major market like USA, Japan, Hong Kong and the Middle East.

2.0 Outline of MAICO

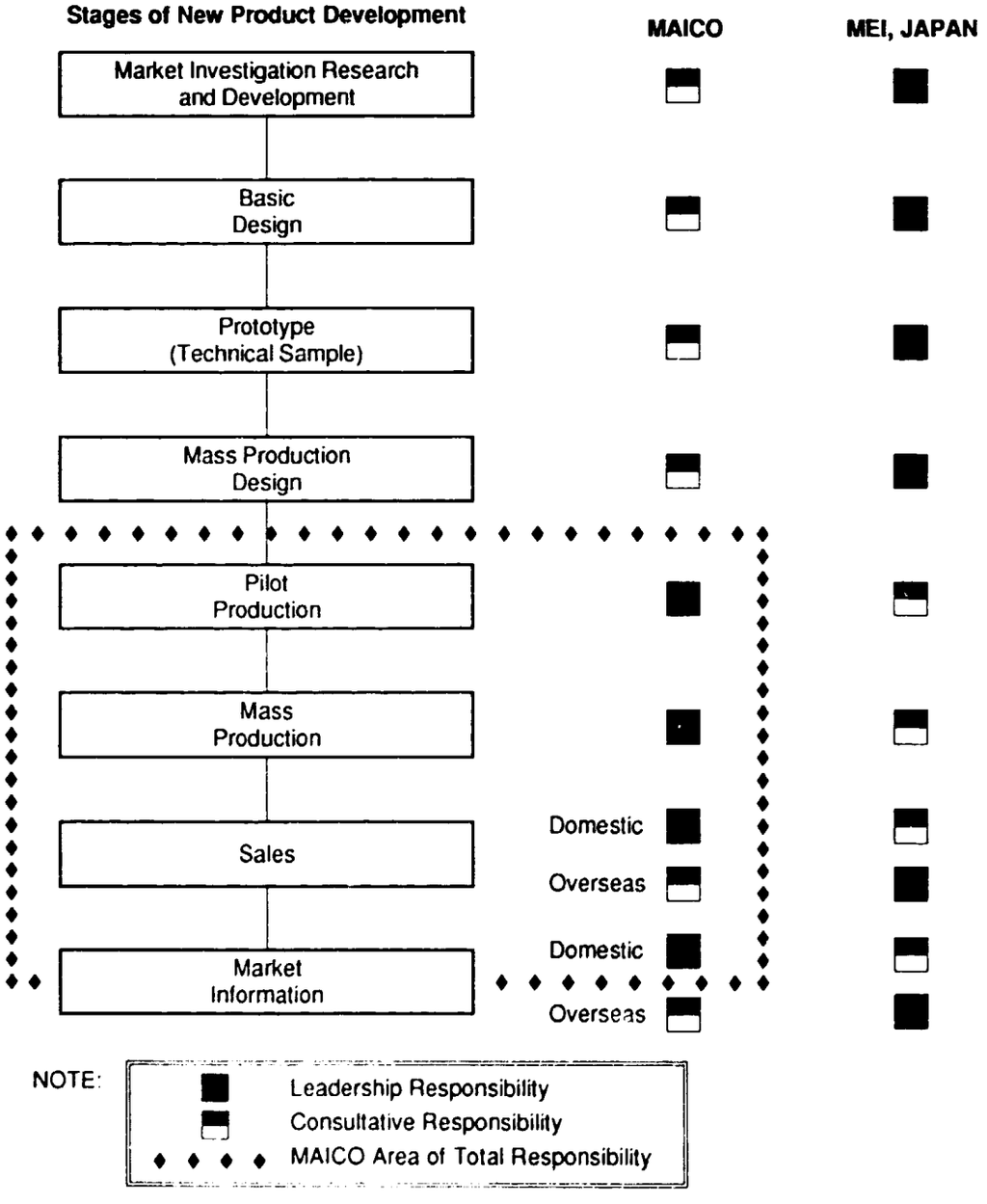
General Information (as of June 1991)

Established:	April 8. 1972.
Land Area:	79,200 M^2
Build-up Area:	60,000 M^2
Fixed Asset Investment:	M$ 195 Million
Paid Up Capital:	M$ 22.5 Million
Equity:	Matsushita Electric Industrial Co. Ltd. 80% Local 20%
Employees:	Total number of employees 1,900
Sales Amount:	M$ 552 Million (1990)
Products and Capacity:	Window Type Room Air-Cond. 850,000 unit/year Dehumidifiers 90,000 unit/year
Special Characteristic:	Export Oriented Vertically integrated factory producing all major components to finished goods
Major Export Market/Buyer:	USA, Japan, Hong Kong, Middle East

3.0 Relationship between MAICO and MEI, Japan

3.1 Production Flow and Quality Assurance System

MAICO has developed a viable PRODUCTION FLOW and QUALITY ASSURANCE SYSTEM with close collaboration with MEI on product development covering the stages on Planning, Design, Pilot Production, Trial and Mass Production, Sales and service and collecting marketing information. MAICO varying degree of responsibility (from assuming full responsibility to consultation with MEI, Japan) is summarized below:



Like most Japanese joint venture companies in Malaysia, MAICO is involved in manufacturing as shown in the dotted line while Research and Development activities and overseas marketing are spearheaded by MEI on a consultative basis with MAICO.

3.2 Technical Assistance and Transfer of Know-how from MEI, Japan

The Malaysia Matsushita Air-Conditioning Group which is made up of:

1) Matsushita Industrial Corp. Sdn. Bhd. (MAICO)

2) Matsushita Compressor and Motor Sdn. Bhd. (MCM)

3) Matsushita Air-Conditioning Corp. Sdn. Bhd. (MACC)

have already started to embark on local Research and Development (R & D) by establishing Matsushita Air-Conditioning R & D Centre (MACRAD) on April 9, 1991 in Shah Alam, Selangor, Malaysia. By 1993 MACRAD is expected to take over R & D function from MEI, Japan. A Technical Support Centre will soon be established to provide a variety of technical support overseas and by 1995 MAICO will be capable of taking over some of the overseas marketing functions.

In recent year, MEI, Japan has been investing more than M$ 40 million annually to enable MAICO to establish more stringent control and inspection systems as well as new production lines and improvements to existing ones. The equipments are continuously upgraded in anticipation of new market trends.

This has resulted in the creation of a comprehensive production capacity ranging from material procurement abroad to application of fundamental technology in material processing, to utilization of the most advanced technology available.

4.0 Matsushita Concept of Quality Control

4.1 What is Quality Control

According to Japanese Industrial Standard (JIS) "Quality Control" is defined as "A system of means to economically produce goods or offer services of quality which meets the requirement of the purchasers" (JIS Z-8101-1981).

4.2 Definition of Quality Control at Matsushita Electric Industrial (MEI)

Matsushita Electric concept of company-wide Quality Control is defined as follows:

"Quality Control at Matsushita Electric means to produce under the Basic Business Policies of the company, the products which satisfy consumer needs and which have high performance and safety as well as high reliability under the most economical levels, and thereby to contribute to the improvement of managerial efficiency and to the increment of social welfare" (Corporate QC Rules).

This policy clearly defined our goal and responsibilities towards society through the provision of products which is customer oriented, reliable, safe to use, good in performance and reasonably priced.

MAICO Quality Control Principle follows that of Matshushita Electric (MEI) and this principle is strongly reflected in MAICO's Regulations and Standards.

4.3 MAICO's Regulation and Standard on Quality Control

Basic Affair Regulation	Basic Business Management Principle States that MAICO Quality Control Principle shall follow Quality Control Principles of Matsushita Electric Industrial (MEI)
Organization Regulation	Organization Regulation Appointment of an INDUSTRIAL STANDARDIZATION QUALITY CONTROL PROMOTER from a director level by Managing Director. Also describes the classification and job authority of QC and other section
General Affair Regulation	Quality Control Regulation Spells out MAICO Quality Control policy and implementation of Quality Control at DESIGN, PROCESS, SUB-CONTRACTED PART and MARKET. Other official activities include Measurement Quality, Education, QCC, Quality Campaign, etc.
General Affair Standard	General Rules of Inspection, Quality Trouble Treatment, etc. eg. Standard of Special Adoption of Goods Rejected Lot Control Standard

For an overall view of MAICO, see Attachment 1. MAICO'S REGULATION AND STANDARD.

5.0 MAICO's Quality Control Regulation

5.1 MAICO's Quality Control Regulation

MAICO's Quality Control Regulation is intended to cover the scope of quality control activities to be carried out in MAICO.

They consists of:

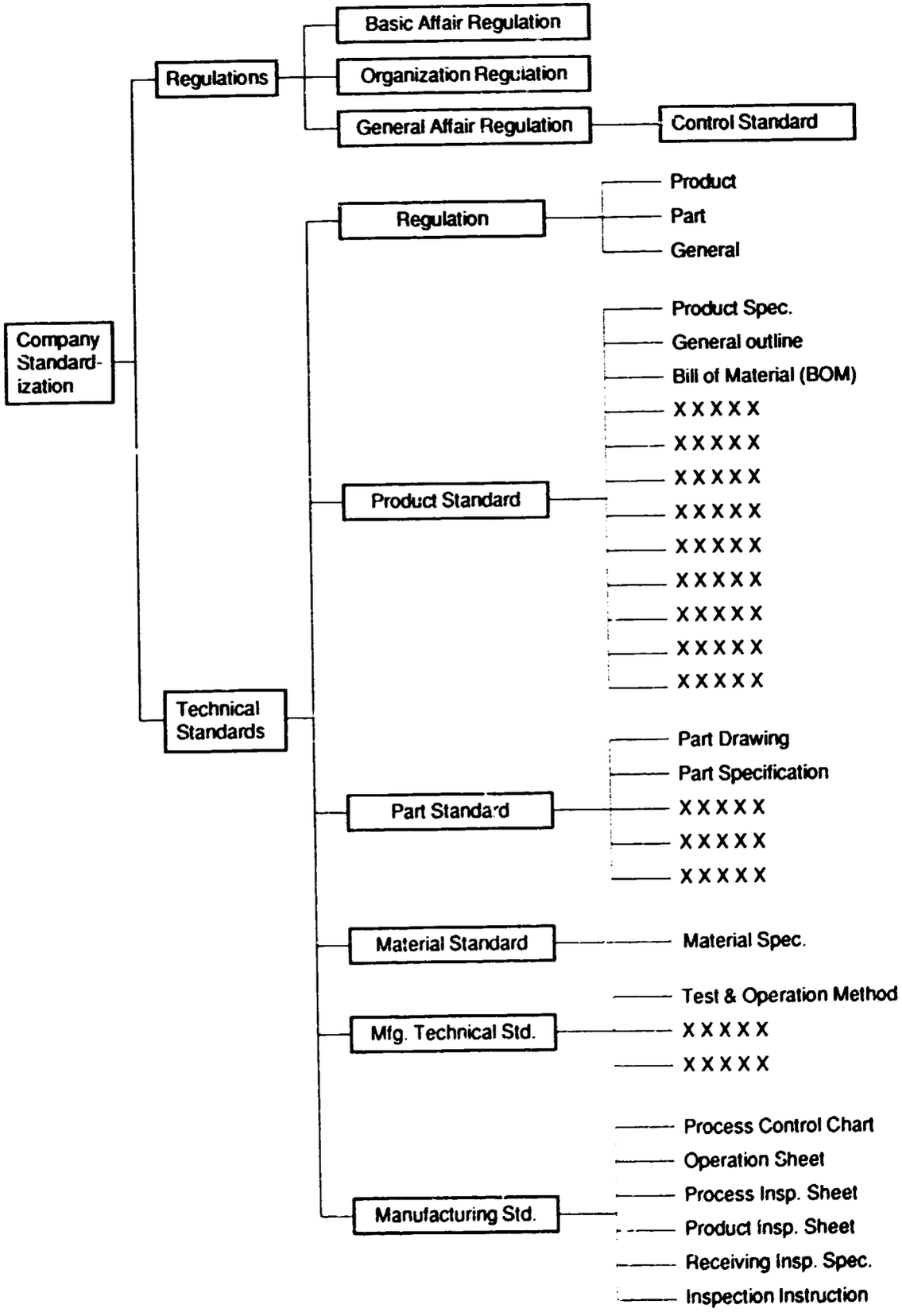
POLICY – follow MEI Quality Control Policy.

PURPOSE – For the establishment of quality control basic and to promote stabilization and company standardization for product quality to be implemented in accordance with the rules for company-wide quality control.

SCOPE – MAICO Quality Control activities

ACTIVITIES	CONTROL POINTS
Design Quality	1) Confirmation to laws, ordinances for both domestic and overseas. 2) Satisfy the purpose. 3) Reliable and safe points. 4) Easy assembly and serviceability. 5) Good packaging.
Process Quality	1) Compliance with work standards and specification. 2) Properly carried out. 3) Control of machine, jigs, tools, and measuring instruments. 4) Control of manufactured goods. 5) Establish system to check and reduce manufacturing problem.

MAICO's Regulation & Standard



ACTIVITIES	CONTROL POINTS
Sub-Contractor Quality	1) Observance of Quality, Delivery and cost requirement. 2) Established self-control system for quality. 3) Information flow system.
Market Quality	1) Quick action and countermeasures. 2) Easy to understand instruction manuals and demonstration of product function. 3) Market quality requirement must be accurately grasped.
Self-Audit	More than once a year to ensure implementation of the above activities and sectional improvement plans.
Measurement Control	1) Suitability measuring equipment. 2) Control of measuring equipment.
Product Facilities Control	Observance of the rules and standards when purchase, handling, maintenance and inspection is carried out.
Education and Training	Enhancement of quality consiousness
Function of Quality Control manager	1) Promote standardization and Quality Control. 2) Set-up rules for establishment and revision of in-house rules. 3) Evaluate product quality level. 4) Provide guidance, advice, co-ordination among all section on standardization and quality control. 5) Provide guidance in event of abnormality. 6) Promote employees education and training. 7) Provide guidance to sub-contractors control.
QC Circle Activities	Organization and enforcement
Quality Campaign	To be carried out company-wide for Quality consciousness enhancement.

5.2 Company Organization

MAICO's organization shows the independency of Quality Control section from the manufacturing section. The ratio of staff who are involved in inspection in MAICO are as follows:

Quality Control Section Staff	153 (8.1%)
Manufacturing section inspection staff (Independent from QC)	96 (5.1%)
Total	249 (13.1%)

6.0 Establishment of Quality Assurance in MAICO

6.1 Top Management Hands-on Site-on New Product Audit

Before a new product is introduced to the market, MAICO conducts Product Audit by Top Management staff (usually Managing Direction is chairman) to "feel" the product quality from a consumer point of view. This type of audit is called Action Quality (AQ) and is repeated at different stages of product development.

The development of the product can be stopped at any stage if AQ Committee feels the consumer quality is not up to the company satisfaction.

6.2 Quality Assurance System of Production Process

The flow chart of manufacturing and quality control is shown in attachment 2. All major components are manufactured by the Malaysia Matsushita Air-Conditioner Group. The local content in our products stands at 66% and this percentage is expected to increase to 75% in 1993, lessening the dependence on overseas imports.

The various type of inspection denoted by ◇ (in-process 100% inspection), Ⓡ Receiving Inspection (sampling) and Ⓐ Quality Assurance Inspection (sampling) is station at every stage of initial assembly until final product packing.

Others Process Control Activities:

- Floor and Self Inspection were emphasised in the process.
- Manufacturing standard documents were used as working method, inspection method and control method for good control of the process.
- Matter and problems related to facilities and layout are solved by Production Engineering section.

6.3 Quality Assurance System of Receiving Parts

The sending of parts by supplier for assembly in MAICO undergoes a series of steps which involves regulations and standards safety check and document data control.

A normal delivery part will be checked in the following way:

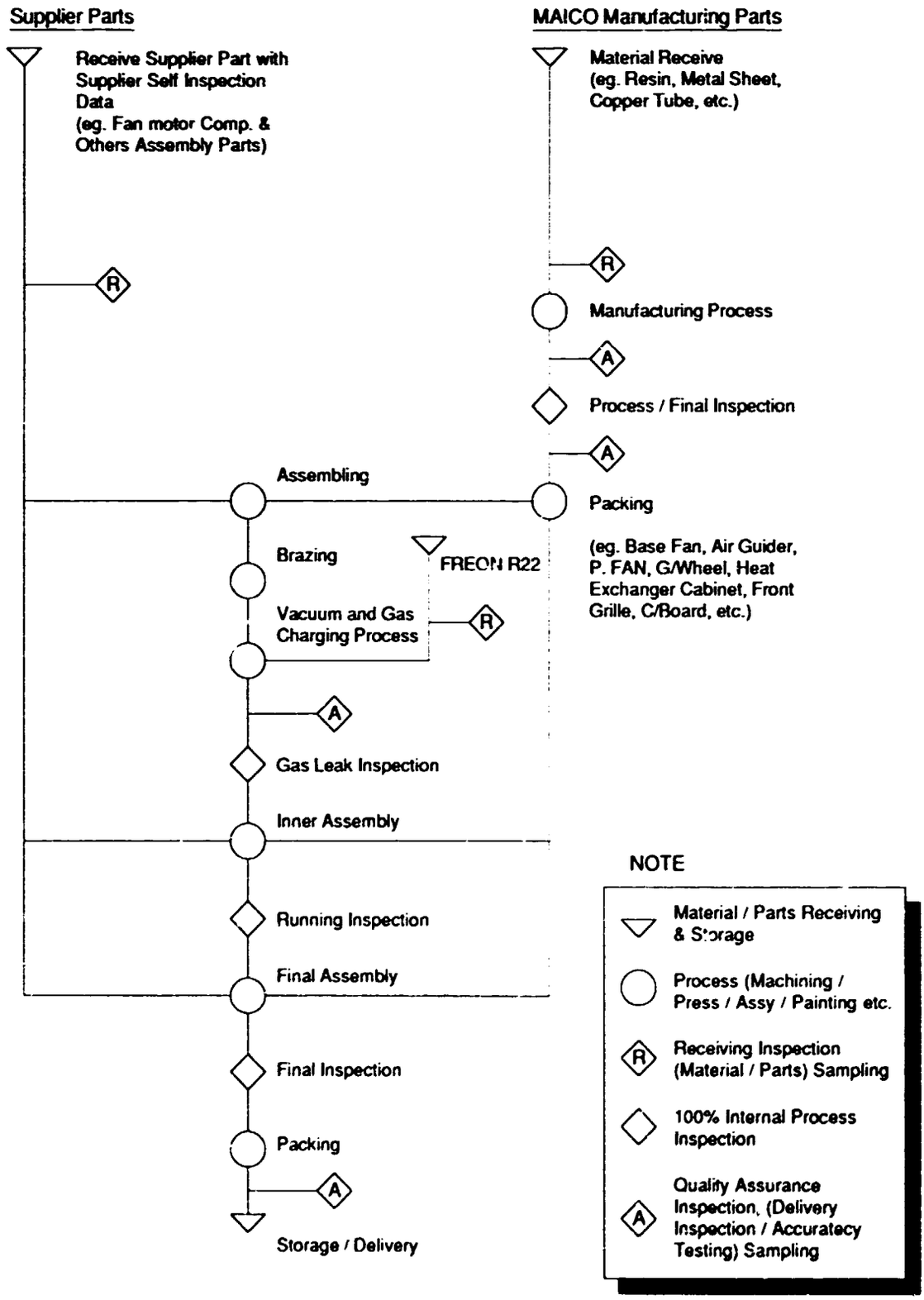
(a) Delivery must include self-inspection data sheet by supplier certifying it to be in compliance with MAICO specification. (Part drawing and specification)

(b) QC Parts Assurance division receive 5 pieces per lot and confirm all selection dimension (including safety characteristics inspection). The judgement delivered is PASSED LOT or REJECTED LOT. (n=5 c=0)

For PASSED LOT

The lot is allowed to be sent to the manufacturing process. However any process abnormality arising out of the use of these parts will automatically result in an abnormality analysis, counteraction and recurrence prevention activity which is summarized up in a report to be follow-up with the supplier.

Outline of Process Flow Chart (Window Type)



For REJECTED LOT

Rejected lot falls under 2 categories:

- No effect to the performance, reliability and safety with consideration of urgent requirement and cost. This type of lot is adopted for use and allowed to be sent to the manufacturing process.
- The confirmed rejected lot. Selection is carried out to determine the OK and OUT parts. The OK parts can be sent to the manufacturing process while the OUT parts is returned to the supplier. Other inspection include INITIAL INSPECTION (Complete checking of all quality characteristics when any design, source or manufacturing condition change) and MINI RELIABILITY LIFE TEST (ensure reliability of selected electrical parts).

6.4 Quality Assurance System for Normal Product Assurance Inspection

The sample is taken from the final packaging process and the sample is checked against product regulation and standards. If the judgement is OK, the sample is packed and sent back to product storage. If the judgement is OUT, the product is put on hold and counteraction, recurrence prevention and reinspection is carried out before the product can be release.

6.5 Abnormality Control System for Product Safety (Manufacturing Assembly Process)

A control route is set-up for dealing with any abnormality during manufacturing assembly.

When a process or product abnormality is discovered by an operator, inspector or others, this abnormality is reported to the section leader who in turn reports to Quality Control section. The role of Quality control section is to take leadership to confirm actual condition and reason for decision making together with the section or parts maker concerned. The final decision is then reported to the Plant Manager and Consumer Quality Assurance. The Plant Manager, acting on the advice of QC and policy matter either put the product on hold or released the product and inform to Managing Director.

The role of Consumer Quality Assurance (CQA) is the dissemination of information to the Managing Director and if necessary to our corporate Quality Assurance headquaters in Japan for follow-up with related department.

Quality Control section will continue to follow-up with the related section or part maker with counteraction implementation counteraction, this activity is reported to the Plant Manager who then released the product on hold.

The settlement of this problem is then reported to the Managing Director by Plant Manager.

6.6 Abnormality Control System for Product Safety (Market)

A separate control system exists for market claim from domestic, Japan and overseas.

For domestic, the Service section receiving a market claim relays the information to Consumer Quality Assurance (CQA) section. The Consumer Quality Assurance, as a secretariat, to the QUALITY INFORMATION (QI) MEETING convenes a meeting with the Managing Director as the chairman, the Plant Manager and permanent committee member from Quality Control, Design and Service section. The function of this Quality Information meeting is to carry out a thorough investigation and made a policy decision, counteraction, implementation and confirmation of counteraction.

For Japan and overseas claim, the market claim is collected by MEI Sales section and our parent company Air-Conditioner Division (ACD) - International Operation Department who in turn informed this to MAICO Consumer Quality Assurance. If the quality problem is serious,

then MEI's Air-Conditioner Division – Quality Generalization Department (QGD) will report to MEI's Corporate Quality Assurance Department and MEI's managing Director.

In the case of Japan market, if the situation warrant, this problem will be informed to Ministry of International Trade and Industry (MITI), Japan.

6.7 Measurement Control

The MAICO Measurement Control activities is controlled by MAICO Regulations and Standards with the aim of maintaining accuracy, reliability and correct usage method of all measuring instrument in use in MAICO.

Traceability

All the measuring instrument are periodically calibrated using our own sub-standards and standards master and both the electrical and mechanical measurement standards are traceable to SIRIM or Japan.

Promotion and Enforcement Activities

This activities is carried out by Measurement Control Committee which is appointed by Managing Director. All measuring instrument which are registered and calibrated is identified by a sticker indicating the using range, calibration validity and control number.

7.0 Standardization

7.1 General Rule of Sandardization

MAICO General Rule of Standardization specified the method of establishing, utilising and management of regulations and standards for ensuring the systematic implementation of various standards for ensuring the systematic implementation of various quality control activities and job efficiency. This general rule quality control activities and job efficiency. This general rule is applied for the system of enactment, application and revision or invalidation of regulation and standard which is to be counseled by the Standardization Committee in MAICO.

Managing Director was appointed as chairman of this standardization Committee and the duties of the committee are as describe below:

(a) Counsel and approval for enactment, revision and invalidation of regulations and standards by MAICO.

(b) Counsel and approval for enactment, revision and invalidation of Technical Standards from ACD, Japan.

7.2 Standardization

The design of our products is done at MEI, Japan. Therefore drafting of product regulation, standard, specification and drawings are done at MEI, Japan which are then sent to MAICO. In MAICO, these come under the control of the standardization section, including correspondence with MEI, Japan.

Due to continuous improvement of product and development of new product, specifications and drawings are continuously being made and revised from time to time. Information of these new and revised document is feedback to every section through the weekly standardization meeting. Problems and suggestions for improvement are also discussed at the meeting and are then feedback to MEI, Japan.

8.0 MAICO Quality History

8.1 JIS Marking Approval

In 1982 MAICO embarked on a programme to improve the management and manufacturing strength of the company in order to produce high quality products by establishment of TQC system. MAICO applied to the Japanese government for JIS Marketing approval which will require a factory examination by the JIS officials. In this examination, not only are the product checked whether they meet JIS Standard by product inspection but mainly considering the company and factory as a system whether it can produce products stably and continuously.

Thus with the mind on the examination ahead, MAICO revamped the entire systems and put in order all affairs by company's regulations and standards. The whole programme took MAICO one year covering following aspects:

- Management's policy and enthusiasm
- Employees' training and education system
- Company's standardization and management of systematic quality control
- Company's standardization
- System of quality assurance

In April 1983 MAICO obtained JIS marking approval for window-type room air-conditioners.

Our products certification now includes:

JIS: 1986 Split type room air-conditioner

UL: Underwriters Laboratories

CSA: Canadian Standards Association

AHAM: Association of Home Appliance Manufacturers

AS: Australian Standards

JRAIA: Japan Refregeration and Air-Conditioner Industry Association

8.2 Quality Control Circles (QCC)

QC Circle activities were started in 1980 after the QC Circle concepts and it's implementation plan were introduced to the middle and top management.

Currently there are 69 circles with 961 members engaged in these activities and each circle have meetings once a week. Annually we have inhouse presentation of selected circles and the best circles will participate in All Malaysia Matsushita QCC Presentation and government sponsored State and National QCC conventions.

1990 Quality Year QCC Circles Achievement

Participation	Achievement
All M' sia Matsushita QCC Presentation	Awarded Gold (2 QCC Circle)
NPC QCC Presentation – Regional – National	Awarded Gold (2 QCC Circle)

9.0 MAICO's Quality Requirement tc Suppliers

MAICO Purchasing Regulation and Parts Quality Requirement Standard stipulated the policies procedure and requirement to suppliers in terms of quality, cost and delivery. The summary is as follows:

(a) Have a clearer understanding of MAICO's quality level and system

(b) Have a better parts quality control system, thus minimising careless rejects.

(c) Ensure good quality parts to MAICO through proper guided self inspection system.

In order to ensure that the company's quality requirement are being met by suppliers and continuously improved, the following process have being carried out in MAICO:

Process	Description
Purchase Agreement	• Supplier are taught on company's quality requirement from the initial appointment with reference to General Terms and Condition of Purchase Agreement and Parts Quality Requirement Standard.
Factory Evaluation / Audit	• Factory evaluation / audit during – New factory – New part – Line claim – Monthly factory audit • Requirement on supplier for company quality manual (Quality policy / organization etc.)
MAICO Quality Control Receiving Inspection	• Quality Control full time division (Part Assurance Division) to check the incoming parts to our company following the Quality Assurance System and Part Quality Requirement Standard. These inspection include initial inspection for new parts, normal inspection and mini life test for part reliability.
Supplier Meeting / Discussion	• Daily/monthly meeting with supplier on the: – Quality trouble. – Performance of supplier, etc.
Full Time QC Support Personnel	• QC support personnel to monitor the performance of selected main supplier
Follow-up Activity	• Concentration of follow-up activities on main supplier by monthly audit. • Monthly supplier meeting • Support activity by Purchasing and QC section to improve the quality and responsiveness of supplier.
Quality Activity and Training	Supplier often invited to observe MAICO's quality activities. eg. QCC Presentation, seminar.exhibition etc. MAICO QC Personnel also held as supplier QCC Presentation Judges
	Training provided to the selected supplier or sub-contractor. eg. Brazing skill, Installation kit assemble process etc.
Quality Control QAIS Follow-up Activity	Quality trouble follow-up activity with supplier for analysis of cause countermeasure and prevention recurrence activity.

In order to further improve our localization activity, MAICO started a special activity called Supplier Q-UP 50 activity with the main aim to reduce rejection lot out and line claim by 50% of selected 10 main suppliers.

These suppliers were asked to identify their weaknesses and strength and provide recurrence prevention countermeasure. These 10 main suppliers were asked to do a presentation to MAICO Top Management on their improvement plans and these plans are review every 6 months by MAICO management.

The best supplier is given an award by MAICO's Managing Director during the annual supplier "Thank You" dinner.

10.0 1990 Quality Year Activities

MAICO declared 1990 as a Quality Year with the purpose of establishing a base to achieve a strong Self Control Quality Assurance System by 1993, (to coincide with MAICO 20th Anniversary).

1990 Quality Policy	Make quality in manufacturing – To build Self Control Quality Assurance System
Target	Market Quality – No major problem in 1990 onwards Manufacturing Quality – To reduce process rejection 50% Parts Quality – To reduce 50% of lot out and line claim
Slogan	"Challenge Zero Defect, Build Customers Trust"

Several company-wide quality improvement activities were carried out.

There are: –

Activity	Target	Result
Design Quality Assurance	• Strengthen system against design quality	Installation of new facilities and system
Manufacturing Quality Assurance (Q-up 50 Campaign)	• Reduce 50% process rejection • Strengthen in-house parts floor inspection	Achieved 37%
Suppliers Parts	Quality improvement supporting activity for 10 main suppliers • Reduction of lot out and line claim	Improvement of lot out by 53%
Quality Consciousness Enhancement Activity	• Suggestions (named as Something Wrong Campaign) – enable all staff to report on any abnormal quality situation with monetary gains if problem correct.	Collected 2,728 suggestions on quality improvement. 20% relating to minor quality discrepancies
	• Hands-on Site-on factory audit by Top Management (Q-Day)	Have resulted in some quality improvement activities by various category of staff.
	• QC Education – for line leader and QCC leader.	50% staff attended 96% passed examination
Measurement Control Month	To promote Measurement Control knowledge to all MAICO members effectively in order to improve the quality and productivity	• Seminar • Exhibition • Promotion Handout • Etc.
Quality Exhibition	Exhibition on: • Market claim items • Sectional quality trend and improvement activities • Sectional recurrence prevention activities.	Instill consciousness
QCC Activities	• Meeting once a week • Project improvement theme	• Internal QCC presentation was held • Participated in 8th All Malaysia Matsushita (emerged as the Top QCC Group) • Invited to participate in Japan in Nov. 1992. • Participated in NPC regional and national level

11.0 Problems Faced and Lessons Learnt

Though MAICO has installed a comprehensive and foolproof quality assurance system, some market feedback has caused us to re-examine our present situation. The following areas have been identified for improvements:

(a) The over confident mind "Our product is in the market for many years and there is no problems".

Attention should be paid to the slightest doubt over quality issues.

(b) The scope of quality assurance is not finished after goods are released from factory to warehouse. Life test, periodical inspection of stock product, simulation tests on transportation and shipping should be appropriately done.

(c) Reliability tests and Packaging Evaluation should be done concretely.

(d) Cost-down efforts should be implemented after thorough investigation. Precaution should be taken when sourcing from new suppliers, process change by supplier and using alternative materials.

12.0 Suggestions to Malaysian Manufacturers

(a) Top Management should be enthusiastic on quality or nothing will happen otherwise. Priority and clear cut policy for quality should be fixed. Many suppliers lack the concept and mistakenly think that by introducing quality assurance it will incur extra costs. Quality Control is not a loss factor, it is an additional profit.

(b) Standards and regulations should be established for all affairs of the company. Many suppliers lack in this area and in particular, process control documents without which stable and constant quality cannot be monitored.

(c) Education and training is the most vital factor for quality improvement and should be done for all category of staff periodically. Everyone should learn how to solve problems with the tools of QC.

(d) Do not neglect to invest and update production machinery and inspection equipments. Joint venture or technical collaboration with foreign expertise should be considered as a means to improve technical know-how.

(e) Encourage small quality improvement activities by all level of staff.

2nd day

– PANEL DISCUSSION –

Implementation of Quality Control in Small & Medium-sized Industries

Leader

Prof. Yozo Mukawa	Honorary Professor of Chuo University

Panelists

Mr. Masaru Sekiguchi	Director of Eiko Development Co., Ltd. (Past General Manager of Quality Control Division, The Furukawa Electric Co., Ltd.)
Dr. Kenneth S. Stephens	Senior Industrial Development Officer, Institutional Infrastructure Branch, UNIDO
Mr. Sadaki Ishiwata	Director of Engineering Department, Shinagawa Electric Wire Co., Ltd.
Mr. Tin Check Ping	Assistant Manager of Quality Control Section, Matshushita Industrial Corp. Sdn. Bhd. (MAICO)
Mr. Abdullah Ali	Head of Technology Transfer Division, SIRIM

A Malaysian Expert is scheduled to participate.

2nd day
Oct, 29 - 31, 1991

International Electrotechnical Commission Quality Certification System (IECQ)

– Voluntary Third Party System for Electronic Components Based on ISO 9000 Series –

by Yuji GOMI
Executive Director of Inspection
Division, Reliability Center for
Electronic Components of Japan

1. Introduction

The full name of the IECQ is the International Electrotechnical Commission Quality Assessment System for Electronic Components, and it has been operating since 1982. The system is controlled by the Certification Management Committee (CMC) which is directely connected with the IEC council.

The object of the system is to facilitate both national and international trades in electronic components of assessed quality in accordance with the principle of reciprocity. This object is attained by defining and implementing the quality assessment procedures in such a manner that components released as conforming with the requirements of applicable standards or specifications are acceptable to all participating members.

The procedures for the quality assessment of components are provided in this system, but it does not necessarily give assurance of compliance with the safety requirements for equipment using these components.

2. Component Types Covered by the IECQ

The rules of the IECQ specify electronic components subject to certification as "all electronic components for which quality assessment is required." These components include at present:

(1) Passive components

Capacitors (fixed and variable), resistors (fixed, network and variable), varistors, thermistors, filters, resonators, and crystal units,

(2) Active components

Vacuum tubes, discrete semiconductor devices, integrated circuits (monolithic and hybrid), opto-electronic devices, and liquid crystal devices,

(3) Electromechanical components

Switches, keyboard switches, electromagnetic relays, and connectors, and

(4) Other components

Cables (LF, HF, coaxial and optical), printed circuit boards, inductors, transformers, attenuators and cores for inductors and transformers.

The components (products) considered to be added in future include components, assembly and sub-assembly products, or semi-finished products with new functions. For the components to be subjected to certification, the recognition of the CMC of IECQ must be obtained and the IEC standards for the components or the provisional standards recognized by the CMC for them should be met.

3. Governing Documents for the System

The IECQ is subjected not only to the IEC's statutes but to the following documents for control and management:

(1) Basic rules of the IECQ (Document No. QC 001001)

This document outlines the system mentioning the basic items such as:

Object of the system, Means of attainment, National/international organizations, Relation to the IEC council, Requirements of participation, Legal provisions, Standards (or specifications), Quality assessment, Finance, and Terms/definitions (as an appendix).

(2) Rules of procedures of the IECQ (QC 001002)

This document specifies specific methods and conditions of the system including the following items:

Participation, Standards and specifications, Approval of national supervising inspectorate, Approval of manufacturers/independent distributors/independent test laboratories, Qualification and capability approval of components, Quality conformance of components, mark/certificate of conformity, Certified records of released lots, Access to the system by manufacturers/distributors/test laboratories in non-participating countries, and Arbitration and appeal.

To understand the system itself and how it is operating internationally, we wish to suggest that you will read through items such as standards (frequently called specifications by the IECQ and particularly required for tests and examinations of components), approval of national supervising inspectorate, approval of manufacturers and qualification/capability approval of components;

(3) Guidance documens (QC 001003)

They give guidance to unify among countries mostly the procedures and methods for treatment by the National Supervising Inspectorate (NSI) in each country such as, for example, handling amendments to detailed standards and specifying forms of test reports which are too detailed to be mentioned in Rules (1) and (2) above. The titles of the main documents are as follows:

(i) Approval of independent test laboratories within the system,

(ii) Approval of an NSI by the ICC (Inspectorate Coordination Committee) to use the capability procedures of the IECQ, and

(iii) Amendment to detailed standards

(4) Standards/specifications list (QC 001004)

This list shows not only IECQ standards applicable to assessment and handling of each electronic components, but also drafts for standardizing, indicating in what stages they now stand, and it includes detailed standards made in each countries. It is possible to find from this list what components could be certified at present. The list is published three times a year by the central office of the IEC. Individual standards are also obtainable from TI Ltd. (U.K.).

(5) Qualified products list (QC 001005)

This document lists up the manufacturers, distributors, and independent test laboratories of each country which are recognized by the IECQ, and also includes the qualified components, relevant standards, names of components and the scope of ratings and characteristics. Therefore it is what is called the results of the IECQ. The list is intended to be used effectively by component users in selecting components for assembly of equipment, and it is widely distributed to various counties. The list is updated twice a year. The information is also obtainable from the CODUS's worldwide on-line database.

Note: The documents in (1) to (5) are obtainable from the IEC central office.

4. Participation in the System and Its Use

(1) Organization of the system and required conditions of participating countries

(i) As an international organization there is the Certification Management Committee (CMC) directly connected with the IEC council, under which the Inspectorate Co-ordination Committee (ICC) is set up.

The roles of the CMC are preparation/amendment of the system's rules, coping with problems of standards and finance and correspondence with outside organizations. The CMC entrusts certification work to the ICC. Member countries participate in the activities of the CMC by their right to vote.

The roles of the ICC are recognition of a national supervising inspectorate (NSI) and recognition of manufacturers in all the certifying countries, and it is responsible for securing equality of quality assessment of electronic components. When conducting certification work, if problems happen concerning standards or the system, it will ask the CMC for its instructions. All member countries participate in the activities of the ICC by their right to vote, but concerning the designated matters countries which have no NSI have no right to vote.

(ii) To become a member country the following must be satisfied:

- It is a member country of the IEC, attending the CMC/ICC.
- It has an organization and functions as a national authorized institution (NAI), taking the responsibility for implementation in the country. The NAI of Japan is the Japanese Industrial Standards Committee (JISC).
- It has a national standards organization (NSO), making domestic standards and necessary control documents. The NSO of Japan is the JISC.
- It has an organization and functions of a national supervising inspectorate (NSI). The NSI should have facilities as a neutral third party to independently

certify manufacturers and the like, assess and maintain the quality of components, supervise the use of the mark/certificate of conformity, and conduct audit tests of certified components. The NSI of Japan is the Reliability Center for Electronic Components of Japan (RCJ).

- It should clarify its calibration service organizations for measuring instruments. The organizations may be located in a foreign country.

The domestic organizations in Japan are indicated in Figure 1.

(2) Member countries of the IECQ and their inspectorates

The present member countries and the NSI's are as indicated in Table 1.

The NSI (EC) of Denmark approves not only its own manufacturers but those in Norway and Sweden. The CMC has recognized that the NSI of Japan (RCJ) also approves manufacturers in Singapore and Thailand, and several manufacturers have been approved.

Table 1. Member Countries and Their Inspectorates

(3) Present state of certification (From the latest QPL)

(i) Approved traders

Manufacturers	155
Independent distributors	32
Independent test laboratories	33

(ii) Qualified products 129

Japan occupies about 30%.

(4) When Malaysian manufacturers want to use this system, what should be done?

By taking one of the methods mentioned below they can participate in this system and use it. Details of the application procedures are explained in the rules of the IECQ.

(i) To participate in the system with the NAI, NSO and NSI-Japan, the United States and many other countries take this form. The NSI has to receive documentary examinations and on-the-spot examinations by representatives of the ICC. Test/measuring facilities, personnel including auditors, and work experience are also required, and the above involves great expense.

(ii) To have only the NAI and NSO and entrust certification work to an NSI in a foreign country after getting approval of the ICC – Singapore entrusts the work to the NSI of Japan (RCJ). This is an example of this case.

(iii) To organize a national management institution representing the trade and make correspondence with the CMC/ICC through it – An example is a national committee of the IEC or an appropriate industrial association.

(iv) When none of the methods mentioned above (i) to (iii) can be taken, a manufacturer who wishes to use the system may independently apply to the CMC.

5. Conditions of Traders Who Can Use the System

A trader in a country or a region approved by the CMC should receive documentary examinations and on-the-spot examinations by the auditors of the NSI. The following are requested of each trader.

(1) Component Manufacturers

The internal quality assurance system should be well prepared and the processes from receipt of materials to shipment of finished products controlled by the rules of the IECQ and the requirements of ISO 9001 or 9002. Part of the processes may be subcontracted, and subcontracts may be made in foreign countries. When a company has two or more factories, the approval is given to each factory (location) based on an application.

(2) Independent distributors

The reasons for approving this trader are to prevent deterioration of the quality of certified components in the distribution route from manufacturers to users and to secure traceability of the test results of inspection lots. The requirements include securing the mark/certificate of conformity when inspection lots are divided and sold in small units and re-examination of products stored for a long time (for example, more than a year) at the time of shipment.

The examination by the NSI is made in accordance with the quality manual made by the distributor. A responsible person for quality assurance should be designated by the distributor and approval of the NSI should be obtained.

(3) Independent test laboratories

Electric components go through the processes of assembly, inspection, transport, and installation by component users (makers of equipment) after shipment has been made, followed by operation of end users. Quality and reliability should be confirmed by testing at each stage. Test facilities for these purposes include those for mechanical shock test, vibration test and environmental tests such as high and low temperature test, temperature cycle test and humidity test, and may other versatile tests combining the above tests. It is difficult for any component manufacturers to own all of these test facilities.

The NSI, therefore, approves an organization or a company possessing these facilities and equally accepts test results obtained there. Approval of these test laboratories is made in accordance with ISO/IEC Guide 25 (Requirements for Test laboratory). The examination of the NSI is conducted in accordance with the quality manual made by the laboratory, and main test items include the control and calibration of facilities, the capacity of operators, and report procedures for test results. The laboratory should designate a manager responsible for its test results and receive approval of the NSI.

These three types of traders are registered in the QPL after the approval is given and notified throughout the world. (Refer to 3 (5).)

6. Processes of Quality Certification

Manufacturers' ultimate purpose of using the IECQ is to ship their components with the mark/certificate of conformity. For this purpose the manufacturers should receive the examination of the NSI in accordance with the following processes:

(1) Approval of manufacturers

A manufacturer should submit an application document for each factory to be examined and take the following measures:

(i) Preparation and maintenance of the quality manual

The quality manual expresses in writing the conditions of the IECQ and the requirements of ISO 9001 or 9002, and their main items are as follows:

Management responsibility, Quality system, Design control, Document control, Purchasing, Product traceability, Process control, Inspection and testing, Inspection/measuring/test equipment, Control of nonconforming product, Corrective action, Records, Quality audit, Training, and Statistical technique.

The NSI reviews the above for approval.

(ii) Examination of factories

The NSI refers the quality assurance system of a factory to the quality manual and examines each department. Various records in the past give useful clues to future prospects.

(iii) Designation of the chief inspector

A factory recommends a manager who is responsible and authorized to take measures for the quality of products to be shipped, and receives approval of the NSI.

(iv) When qualification approval tests are conducted in a factory

When qualification approval tests and periodic tests are conducted in a factory, approval of a laboratory corresponding to 5 (3) is added to the factory examinations. When all of these procedures and the factory examinations are found to have no problems, a certificate is issued to the manufacturer by the NSI or a designated domestic organization.

(2) Qualification approval tests

There are two methods for assessing products. One is qualification approval and the other is capability approval. These two are called here simply qualification approval. Table II indicates an example of qualification approval tests.

Components can receive qualification approval tests when:

(i) The IEC standard approved by the CMC is available (Refer to QC 001004),

(ii) The processes after the "primary stage of manufacture" for each component specified by the standard are securely controlled,

(iii) A detailed standard required by the IECQ is prepared in accordance with the relevant standard, and

(iv) The date and place of qualification approval tests, test equipment to be used, and others are planned. (When the test laboratory in 5 (3) is used, it should be clearly mentioned.)

The NSI should witness the tests and if necessary conduct audit tests.

When the test results are confirmed to meet the requirements of the standard, a certificate is issued to the manufacturer by the NSI or a designated domestic organization, and shipment of products is allowed with the mark/certificate of conformity attached.

(3) Maintenance of both manufacturer's approval and qualification approval

The chief inspector should report to the NSI in the cases mentioned below, even after receiving the qualification approval. The NSI may take procedures for re-approval based on these reports.

(i) When essential amendments are made to the quality manual, and

(ii) When the manufacturing place or the manufacture sharing with other factories is changed.

The state of use of the mark/certificate of conformity has to be periodically reported to the NSI as a result of periodic tests. And the right of the manufacturer to ship certified components continues, unless it violates the rules of the IECQ and the requirements of the ISO 9000 series.

7. IECQ Standards

There are many IEC standards for electronic components alone, but there are not so many standards which can be used by the IECQ. Development of IECQ standards is explained in detail in IEC Guide 102, and is summarized as follows:

(1) Hierarchy of standards

(i) Basic standards: ISO standards are used for units, marks, basic environmental test methods, sampling procedures and the like.

(ii) Generic standards: These standards are applicable to component families (for example, capacitors) or sub-families (for example, ceramic capacitors), and sectional and blank detail standards may be included in this category. They specify ratings, characteristics, and requirements as well as the duration of periodic inspection, sample sizes, representative samples for testing, permissible defectives, criteria of lots accept/reject and the like which are common to components.

(iii) Blank detail standards: They are made from the requirements of generic or sectional standards and contain a list of technical criteria of the components.

(iv) Detail standards: These standards are applicable to individual components, dealing with electrical characteristics, tests, inspections, and other requirements peculiar to the components. Table IIIA indicates an example of lot-by-lot inspection criteria, Table IIIB periodic inspection criteria and Table IIIC more detailed criteria of both inspections.

(2) Provisional standards

In the absence of applicable IEC standards other standards or specifications may be

used provisionally, provided they comply with the technical formats and inspection criteria of the system, and that they are submitted to the CMC by the NAI for approval and possible IEC standardization action by the IEC technical committee concerned.

The procedures will promote international standardization. The IECQ has about 100 provisional standards at present.

8. Merits Derived from the Use of This System

(1) To component manufacturers

(i) A factory (enterprise) can use the compatibility of its quality assurance system with the requirements of the IECQ including ISO 9001/9002 for a sales point to users, taking an opportunity of the examination.

(ii) In the process of the examination, advices by the NSI can be expected concerning clarification of the responsibility of each department, coordination with other departments, arrangement of internal documents, improvement in coping with abnormal situations and the like. The examination also enhances the consciousness, training, and confidence of employees.

(iii) National and international reputation is enhanced.

(2) To users of components

(i) As shipment is made by suppliers under supervision of the NSI, users do not need to conduct re-examinations, enabling them to prevent cost up, shorten their lead time, and eliminate their own specifications when placing orders.

(ii) Acquisition of quality assured components becomes easier. The QPL can be used as a useful source of information for any regions in the world. Components can be purchased from two or more suppliers. As time required to receive approval is eliminated, small users are favored by this system.

(iii) The reliability and traceability of components can be expected.

(iv) Test data of quality assessed components can be obtained from the manufacturers of the components as certified test records. Correctness of these records is guaranteed by the countersignature of the NSI.

9. Future of the IECQ

(1) Issues on future development of the IECQ are as follows:

- The system is somewhat complicated, and it is considerably difficult to get understanding of users. (There is an opinion which favors more flexible management in the certification work of traders.)
- As mandatory power is weak without forcible safety measures, users and manufacturers do not pay much attention to the system.
- There are not so many applicable standards, limiting the scope of components which can be certified.

(2) To make the IECQ more attractive to users of components the following measures are being considered:

(i) In place of the AQL or the LTPD used to make the judgement before shipment, the Assessed Process Average (APA) will be considered, and the NSI will confirm the daily defective fractions of manufacturers and put them in the QPL,

(ii) The IECQ will annex the certification system of the CENELEC Electronic Components Committee (CECC) and cover the European market,

(iii) New users will be found; for example, efforts will be made to meet the market needs by making adjustments with telecommunications, ISO/TC 20 (Aircraft and Scope Vehicles) TC 22 (Road Vehicles) and others,

(iv) The Total Quality Management (TQM) will be introduced to the quality assurance system of component manufacturers in connection with certification by the ISO 9000 series, and

(v) The CMC will conduct PR activities in various countries; for example, forums will be held.

10. Conclusion

The IECQ is the only system for electronic components internationally unified and recognized. Its activities are closely watched by manufacturers in other fields of products.

We hope that in order to work on the worldwide markets you will closely watch the movement of the IECQ and, if possible, participate in it, make constructive proposals and contribute to the world economy.

Fig. 1 Structure of National Organization

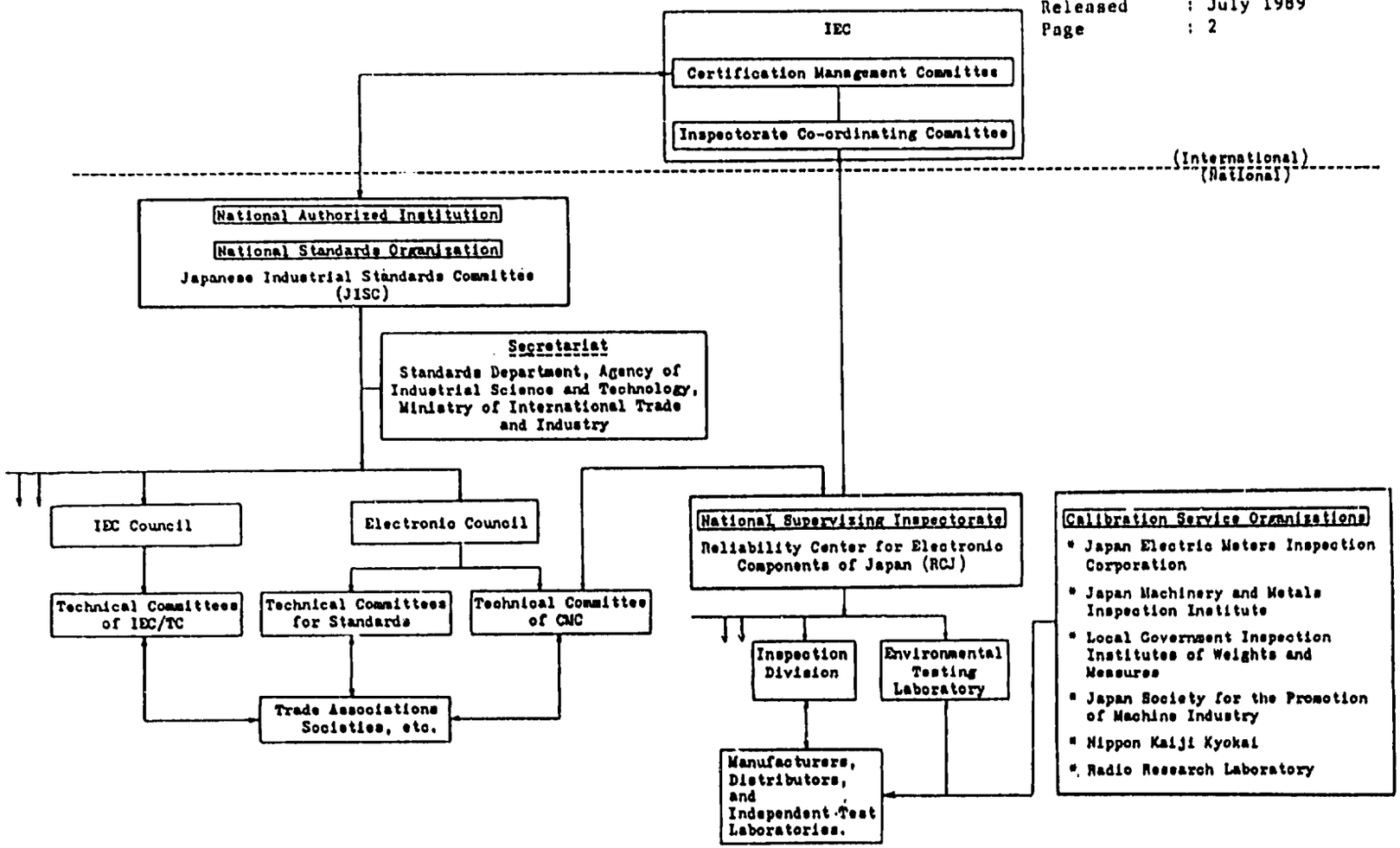


Table II

Sampling plan together with numbers of permissible defectives for qualification approval tests

Group No.	Test	Sub-clause of this publication	Number of specimens (*n*) and number of permissible defectives (*pd*)					
			Per value[4]	For four or less values[4] to be tested			For six values[4] to be tested		
			n	4*n*	*pd*	*pd* total	6*n*	*pd*	*pd* total
0	Visual examination Dimensions Leakage current Capacitance Tangent of loss angle Impedance[1] Spare specimens	4.1 4.1 4.2.1 4.2.2 4.2.3 4.2.4	26 2	104 8	1		156 12	2[2]	
1A	Robustness of terminations Resistance to soldering heat	4.3 4.4	3	12	1	4	18	1	6
1B	Solderability Rapid change of temperature Vibration Bump or shock[3]	4.5 4.6 4.7 4.8 or 4.9	6	24	1		36	2[2]	
1	Climatic sequence	4.10	9	36	2[2]		54	2[2]	
2	Damp heat, steady state	4.11	5	20	1		30	2[2]	
3	Endurance	4.12	5	20	1		30	2[2]	
4A	Surge voltage	4.13	2	8	1		12	1	
4B	Reverse voltage[1]	4.14	2	8			12	1	
5	Characteristics at high and low temperature Charge and discharge[1]	4.15 4.16	3	12	1		18	2[2]	

[1] If prescribed in the detail specification.
[2] Not more than one defective is permitted from any one value.
[3] As prescribed in the detail specification.
[4] Case size/voltage combinations, see Sub-clause 3.4.1.

Table III A

Inspection sub-group**	D*		E		F*		G*	
	IL	AQL (%)	IL	AQL (%)	IL	AQL (%)	IL	AQL (%)
A1			S-4	2.5				
A2			II	1.0				
B1			S-3	2.5				
B2			S-3	2.5				

IL = inspection level
AQL = acceptable quality level

Table III B

Inspection sub-group**	D*			E			F*			G*		
	p	n	c	p	n	c	p	n	c	p	n	c
C1A				6	9	1						
C1B				6	18	1						
C1				6	27	1						
C2				6	9	1						
C3				3	24	1						
C4A				12	6	1						
C4B				12	5	1	1					
C5				3	15	1						

p = periodicity in months
n = sample size
c = permitted number of defectives

Notes concerning Tables III A and III B

* The assessment levels D, F and G are under consideration.

** The content of the inspection sub-groups is described in Section Two of the relevant blank detail specification.

Table III C

Sub-clause number and Test (See Note 1)	D or ND	Conditions of test (See Note 1)	I L (See Note 2)	A Q L	Performance requirements (See Note 1)
GROUP A INSPECTION (Lot-by-lot)					
Sub-group A1	ND		S-4	2.5%	
4.4 Visual examination					As in 4.4.2 Legible marking and as specified in 1.5 of this specification.
4.4 Dimensions (detail)					As specified in Table I of this specification
Sub-group A2	ND		II	1.0%	
4.5.1 Leakage current		Protective resistance: 1000Ω			See Table II B
4.5.2 Capacitance		Frequency: 120 Hz			Within specified tolerance
4.5.3 Tangent of loss angle (tan δ)		Frequency: 120 Hz			See Table II B
GROUP B INSPECTION (lot-by-lot)					
Sub-group B1	D		S-3	2.5%	
4.5.4 Impedance		Frequency: 100 kHz			As in Table II C
4.7 Solderability		Method: 1			
4.7.2 Final measurements		Visual examination			As in 4.7.2

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size & criterion of acceptability (see Note 3)			Performance requirements (see Note 1)
			p	n	c	
GROUP C INSPECTION (periodic)						
Sub-group C1	D		3	12	1	
4.6 Resistance to soldering heat		Method: 1 Duration: 5±0.5 s				
4.6.2 Final measurement		Visual examination				As in 4.6.2
		Capacitance				$\frac{\Delta C}{C} \leq$ 5% of value measured initially
		Tangent of loss angle				≤ initial limit
Sub-group C2	D		3	12	1	
4.9 Bond strength of the end face plating (4)		Capacitance (with board in bent position)				$\frac{\Delta C}{C} \leq$ 5% of value measured initially
		Visual examination				No visible damage
Sub-group C3	D					
4.3 Mounting		Visual examination Leakage current				As in 4.4.2 ≤ initial limit
		Capacitance				$\frac{\Delta C}{C} \leq$ 3% of value measured initially
		Tangent of loss angle				≤ initial limit
		Impedance				≤ initial limit

3rd day

SEMINAR ON
ACHIEVING COMPETITIVE QUALITY THROUGH STANDARDIZATION AND QUALITY CONTROL

Japan's Policy toward International Assessment and Registration System Using ISO Quality Assurance Standards

Lecturer: Mr. Akio Hayashi
Director for International Standardization Affairs,
Standards Department, AIST, MITI

The Need To Implement ISO 9000 in Malaysia

Lecturer: Mr. Lam Teng Chee
Director of Standards Division,
SIRIM

Implementation of Quality Assurance Activities (ISO 9000) in Factories

Lecturer: Mr. Chikafumi Morita
Director of Quality Assurance Center, JMI Institute

Panel Discussion:

Competing in the World Market

Leader: Mr. Akio Hayashi

Panelist: Mr. Chikafumi Morita, Mr. C.M. Achuthan,
Ms. Magdalena Fajardo Savarain, Mr. Lam Teng Chee

A Malaysian Expert and an Asean Expert are scheduled to participate.

29th – 31st October 1991
The Regent of Kuala Lumpur

3rd day
Oct. 29 – 31, 1991

Japan's Policy toward International Assessment and Registration System Using ISO Quality Assurance Standards

by Akio HAYASHI
Director for International Standardization Affairs, Standards Department, Agency of Industrial Science and Technology

Foreword

Since the establishment by ISO of the ISO 9000 series which are a set of international standards for quality assurance, efforts have been made to realize the global unification and harmonization in the systems of quality assurance and quality control which have been undertaken independently by each country.

The ISO 9000 series are standards, and ISO itself does not operate the assessment and registration scheme. However, various countries centering on the ISO member bodies are beginning to take actions to establish the global assessment and registration scheme for quality systems based on the provisions of this ISO 9000 series, by using their existing systems or by adapting them.

These activities have been accelerated by duty of esteeming international standards by each country under the GATT Standards Code and the movement for the regional unification of the regulations and certification systems aming at the coming integration of the EC market next year.

Japan is also taking measures to make a system to cope with the global movement mentioned above, and I wish to explain the present state and future schemes of Japan.

1. Background and Necessity of Assessment and Registration

Scheme for Quality Systems

The ISO 9000 series which are international standards for quality control and quality assurance were established in 1987 and have been adopted as national standards by more than 40 countries (Refer to Table). From the viewpoint of smooth flow of products, arrangement of the assessment and registration scheme for quality systems based on these series is actively under way, especially in EC countries, and movement toward mutual recognition among various countries is promoted.

The draft revision of the GATT Standards Code which has been virtually agreed upon internationally obligates its member countries to respect the international guides or recommendations in the conformity assessment procedures. It also requires that each country accepts under certain conditions the results of conformity assessment made by other countries. For this reason, it has become necessary for Japan to utilize the ISO 9000 series appropriately in the JIS marking system and other various systems.

Quality assurance in accordance with the ISO 9000 series has come to be requested in some cases by mandatory certification systems based on laws and regulations and by company procurements mainly in the EC countries. For this reason, to some companies in our country exporting to the EC countries, acquisition of a certificate of registration based on the ISO 9000 series has actually become necessary.

While the movement as above is under way, companies in Japan have been making positive evaluation of the ISO 9000 series that introduction of the ISO 9000 series will promote further improvement of their quality control, and they expect that the assessment and registration scheme of quality systems based on the ISO 9000 series will be generally used as a basis to assess the system and state of quality control in various kinds of certification systems.

Furthermore, some private assessment bodies in Japan have started the assessment and registration for quality systems based on the ISO 9000 series as their independent business and have been making efforts to conclude mutual recognition contracts with overseas assessment bodies.

Reflecting the present situation mentioned above, the ISO 9000 series were adopted as the JIS Z 9900 series in our national standards system on October 1st this year.

From the viewpoint of securing international harmonization and smooth international trade and further improving quality control of companies in Japan, the establishment of an assessment and registration scheme for quality systems based on the JIS Z 9900 series are being considered and discussed.

While expecting the series to be applied to the certification systems broadly in Japan, positive utilization of the JIS Z 9900 series and acceptance of the results of assessment and registration in the JIS marking examination are also under consideration.

Specific consideration and discussion are under way in the Divisional Council on Accreditation and Certification which was established in the Japanese Industrial Standards Committee (JISC) in May this year and is headed by Yotaro Iida, vice chairman of the Federation of Economic Organizations. The Divisional Council is scheduled to present its report around next spring.

2. Assessment and Registration Scheme for Quality Systems in Japan

Although specific details have not yet been decided in the present situation as mentioned above, directions presently considered are as follows:

(1) Framework of Assessment and Registration Scheme for Quality

To begin with, I wish to talk about the direction in which measures for the assessment and registration scheme for quality systems based on the ISO 9000 series are heading.

In the framework of the assessment and registration scheme for quality systems, as I indicated its concept in "Fig. – Accreditation, and Assessment and Registration Scheme", it is anticipated that an applicant such as a manufacturer who wishes to be registered in this scheme makes an application to an assessment body with necessary papers attached, and after it has been registered based on the result of its examination, it will be widely notified as an ISO 9000 series-registered factory.

To examine technical competence and secure reliability of private assessment bodies, accreditation of the assessment bodies by an accreditation body is necessary. General examples in many countries show that only one accreditation body is established in one country from the viewpoint of securing the equal level of assessment bodies.

To realize the international harmonization of the scheme and to maintain the technical competence of auditors, as the cases in overseas countries indicate, it is considered necessary to establish an organization for registration of auditors in line with the international standards and guides and training organizations which educate those auditors.

(2) Positive utilization of JIS Z 9900 in the JIS marking system

Next, I wish to talk about their use in the JIS marking system which you might well be familiar with. The JIS mark is a mark of quality and reliability, being applicable not only to factories in Japan but widely to those in foreign countries. Malaysian factories, such as Malaysian Sheet Glass BHD, Kee Fatt Industries SDN. BHD, and Matsushita Industrial Corporation are approved to affix JIS mark on their products.

In the examination of factories for approval of JIS marking, basically two different aspects of "conformity with product standards" and "quality control system" are checked. In "quality control system" out of these two, the JIS Z 9900 series can be used as a criterion for this examination. Also, the result of registration based on quality systems assessment and registration scheme can be accepted and used in the examination in the JIS marking system.

We think on the above grounds that necessary arrangement should be made to rationalize the examination in the JIS marking system, to perform international obligations to respect international guides or recommendations, and to accept the results of conformity assessment made in foreign countries.

Specifically speakng, of the above-mentioned two aspects for examination in the JIS marking system, assessment on the "conformity with product standards" will be conducted as before. Concerning "quality control system", I think that acceptance of the results of the assessment and registration based on the ISO 9000 series conducted by accreditated assessment bodies is appropriate for avoiding repetitive examinations.

3. Effects of ISO 9000 Series from Viewpoint of International Trade, and Cautions

The above is the direction in which the ISO 9000 series are treated in Japan. Next I wish to talk about the merits from the international standpoint, and issues to be avoided.

(1) Merits of the ISO 9000 series

I wish to point out 3 merits of the ISO 9000 series.

First, they give manufacturers specific targets of their quality control activities, leading to improvement of the quality of their products.

Second, the state of quality control activities of manufacturers can be assessed and registered fairly, impartially, and neutrally by the third-party assessment body in line with objective check items common to the world.

Third, the result of the assessment and registration becomes a "common passport to international markets", and there is a possibility that such schemes will grow up to be a measure to avoid unnecessary repetitive examinations conducted in different countries.

From the above viewpoints, it can be said that this is a system which enables strengthening international competitiveness of industries in each country worthy to be actively promoted.

(2) Points to be avoided when introducing ISO 9000 series

When adopting and operating the assessment and registration scheme for quality systems based on the ISO 9000 series, I which to talk about the "3 traps" which should be avoided.

The first is a lack of unity in implementing the ISO 9000 series, and a lack of harmonization of assessment by assessment bodies. Mr. Lam of SIRIM pointed out this at the PASC meeting in April. He said that a certain condom maker had been examined based on the ISO 9000 series by assessment bodies in several countries and by different assessment bodies in a country, however results had come out very peculiar that different comments and interpretation were made by different assessment bodies. If a visa is required to each and every market, the value of the "common passport" will be lost.

The second, though it is connected to the first, is the implementation of perfunctory/bureaucratic examinations. Requests by an assessment body for submission of a massive volume of papers useless to manufacturers will diminish the meaning of the assessment of their quality systems. We should not forget that the purpose of the ISO 9000 series is quality assurance.

The third is overconfidence of manufacturers in having passed the examination by the ISO 9000 series. I sometimes hear "If we clear the ISO 9000 series, no TQC is any more necessary". But I think this is a mistake. Total quality control (TQC) can be achieved, only when the three items of quality assurance (QA), quality control (QC), and quality improvement (QI) are all achieved combinedly. Activities aiming at it are TQC. TQC, therefore, cannot be achieved without QA based on the ISO 9000 series, but I do nor think that the manufacuturers alone can not make their products only by QA with international competitiveness to meet the needs of users. This can be clearly seen from the fact that ISO/TC176 which is in charge of the ISO 9000 series is strongly requesting Japan to draft standards on QI.

4. Future Subjects Surrounding ISO 9000 Series

Finally, I wish to conclude my lecture today on the ISO 9000 series by talking about three subjects in the future.

First, we should bring this up to the quality assurance system trusted by users, consumers, and governmental bodies operating the mandatory certification systems in various countries throughout the world. We have to arrange the scheme to enable smooth international mutual recognition of the results of assessment and registration.

Second, for the purpose of achieving the above, it is necessary to promote international introduction of assessment guidelines to harmonize the assessment level of each country and establish international or regional networks of accreditation bodies and assessment bodies. This plan has been proposed at the occasions of ISO and PASC by Japan.

Third, those concerned should actively use the ISO 9000 series. For example, when manufacturers purchase parts or materials, they should consider whether suppliers are ISO 9000 series registered firms or not and the governmental bodies should apply them extensively as a basis of the certification system based on laws and regulations or of the government procurements.

Those concerned in the world should "consider quality" as their own problem, apply the ISO 9000 series for improving quality of products, and improve the ISO 9000 series by revising them.

We, Japan, wish to tackle these subjects actively in cooperation with interested foreign countries.

Thank you very much for your listening.

Table: The Present Situation of Adopting ISO 9000 Series as National Standards in the World

Standards body (country)	Quality management and quality assurance standarsds: Guidelines for seliction and-use	Quality systems: Model for quality assurance in design/development, production, installation and servicing	Quality systems: Model for quality assurance in production and installation	Quality systems: Model for quality assurance in final inspection and test	Quality management and quality system elements: Guidelines
ISO	ISO 9000:1987	ISO 9001:1987	ISO 9002:1987	ISO 9003:1987	ISO 9004:1987
European community	EN 29000	EN 29001	EN 29002	EN 29003	EN 29004

IDENTICAL

Australia	AS 3900	AS 3901	AS 3902	AS 3903	AS 3904
Austria	o Norm EN 29000	o Norm EN 29001	o Norm EN 29002	o Norm EN 29003	o Norm EN 29004
Belgium	NBN-EN 29000	NBN-EN 29001	NBN-EN 29002	NBN-EN 29003	NBN-EN 29004
Canada	-	-	-	-	CSA Q420-87
Columbia	ICONTEC-ISO 9000	ICONTEC-ISO 9001	ICONTEC-ISO 9002	ICONTEC-ISO 9003	ICONTEC-ISO 9004
Cyprus	CYS ISO 9000	CYS ISO 9001	CYS ISO 9002	CYS ISO 9003	CYS ISO 9004
Czechoslovakia	CSN ISO 900	CSN ISO 9001	CSN ISO 9002	CSN ISO 9003	CSN ISO 9004
Denmark	DS/ISO 9000	DS/ISO 9001	DS/ISO 9002	DS/ISO 9003	DS/ISO 9004
Finland	SFS-ISO 9000	SFS-ISO 9001	SFS-ISO 9002	SFS-ISO 9003	SFS-ISO 9004
France	NF-EN 29000	NF-EN 29001	NF-EN 29002	NF-EN 29003	NF-EN 29004
Germany	DIN ISO 9000	DIN ISO 9001	DIN ISO 9002	DIN ISO 9003	DIN ISO 9004
Hungary	MI 18990-1988	MI 18991-1988	MI 18992-1988	MI 18993-1988	MI 18994-1988
Iceland	IST ISO 9000:1987	IST ISO 9001:1987	IST ISO 9002:1987	IST ISO 9003:1987	IST ISO 9004:1987
India	IS 14000:1988	IS 14001:1988	IS 14002:1988	IS 14003:1988	
Ireland	IS/ISO 9000	IS/ISO 9001	IS/ISO 9002	IS/ISO 9003	IS/ISO 9004
Italy	UNI/EN 2900-1987	UNI/EN 2901-1987	UNI/EN 2902-1987	UNI/EN 2903-1987	UNI/EN 2904-1988
Malaysia	-	MS 985/ISO 9001-1987	MS 985/ISO 9002-1987	MS 985/ISO 9003-1987	-
Netherlands	NEN-ISO 9000	NEN-ISO 9001	NEN-ISO 9002	NEN-ISO 9003	NEN-ISO 9004
New Zealand	NZS 9000:1990	NZS 9001:1990	NZS 9002:1990	NZS 9003:1990	NZS 9004:1990
Norway	NS-EN 29000:1988	NS-EN 29001:1988	NS-EN 29002	NS-EN 29003	-
Philippines	PNS ISO 9000:1989	PNS ISO 9001:1989	PNS ISO 9002:1989	PNS ISO 9003:1989	PNS ISO 9004:1989
Poland	ISO 9000	ISO 9001	ISO 9002	ISO 9003	ISO 9004
Romania	RS ISO 9000	RS ISO 9001	RS ISO 9002	RS ISO 9003	RS ISO 9004
Singapore	SS 308 Part 0:1988	SS 308 Part 1:1988	SS 308 Part 2:1988	SS 308 Part 3:1988	SS 308 Part 4:1988
South Africa	SABS 0157:Part 0	SABS 0157:Part I	SABS 0157:Part II	SABS 0157:Part III	SABS 0157:Part IV
Spain	UNE 66 900	UNE 66 901	UNE 66 902	UNE 66 903	UNE 66 904
Sweden	SS-ISO 9000:1989	SS-ISO 9001:1989	SS-ISO 9002:1989	SS-ISO 9003:1989	SS-ISO 9004:1989
Switzerland	SN EN 29000:1988	SN EN 29001:1988	SN EN 29002:1988	SN EN 29003:1988	SN EN 29004:1988
Tanzania	TZS 500:1990	TZS 501:1990	TZS 502:1990	TZS 503:1990	TZS 504:1990
Thailand	TISI ISO 9000	TISI ISO 9001	TISI ISO 9002	TISI ISO 9003	TISI ISO 9004
Tunisia	NT 110.18-1987	NT 110.19-1987	NT 110.20-1987	NT 110.21-1987	NT 110.22-1987
United Kingdom	BS 5750:1987: Part 0:Section 0.1	BS 5750:1987: Part 1:	BS 5750:1987: Part 2:	BS 5750:1987: Part 3:	BS 5750:1987: Part 0:Section 0.2
USA	ANSI/ASQC Q90	ANSI/ASQC Q91	ANSI/ASQC Q92	ANSI/ASQC Q93	ANSI/ASQC Q94
USSR	-	40.9001-88	40.9002-88	-	-
Yugoslavia	JUS A.K. 1.010	JUS A.K. 1.012	JUS A.K. 1.013	JUS A.K. 1.014	JUS A.K. 1.011
Zimbabwe	SAZ 300	SAZ 301	SAZ 302	SAZ 303	SAZ 304

EQUIVALENT

China	GB/T 10300.1-88	GB/T 10300.2-88	GB/T 10300.3-88	GB/T 10300.4-88	GB/T 10300.5-88
Jamaica		JS 167:Part 1:1990	JS 167:Part 2:1990	JS 167:Part 3:1990	
Venezuela	COVENIN 3000	COVENIN 3001	COVENIN 3002	COVENIN 3003	COVENIN 3004

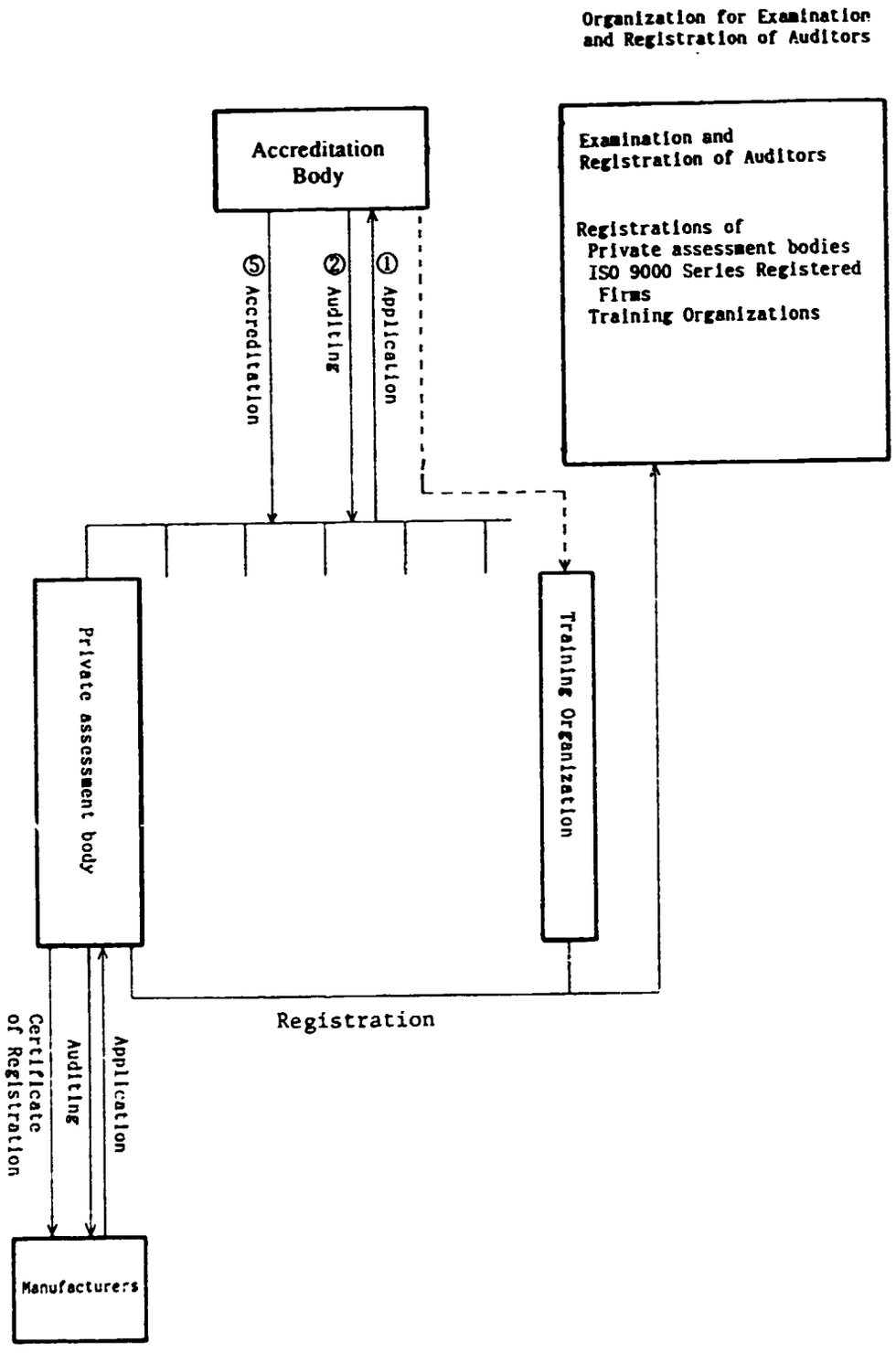


Fig. Accreditation, and Assessment and Registration Scheme

3rd day
Oct. 29 – 31, 1991

The Need to Implement ISO 9000 in Malaysia

by Lam Teng Chee
Director of Standards Division,
SIRIM

SYNOPSIS

Malaysia has traditionally been an agro-based economy. Over the last decade, the manufacturing sector grew in importance and growth rates were unprecedented over the last few years, making the manufacturing sector the biggest export earner.

Malaysia today is well on the road to industrialization and as the economy shifts from an agro-based one to one that is increasingly industrial in nature, Malaysian manufacturers have to realise that QUALITY is the key to success. Within the context of an economy that relies heavily on earnings from the industrial sector, QUALITY is often a matter of survival.

In many parts of the world today, the globalization of trade is becoming apparent. Malaysia's domestic market is simply too small to effect the economic changes envisioned by the nation's Vision 2020. If we want to improve our economic situation, then Malaysia has no choice but to look to foreign markets and that too at markets which have strong purchasing powers. Such markets are characterised by stiff competition making QUALITY the single most important issue that manufacturers have to address if they want any measure of significant success.

Political and Economic changes are taking place globally at a rapid pace. Perhaps the most significant economic development in recent years is the imminent unification of Europe under a Single market.

This market with more than 300 million people is almost as big as the US and Japanese markets put together with one of highest purchasing powers in the world. To ignore the requirements of such a market would prove fatal to the economic development of Malaysia.

It is therefore pertinent to address the requirements of the EC Single Market of 1992 pertaining to the entry of foreign goods. In 1985, the EC Council of Ministers agreed on a New Approach incorporating Technical Directives for the removal of technical barriers to trade. Under this approach, essential requirements relating to safety, health and protection of the environment and consumer would have to be met to facilitate trade with and between EC member countries. In 1985 a Directive called the Product Liability Directive was also adopted by the EC countries. Under this Directive, a manufacturer, including third country exporters into the EC, will be held liable, if a person is harmed or an object damaged by a defective product. The burden of proof will lie on the manufacturer and the minimum defence that he can rely on will be a well-documented and well-implemented quality assurance system.

This quality system is the EN 29000 series of standards which is the European equivalent of the ISO 9000. It therefore holds that if Malaysian manufacturers vie to penetrate this extremely lucrative market, then they need to implement the ISO 9000 Quality Management System.

SIRIM is on an aggressive drive to promote quality, particularly the certification and registration to the ISO 9000 scheme. Within three years, 45 certificates have been awarded to 39 firms with regard to the ISO 9000. Another 184 applications are being processed at various stages. No effort is being spared by SIRIM to get more Malaysian manufacturers to comply to ISO 9000 standards.

It is however important to note that the ISO 9000 is not an end in itself. The ISO 9000 strictly speaking, lays down the basic infra-structure for Total Quality Control. By itself, it cannot achieve the highest quality. Certification to the ISO 9000 is only one of the important elements of Total Quality Control. Manufacturers have to remember that finally it is CUSTOMERS who decide whether products meets up to their expectations or not.

It is therefore extremely important that manufacturers view the ISO 9000 scheme not as an end in itself but as a beginning for upgrading quality which will enable manufacturers to penetrate vast new markets.

3rd day
Oct. 29 - 31, 1991

Implementation of Quality Assurance Activities (ISO 9000) in Factories

by Chikafumi MORITA
Director of Quality Assurance
Center, JMI Institute

1. Introduction

"Quality" and "standards" have gradually become important matters to customers in the competing world of the domestic and international trade. The companies supplying products and services should be able to prove their superiority to their competing parties in their competing fields. At the same time they have to retain profits and increase the efficiency of operation.

Companies which intend to control the quality of their operation face a problem of selecting a proper method from among various available methods for quality improvement.

Since the industrial revolution, the quality has been vehemently discussed and experts in each field have taken their own approach to the quality improvement. While these approaches have enlarged the scope of techniques applicable to management, they often cause confusion and inconsistency to companies which are not pursuing the improvement of management. Of the methods of approach, some are apparently wrong, but they usually give the companies a guide in the implementation of their policy, and supply a basis for the foundation of their quality. If companies are taking approaches different from the quality system mentioned above the customers are receiving products or services from such companies, they cannot get objective evidence necessary to evaluate the intention, implementation, and effectiveness of their quality system.

Development of standards for the quality system has provided the basis to evaluate these matters. Some of initial standards came from large customers requesting suppliers to accept their requirements for quality. Since then national standards for the quality system have been developed in many countries. As a matter of fact, these standards have been used for foreign trade in countries which have no domestic standards. In 1987, the International Standardization Organization (ISO) published the ISO 9000 series of standards for quality assurance and quality management which were developed based on the 1979 version of the British Standard BS 5750.

The above standard series has been recognized in more than 80 countries and adopted as a national standard. Japan also has recently decided to adopt it as a national standard. Customers who wished to confirm the quality of products which they purchased used to make periodical assessments of many suppliers in the 1960s and 1970s. Some suppliers employed full time workers to prepare for outside assessments by customers. In many countries, independent companies of the third party started a registration system to certify compliance with the requirements of recognized standards for the quality system in place of audit by customers. This registration was audited by auditors well trained for the requirements of, for example, BS 5750. Purchasers came to trust the registration program of these third parties, and some of them reduced or entirely abandoned their own programs. Bidders and contractors now request that the products they purchase should be manufactured based on the quality system which is in

compliance with the requirements of the recognized standards and audited for registration by the third party certifying organization. This trend has been increasing. Selection of good and secure suppliers gives strong tools to the management for reducing costs and improving materials and services they receive.

Companies which have been successful on international markets already have their securely established quality assurance system, and it is not that ISO 9000 includes the requirements calling for a big change in their system. In other words, such companies already satisfy about 80% of the requirements of ISO 9000, and, therefore, I think that concerning the remaining 20% the companies need to put their system in writing in accordance with the requirements of ISO 9000.

One of the most common criticisms against ISO 9000 is that the volume of documents and work used for the quality management system is huge, but actually this is not the case. ISO 9000 requests documentation, only when bad effects are liable to be caused in the absence of documents. In other words, documentation is requested to secure quality, and there is nothing more than that.

When we satisfy the requirements of the quality control system specified by ISO 9000, the problem we face first is to make the quality manual of a company.

The quality manual is part of all the documented quality system of a company. This describes plans for what should be done, and people are requested to do what have been put in writing; therefore, plans for quality and the quality system of the company as well as other functions to be satisfied can be specified in the quality manual, which can be called a central container of technology and knowledge of the company. Many pieces of very useful information are stored in human brains, fragile containers, but they are valuable resources of the enterprise. By describing these pieces of information in writing they are transferred to the objects belonging to the entire company from those of key persons, and weakness of the company is reduced and communication between departments, sections and employees is accelerated. The quality manual which describes how quality should be controlled in the company becomes a very useful tool for training.

Preparation of the quality manual makes systematic planning for the quality system possible and verifies to customers, certifying organizations, and shareholders that the items specified in it are not merely incidental and tentative ones for implementation. By establishing the quality system we can make a basis for our periodical audits and reviews to check firstly whether we are doing what we say we are doing and secondly whether the quality system still satisfies our requirements.

The quality manual is successfully used to find what each employee is supposed to do and to make employees perform their work more efficiently by eliminating uncertainty and specifying the responsibility and authority of the system.

Most companies are managed, based on myths and some traditions. The documented quality system with the quality manual and others reflects how things recognized by employees, customers and outside organizations are performed in actual activities. The main purpose of the quality manual, however, is to be used as a permanent reference for introducing and maintaining the quality control system, and to provide sufficient information on the quality management system of a company.

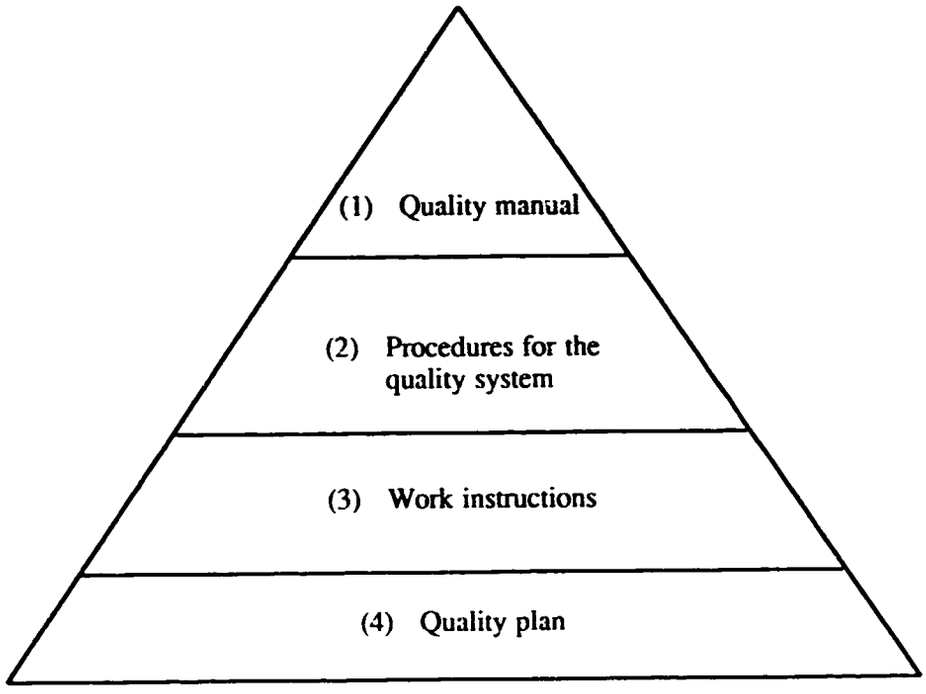


Fig. 1 Structure of Quality Management

2. ISO 9000 Series

ISO 9000

The name of "ISO 9000 series" is derived from the names of the corresponding standards. ISO 9000 is an advice standard with two purposes; one is to clarify the differences in the main concepts concerning quality and their mutual relations, and another is to provide guidlines for selection and use of a series of international standards concerning the quality system, which are applicable to the purpose of inside quality control (ISO 9004) and the purpose of outside quality assurance (ISO 9001, ISO 9002 and ISO 9003).

The fact that the composition of this series is not ideal can be found in this stage. Since the 9000 series is in the fixed form, we are likely to read from page 1 of 9000 to 9002 to 9003 and to the last page of 9004, but this is not a good way of reading this series. If possible, read ISO 9004 right after finishing ISO 9000.

ISO 9004

ISO 9004 is a secondary advice document in the ISO 9000 series, giving detailed advices to a company about the general quality management and the requirements of the quality system. ISO 9004 gives, in addition to the requirements of the three standards (ISO 9001, 9002 and 9003) which are used for contract documents, guidance in other fields such as marketing, safety of produts, responsibilities for compensation of products and quality costs, and, therefore, ISO 9004 is the most useful standard in the ISO 9000 series.

The companies which implement their own effective quality management instead of applying the system requirements of ISO 9000, 9002 or 9003, attain successful goals by using ISO 9004. Since ISO 9004 is an advice document, it is written using "should," instead of a

mandatory word "shall." The remaining three standards, ISO 9001, 9002 and 9003 are used for contracts between suppliers and customers. For this reason a mandatory word "shall" is used in these documents. Even ISO 9003, the simplest standard for a quality system is written using "shall" to reflect the obligations of suppliers.

Since the three mandatory standards are applied to the average processes, examinations from the simplest one to the most complicated (in other words, in the order starting from ISO 9003 to ISO 9002 to ISO 9001) is considered the best to study their applicable scopes and functions.

ISO 9003

ISO 9003 is a contract standard used when compliance with the specified requirements is assured by suppliers only by the final inspection and test.

This standard does not end here. Quality plan for the management policy and organization is apparently required. Documentation of the procedures to follow is necessary, and the documents should be controlled. Personnel should be educated and trained. Inspection and test equipment should be calibrated and controlled.

The system to indicate the state of inspections and tests should be established to control products of nonconformity. Records of quality should be kept, and if appropriate, statistical methods should be established. The above looks complicated, but the requirements of ISO 9003 are a simplified version of the same requirements specified in ISO 9001 or ISO 9002. The quality system of ISO 9003 is generally applicable only to comparatively simple products or services.

ISO 9002

The step-up from the requirements of ISO 9003 to those of ISO 9002 constitutes a very big difference, compared with the step-up from ISO 9002 to ISO 9001. The standard of ISO 9002 prescribes the method of assuring the conformity with the specified requirements by suppliers during manufacture and installation. It includes the requirements of the final inspection and test specified in ISO 9003, but specifies them more in detail. In addition to that, ISO 9002 prescribes the following requirements.

1. Internal audit
2. Contracts Review
3. Purchasing
4. Process control
5. Corrective action and
6. Purchaser supplied products.

ISO 9001

ISO 9001 is the most complete model of the quality assurance system. The sentences of each item in ISO 9001 are entirely the same as those in ISO 9002, but two more elements of the quality system are added to its mandatory requirements. These two elements are design control and servicing and they are reflected in the title of the standard "Quality Systems - Model For Quality Assurance In Design, Development, Production, Installation and Servicing."

Conclusion

The above is the composition of the ISO 9000 series of standards. The point to which I wish to call your attention is that the purpose of the ISO 9000 series is not to standardize the quality system implemented by various companies. The fact that there are three mandatory standards does not mean that there are three kinds of excellent levels, but it means that the elements of the quality system are divided into three separate models based on the functions required of suppliers of products or services, or the capacity of the organization of companies.

It is known that from among the three mandatory standards one can be selected which satisfies the needs in almost all circumstances. it is also acceptable to eliminate some elements of the quality system required by the selected standard in some cases or add other elements in other case. For example, there are no reasons why you cannot supplement ISO 9002 by the items concerning servicing taken from ISO 9001. When elements of the quality system specified in the selected standard need amendments, it should be stipulated in the contract that an agreement is required between the purchaser and supplier.

What is ISO 9000?

The ISO 9000 series is an international standard for quality, published for the benefit of suppliers and purchasers.

It shows suppliers and manufacturers what is necessary for a quality-oriented (preferred) system. It does not give elite high-level requirements which very few enterprises can meet or need to meet, but a practical quality standard which all industries can apply.

The principle of ISO 9000 is applicable to any scale of enterpriese, whether it be a ten or ten thousand worker enterprise. It clarifies basically essential fields and defines procedures as well as gauges for products or services in conformance with customers' needs.

The application of ISO 9000 gives the enterprises the following practical merits; first, they can curtail expenditures because their procedures come to be surely rooted and more effective; second, they can satisfy clientele, because they can improve quality in all positions; third, they can avoid waste and reduce the time-consuming corrections of designs and procedures.

What is quality and how to we define it?

Quality has diverse meanings. In ISO 9000, its meaning is "to be suitable for purpose and, moreover, to be safe in use." In other words, the most important thing is whether the services satisfy the customers' needs, or whether the products are designed and assembled so as to meet them.

What are the constituent parts of ISO?

ISO 9000: Standard of quality control and quality assurance
----- Manual of selection and use.

ISO 9001: Quality system
----- Quality assurance model of design/development, production, installation and after-sales servicing.

ISO 9002: Quality system
----- Quality assurance model of production and installation.

ISO 9003: Quality syste
----- Quality assurance model of final inspection and test.

ISO 9004: Elements of quality control and quality system
----- Manual.

What is the purpose of using ISO 9000?

ISO 9000 describes how to establish, record and maintain an efficient quality system. By utilizing this system, the enterprises can show their customers that they are tackling the quality problems in order to supply products which meet their needs.

The standard of ISO 9000 is internationally approved, systematically documented and ordinarily practical. It is divided into sections, designed to enable producers to apply the standard easily and efficiently.

By applying ISO 9000, the following actual savings become possible: this totally consistent control of the enterprise system can streamline the production processes as well as save the time and resources (manpower, materials, equipment) required for the design's replanning and revision, and furthermore, the enterprise can keep complete records of every production step. These records are very valuable for the improvement of products and the production processes and, moreover, very important in case of claim for product liability.

Who uses ISO 9000?

The suppliers can apply ISO 9000 to establish their quality systems. Customers can specify that the quality of the products and services to be purchased be controlled by a management system based on ISO 9000. Customers and the third-party institutions can use ISO 9000 as a standard to evaluate the suppliers on their quality control systems and their ability to produce satisfactory products and services. Actually, this method is being used by many large-scale public purchasing institutions or authentic qualified third-party institutions for authentification. The enterprises evaluated on the ISO 9000 and listed on registers are given many direct benefits: inspection charge reduction, quality improvement, and effective use of scarce resources. An evaluated export enterprise has another advantage, i.e. if an evaluation certification is demanded from an overseas regulating authority, such a certification can be issued based on the ISO 9000 evaluation.

Who are responsible for the functions affecting quality?

(4.1 Management Responsibility)

The important qualifying condition to succeed in business is that the policy and purpose of the company are clear. The policy and purpose must include the quality, in other words, the needs of customers. The operations affecting quality must be controlled, and all the responsibilities of the persons conducting these operations clarified and designated. The persons who have received education and training must be placed in these operations in order to verify that they are correctly conducted.

A manager must be endowed with necessary authority and qualification, and he must be clearly entrusted with his work. The work of the manager is to adjust the quality system and supervise it, and furthermore, he should take effective measures to satisfy the requirements of ISO 9000.

Reviewing the quality system is an important task, and assessment of the result of internal quality audit must not be forgotten. A company must make plans for reviewing and adjusting

the quality system based on its results and experiences. When reviewing the system, the company must clarify defects and abnormal conditions, propose their improvement, check the effects of the management at all levels, and verify that the target and methods of the management have reached the ideal level. The merits which are obtained by these reviews are useful for actual applications, leading to the increase of profits of the company and the satisfaction of customers.

What are the necessary matters (matters to consider) to build up the quality system?

(4.2 Quality system)

To give what characteristics to the organization, structure, resources, responsibilities, procedures and processes of a company to what extent is a very important decision for the management to make, giving big effects to quality. It is important to express them in writing. By doing so those concerned can easily understand them, and consistent quality control at one level can be maintained by this quality system. The quality system must be planned and made by taking into consideration all other functions, such as contact with customers, production, purchasing, sub-contracts, education, training and installation. Concerning quality plan necessity to utilize the latest method for quality inspection must be clarified, and equipment and persons must be secured to implement the quality plan and proper records of quality must be kept.

How are the contract requirements confirmed?

(4.3 Contract review)

It is important to review a contract prior to starting operation. A company can protect itself by reviewing the contact requirements to confirm whether they are not different from the proposals made at the time of initial negotiations and whether the suppliers have resources to comply with the requirements. Reviewing of the contract is an activity, by which the necessity to make adjustments with customers may be found.

What design functions have to be controlled?

(4.4 Design control)

Company management must establish a department to plan design and development, and allocate there the qualified staff provided with appropriate resources (capacity and materials). They are also required to control interface among different departments and companies, put in writing the input requirements for designing and the output from designing based on the requirement and planning.

It is also necessary for company management to allocate capable persons so that the output from designs securely complies with the input requirements to them. Furthermore, all changes of designs must be controlled by the documented procedures. To undertake very carefully planned and documented control in every stage of company operation is the way of sensibly conducting business, and this enables smooth management of the entire processes from making design charts to shipping finished products, ensuring manufacture of products which can be safely used.

What system is required for control of documents and their subsequent amendments?

(4.5 Document Control)

A company must have a coordinated system in which all documents can be used in any places where they are required and amendments to these documents are approved by the persons

who have first approved them. The system must provided with not only the documents necessary to planning, designing, manufacturing and inspecting of products but the documented procedures indicating how to control each department and who controls what, where and when.

How are purchased products and services controlled?

(4.6 Purchasing)

Nothing is more important to manufacturers who are sensitive to quality than defects of purchased products. Once a company is confident that its subcontractors are satisfactory, the purchased products, services and data from them must be controlled by documentation and the purchased products and, when necessary, the quality system of suppliers must be inspected and confirmed.

When products are supplied by purchasers, how should they be controlled?

(4.7 Purchaser supplied product)

In some cases products may be owned by customers, and they are supplied to your company to satisfy contracts. Those products must be checked and confirmed whether they are satisfactory to meet the purposes. Furthermore, you are responsible for storing and handling them without damage. ISO 9000 provides guidelines in this matter.

Why are identification and traceability of products required?

(4.8 Identification and traceability of products)

Identification of each product or each lot of products is important to avoid confusion when there are many different kinds of products, their differences cannot be recognized visually, and different products are shipped to different customers.

Identification is particularly important for purchased products to be handed over to manufacture before the certification of conformity is obtained. When traceability is required on account of safety, by law or for other reasons, identification of products by documents enables suppliers to trace and recall nonconforming products or hazardous products delivered to customers.

What controls are required at the manufacturing department?

(4.9 Process control)

Manufacturing operations must be made in a well controlled state including documented operation instructions. orderly control is important in a factory. When some operations or processes have been excluded or left out from the control procedures of a company, there is a possibility that products below the level may be manufactured. Excellent operation instructions eliminate confusion. These operation instructions indicate what kind of work must be done or what kind or service must be supplied, giving authority and responsibility to workers. The requirements of all customers must be put in writing in a simple form, but the documents must be written in such detail as to show how work must be done and clarify necessary standards for operation and quality.

The operation procedures and instructions must include everything in the stages of manufacture, assembly and installation. ISO 9000 clearly mentions what must be included in operation instructions and requests that, for example, sufficient control over the special processes of

welding, forging or heat treatment must be made. Manufacturing operation incorrectly applied is liable to cause big damage to a factory. The regulations of ISO 9000 are made to prevent costly mistakes.

What are necessary for inspections and tests?

(4.10 Inspections and tests)

Inspections and tests are performed on incoming goods, and products for the purposes, such as controlling their manufacturing processes, assuring compliance with the requirements of quality features, confirming implementation of all the specified inspections and tests of receiving and manufacturing in the stage of finished products, and certifying compliance with all the requirements.

It is necessary at receiving inspection to check a certificate of conformity attached to the product. The procedures for inspections and tests must include their methods, persons who conduct them, accuracy and appropriateness of test equipment, and completeness and accuracy of recorded data.

What controls are necessary to inspection, measuring and test equipment?

(4.11 Inspection, measuring and test instrument)

When a company wishes to certify correctly that their products comply with the requirements specified by customers, it must be equipped with inspection, measuring and test instruments and control, calibrate and maintain them.

What is important is that the state of calibration of these instruments is traceable to the national standards, they maintain necessary accuracy, and their accuracy is consistent with the capacity required to measure the products. The procedures and records required to control the equipment are also necessary.

What should be the state of inspection of products in the manufacturing processes?

(4.12 State of inspections and test)

A company must set up a system to identify the state of inspection of products in all the manufacturing stages. The documented control procedures are necessary, and by preparing them it becomes possible to easily classify the products into those not yet inspected, inspected and approved or inspected and rejected in every stage. The procedures must include approval records made by inspectors who allow deliveries of accepted products to the next step, assembly or shipment.

What control is necessary to rejected products?

(4.13 Control of nonconforming products)

All non-conforming products must be clearly identified so that they may not be used, shipped or mixed with acceptable products. Documents must be kept indicating the name of a product, quantity, the nature of rejection, its extent, the authority and decision to review the treatment of a rejected product and how it must be disposed of. These copies must be distributed to positions concerned to take corrective measures and records.

How can be causes of defects be corrected?

(4.14 Corrective action)

Quick and effective corrective actions are necessary for the quality system of a company. It is not enough to separate defective products. The causes must be studied and identified. Incorrect operation methods or negligence to follow operation instruction can be causes of rejection in many cases. Poor designs and defective specifications also cause rejection. When defects are found, poor designs, specifications and operation methods must be corrected. The scope of quality control must cover services, parts, materials and products supplied by sub-contractors.

What procedures are necessary to protect and maintain the quality of products?

(4.15 Handling, storage, packaging and delivery)

Handling and storage of materials, parts and and finished products are important parts of the quality system. The documented instructions and procedures must specify how products should be handled in the processes, how they should be protected. When products are moved within a factory, measures must be taken so that products of unknown quality or products of different quality may not be mixed up with similar products. No products must be stained, precision parts protected appropriately, and no products left out from operations and inspections. When the traceability of products is required, it is important to protect the quality of products and make the proper identification of products for preservation.

What records are necessary?

(4.16 Quality records)

Records are objective evidence to prove that a company complies with the quality requirements of customers, and they must include audit reports of the quality assurance system, the results of inspections and tests, the calibration of test and measuring instruments, their approval, special adoption and corrective measures. As it is very important that the records are easily accessible, a company must have efficient storing and indexing systems.

How should the quality system be effectively maintained, once it is made?

(4.17 Internal quality audits)

company management must supervise the total functions of the quality system by assessing the results of its internal quality audit. The internal quality audit must be conducted in accordance with the documented procedures to confirm that quality activities are conducted as specified by the plan. The internal quality audit reveals potentially dangerous points in the quality system and eliminates wasteful activities, and it can be used to confirm that corrective measures taken by persons responsible for these activities are effective.

Are education and training necessary?

(4.18 Education and training)

Education and training are necessary methods to the quality system of a company, and persons concerned with quality must receive correct education and training for successful operation of the company. For this it is necessary to clarify operation requiring the acquisition of technique and to implement education and training necessary to such operations. If it is desirable

that the persons should be qualified, such qualification should be verified by tests or authorization papers of the company or some certified outside organizations. Records of education and performance must be kept.

How should after-sales servicing be controlled?

(4.19 Servicing)

Methods to conduct servicing differ a great deal among suppliers, distributors and users. When servicing is made in the standardized manner by contracts or it is made at request, suppliers must make the procedures for controlling and securing the quality of service to be made.

What statistical procedures are taken?

(4.20 Statistical technique)

The statistical technique should include the method for establishing the process capacity, the method for identifying lots, the method for classifying special features, the method for selecting samples, criteria of accept/reject, standards for adjusting severity of tests, separation of rejected lots and the standard for separation.

3. IECEE

What is the IECEE?

The System for Conformity Testing to IEC Standards for Safety of Electrical Equipment (IECEE) is a system established to promote international trade of electrical products. The aim of the IECEE is to simplify the procedures for certification in the member countries by mutually recognizing the test results of each member country. The IECEE is the only organization conducting certification work concerning the safety of electrical products on the global scale. Testing of electrical products is made in accordance with the IEC standards which are international standards. Of the IEC member countries 35 countries participate in the IECEE at present.

How does the IECEE work?

The IECEE operates a scheme for the recognition of testing to standards for safety of electrical equipment (CB Scheme) administered by the Committee of Certification Bodies (CCB). The day-to-day matters are handled by the CCB Secretariat.

The principle of the scheme is that a manufacturer can obtain a CB Test Certificate together with the test report for a defined product indicating that it has been tested and found to conform to relevant IEC standards. The manufacturer can then present this certificate accompanied by the test report to the NCB's in other countries where he wants to have his product certified.(*)

The Committee of Testing Laboratories (CTL) provides the forum in which practical testing problems are demonstrated and discussed. The CTL further details the way in which the tests have to be carried out to achieve the necessary reproducibility, harmonizes the design and use of test equipment and recommends improvement of standards to the IEC Technical Committees.

(*) For further details, see Publication IECEE 02, "Rules and Procedures of the CB Scheme", available from NCB's and the IEC Central Office.

And now ... the benefits

If you manufacture equipment for export:

- You can save time and expense by not having to go through the repeated process of conformity testing for each national market. Generally the product only needs to be tested once against international standards in order to obtain the necessary national certification in various countries (provided there are no differences or additional procedures at national level).
- In many countries you can have your electrical equipment for export markets tested for conformity to international standards for safety at the Testing Laboratory in your home country. If this is not the case a somewhat different procedure has to be followed.
- Your equipment will be included in the "List of CB Test Certificates", where new certificates are published each year.

If you import equipment wholesale:

- You can procure equipment conforming to international safety standards from manufacturers in many countries in the world.
- You only have to go once through tne process of conformity testing to international safety standards.
- You save time by having to have additional tests made only for national deviations from the relevant international safety standard. This can even be done at the first testing.

How to profit from the scheme:

Equipment exporter: To have your equipment tested for conformity to standards for safety, manufacturers in participating countries should contact either the NCB in their own country or any other participating NCB. Manufacturers in non-participating counties should contact the Secretariat of the IECEE.CCB.

Equipment importer: To find out which equipment are recently type-tested successfully and where it is available, consult the relevant regularly published CB Bulletin, available from your NCB, the CCB Secretariat or the IECEE Secretariat at the IEC Central Office.

Which equipment is featured in the IECEE?

The system is applicable to electrical equipment used in homes, offices, workshops and similar locations.

The scheme covers safety-related standards for the following categories of equipment:

- Electronic entertainment equipment
- Cables and cords
- Lighting equipment
- Household and similar electrical appliances

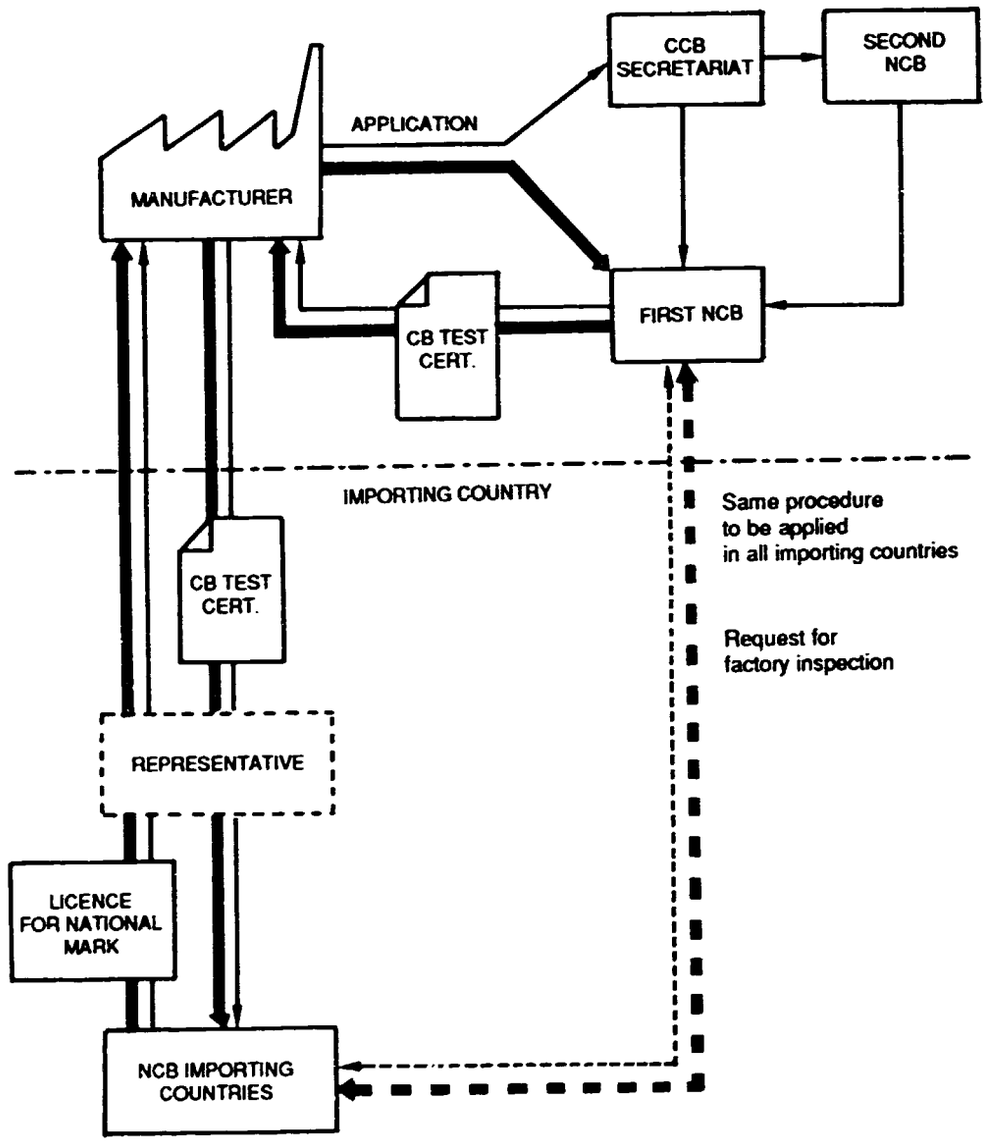
- Portable power tools
- Accessories, including components for appliances
- Protective equipment for installation, including fuses and fuse-holders
- Transformers
- Office machines and IT equipment
- Electromedical equipment.

Whom to contact for a CB test certificate?

A current list of names and addresses of participating NCB's is enclosed. In this list you will also find the address of the CCB Secretariat.

Further details concerning the CB Scheme can be obtained from any NCB or from the CCB Secretariat.

Flow in the CB scheme



Flow for applications from manufacturers in participating countries (Procedure II)

Flow for applications from manufacturers in non-participating countries (Procedure I)

4. Reference

Committee of Certification Bodies

Chairman: Dr A. Balossi Restelli
IMQ
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Teletex: 2401-8126725=SEKelnorm

List of National Certification Bodies

The telephone numbers given by the NCBs for the information sheets and for this list may be different in some cases. This is due to wishes that the client should use certain direct internal dialling numbers for application matters.

Country	National Certification Body
AT, Austria	Österreichischer Verband für Elektrotechnik (ÖVE) Eschenbachgasse 9 A-1010 WIEN Telephone: +43 (222) 587 63 73 Teletex: 3222603 (OEVE) Telefax: +43 (222) 567 408
AU, Australia	Standards Australia Standards House 80 Arthur Street P.O. Box 458 NORTH SYDNEY SNW 2059 Telephone: +61 (2) 963 4111 Telex: aa 26514 astan Telefax: +61 (2) 959 3896
BE, Belgium	Comité Electrotechnique Belge (CEBEC) Rodestraat 125 B-1630 LINKEBEEK Telephone: +32 (2) 380 85 20 Telex: 62834 (CEBEC B) Telefax: +32 (2) 380 61 33

Country	National Certification Body
CH, Switzerland	Schweizerischer Elektrotechnischer Verein (SEV) Prüfstelle Zurich (P-ZH) Postfach CH-8034 ZÜRICH Telephone: +41 (1) 384 91 11 Telex: 81 74 31 (SEV CH) Telefax: +41 (1) 55 14 26
CN, P.R. CHINA	China Commission for Conformity Certification of Electrical Equipment (CCEE), Office: 1106 2 Shou Ti Nan Lu 100044 BEIJING Telephone: +84 (1) 832 00 88 Ext. 2659 or 2662 Telex: 222295 RIMST CN Telefax: +86 (1) 832 08 25
CS, Czechoslovakia	Elektrotechnicky zkusebni ustav Post Office 71 CS-171 02 PRAHA 8 – TROJA Telephone: +42 (2) 84 06 41 Telex: 122880 (EZU C) Telefax: +42 (2) 84 00 84
DE, Germany	VDE-Prüfstelle Merianstrasse 28 D-6050 OFFENBACH (MAIN) Telephone: +49 (69) 83 06 222 Telex: 4152796 (VDEP D) Telefax: +49 (69) 83 06-555
DK, Denmark	DEMKO Lyskaer 8 Postbox 514 DK-2730 HERLEV Telephone: +45 (42) 94 72 66 Telex: 35125 (DEMKO DK) Telefax: +45 (42) 94 72 61
ES, Spain	Asociacion Electrotécnica y Electronica Espanola (AEE) Fransisco Gervas 3 E-28020 MADRID Telephone: +34 (1) 616 00 18 Telex: 48476 (IAAS E) Telefax: +34 (1) 616 23 72

Country	National Certification Body
FI, Finland	Electrical Inspectorate Särkiniementie 3 P.O. Box 21 SF-00210 HELSINKI 21 Telephone: +358 (0) 696 31 Telex: 122877 (SETI SF) Telefax: +358 (0) 69 2 54 74
FR, France	Union Technique de l'Électricité (U T E) Cedex 64 F-92052 PARIS LA DÉFENSE Telephone: +33 (1) 46 91 11 11 Telex: 620816 (CEFUTE F) Telefax: +33 (1) 47 89 45 87
GB, United Kingdom	British Electrotechnical Committee British Standards Institution 2 Park Street LONDON WIA 2BS Telephone: +44 (71) 629 90 00 Telex: 266933 (BSILON G) Telefax: +44 (71) 629 05 06 Authority for the certification of equipment in their areas of responsibility is vested in the following National Certification Bodies: 1) ASTA Certification Services Prudential Chambers 23/24 Market Place RUGBY CV21 3DU Telephone: +44 (788) 578 435 Telex: 311794 (CHACOM G) Telefax: +44 (788) 573 605 2) BEAB, British Electrotechnical Approvals Board Mark House, The Green 9/11 Queens's Road, Hersham WALTON-ON-THAMES Surrey, KT12 5NA Telephone: +44 (932) 24 44 01 Telex: 8812027 (BEAB G) Telefax: +44 (932) 22 66 03 3) BSI, Quality Assurance Certification and Assessment P.O. Box 375 MILTON KEYNES MK14 6LL Telephone: +44 (908) 22 09 08 Telex: 827682 (BSI QAS G) Telefax: +44 (908) 22 06 71

Country	National Certification Body
GR. Greece	The Hellenic Organization for Standardization (ELOT) 313, Acharnon St. GR-111 45 ATHENS Telephone: +30 (1) 201 50 25 Telex: 219621 (ELOT GR) 219670 (ELOT GR) Telefax: +30 (1) 202 07 76 30 (1) 202 59 17
HU, Hungary	Hungarian Institute for Testing Electrical Equipment (MEEI) Váci ut 48/a-b Pf441 H-1395 BUDAPEST XIII Telephone: +36 (1) 149 55 61 Telex: 224931 (MEEI H) Telefax: +36 (1) 129 06 84
IE, Ireland	The National Standards Authority of Ireland (NSAI) EOLAS, The Irish Science and Technology Agency Ballymun Road DUBLIN 9 Telephone: +353 (1) 37 01 01 Telex: 32501 (IIRS EI) Telefax: +353 (1) 36 98 21
IL, Israel	The Standards Institution of Israel (S.I.I.) 42 Chaim Levanon Str. IL-TEL-AVIV 69977 Telephone: +972 (3) 545 41 71 / 2 Telex: 35508 (SIIT IL) Telefax: +972 (3) 541 56 54
IT, Italy	Istituto Italiano del Marchio di Qualitá, IMQ Via Quintiliano, 43 I-20138 MILANO Telephone: +39 (2) 5073 1 Telex: 310494 (IMQ I) Telefax: +39 (2) 5073 271
JP, Japan	IECEE Council of Japan c/o JMI Institute 9-15, Akasaka 1-chome, Minato-ku TOKYO, 107 Telephone: +813 3583 4136 Telex: — Telefax: +813 3583 4137

Country	National Certification Body
KR. Rep. of Korea	IECEE Council of Korea (Rep. of) Korea Academy of Industrial Technology (KAITECH) 222-13 Guro-Dong, Guro-ku 152-650 SEOUL Telephone +82 (2) 860 1114 Telex: K28456 (FINCEN) Telefax: +82 (2) 860 1465
NL. Netherlands	KEMA, LTI Utrechtseweg 310 P.O. Box 9035 NL-6800 ET ARNHEM Telephone: +31 (85) 56 28 62 Telex: 75132 (KLTI NL) Telefax: +31 (85) 51 49 22
NO, Norway	NEMKO Gaustadalleen 30 P.O. Box 73, Blindern N-0314 OSLO 3 Telephone: +47 (2) 69 19 50 Teletex: 18 12 88 (NEMKO N) Telefax: +47 (2) 69 86 36
PL, Poland	CBJW, Central Office for Quality of Product ul. Swietokrzyska 14B PL-00-050 WARSZAWA Telephone: +48 (22) 27 70 71 or +48 (22) 26 67 65 Telex: 816186 (ZNAK PL) Telefax: +48 (22) 26 67 65
SE, Sweden	SEMKO AB Torshamnsgatan 43, Kista Box 1103 S-164 22 KISTA-STOCKHOLM Telephone: +46 (8) 750 00 00 Teletex: 2401-8126010=SEMKO Telefax: +46 (8) 750 60 30
SU, USSR	GOSSTANDART Leninsky pr. 9 117049 MOSCOW U.S.S.R. Telephone: +7 (95) 236 40 44 Telex: 411378 GOST SU

Country	National Certification Body
YU, Yugoslavia	Federal Institution for Standardization Department of Quality and Certification Slobodana Penezica Krcuna 35 YU-11000 BELGRADE Telephone: +38 (11) 64 40 66 Telex: 12089 YUS YU Telefax: +38 (11) 23 51 036

3rd day

– PANEL DISCUSSION –

Competing in the World Market

Leader

Mr. Akio Hayashi	Director for International Standardization Affairs, Standards Department, AIST, MITI.

Panelists

Mr. Chikafumi Morita	Director of Quality Assurance Center, JMI Institute
Mr. C.M. Achuthan	Senior Manager of Quality Assurance Department, Hitachi Semiconductor Malaysia Sdn. Bhd.
Ms. Magdalena Fajardo Savarain	Chief of Basic Technologies Unit, UNIDO
Mr. Lam Teng Chee	Director of Standards Division, SIRIM

A Malaysian Expert and an Asean Expert are scheduled to participate.

SEMINAR ON

ACHIEVING COMPETITIVE QUALITY THROUGH STANDARDIZATION AND QUALITY CONTROL

"SEMINAR FOR TOP MANAGEMENT"

Sponsored by
United Nations Industrial Development Organization (UNIDO)
and
Ministry of International Trade and Industry (MITI), Japan

Hosted by
Standards and Industrial Research Institute of Malaysia (SIRIM)

Organized by
Japanese Standards Association (JSA)

29th October 1991
The Regent of Kuala Lumpur

Top Seminar
Oct. 29, 1991

"QUALITY – The Key to Success"

by Yoshihito Shirai
Managing Director,
Hitachi Semiconductor Malaysia Sdn. Bhd.

"QUALITY – The Key to Success"

1. WHAT IS 'QUALITY'?

   NARROW SENSE ... ABILITY, FUNCTION, SPAN OF LIFE, EXTERNAL APPEARANCE, DESIGN, OPERATIONAL EFFICIENCY, MAINTAINABILITY, RELIABILITY, SAFETY, DOCUMENTS SUCH AS OPERATIONAL INSTRUCTION

   WIDE SENSE ..... STRENGTH OF COMPANY CONSTITUTION (EX. --- TURN AROUND TIME FOR DELIVERY, QUICK RESPONSE, ADHERENCE TO CUSTOMER)

2. RESOURCES FOR QUALITY

   MAN ..... EMPLOYEES ..... '人'

   THING ..... PRODUCTION EQUIPMENT ..... '物'

   MONEY ..... INVESTMENT ..... '金'

3. 'CUSTOMER ALWAYS COMES FIRST

   HOW TO ADHERE TO CUSTOMER'S REQUEST

4. WHAT DIFFERENCE BETWEEN 'QUALITY CONTROL' AND 'QUALITY ASSURANCE'?

5. QUALITY ORGANIZATION IN COMPANY ····· WHO IS RESPONSIBLE FOR QUALITY?

6. ENLIGHTENMENT OF QUALITY AWARENESS

7. TOOLS FOR QUALITY CONTROL / ASSURANCE

8. AWARENESS OF REALITY ····· WHAT HAPPENS OR HAPPENED ON THE ACTUAL SPOT?

9. LEADERSHIP OF THE MANAGEMENT SIDE

Top Seminar
Oct. 29, 1991

QUALITY CONTROL IN MANUFACTURING

– JAPANESE APPROACH –

by C. M. Achuthan
Senior Manager of Quality Assurance
Department,
Hitachi Semiconductor Malaysia Sdn. Bhd.

ABSTRACT

This paper describe the "Quality Control" practices in Manufacturing, with special focus on "Japanese Approach". Emphasis on this paper is on "Controls" to reduce "deficiencies" during manufacturing. Experiences are drawn from the actual practices from Hitachi Semiconductor (Malaysia) Sdn. Bhd., (HISEM) a joint venture enterprise between Hitachi Ltd. and Malaysian government located in Penang and its subsidiary, Hitachi Semiconductor (Kedah) Sdn. Bhd. (HISAH) located in "KEDAH". Even though this paper touches mainly on "Process Control" oriented approach to "Quality", modern concept of "Quality Control" where "Quality" is "built in design" has been mentioned. Finally suggestions to Malaysian local industrialists on how to promote "Quality" efficiently in their organisation has been presented.

INTRODUCTION

Ever since the Manufacturing Companies slowly started shifting their operations from Japan, Europe and United States to South East Asia, there has been lot of deliberations and apprehensions about the quality level of the product that South East Asian market can produce. Each multinational corporation brought their own concepts of "Building Quality" and tried to indoctrinate their local staff with their ideas from the corporate. During this period there was lot of focus on "Japanese Approach" to Quality, because of the dominating effect of Japanese product in the world market. Some of these ideas were borrowed even by their western counterparts in the West but because of the cultural difference between Japan and the West, implementation of those ideas were not initially successful, even though lately it has shown that "culture" is not a barrier. Malaysians being an "adaptive society" has been able to adopt "Japanese Approach" without much difficulty. It has been reported recently that awareness towards "Quality" in south East Asia has been very strong in the recent years because of the migration of multinational corporations towards South East Asia. However "Research and Development" (R & D) function still remain to a large extent in their parent plants in Japan or in the West. Taking into consideration the neccesity to be in close proximity to the customer and to have a closed loop between market research, sales, design and manufacturing function, many of the companies are slowly shifting their R & D" functions to South East Asia. In promoting "Quality" in local industries in Malaysia and guiding them towards the Vision-2020 goals, the Joint-Venture Corporations in Malaysia should be able to play a substantial role.

CONTENT

1. WHAT IS QUALITY?

Quality has been defined in many ways by famous experts. Many of the definitions give elaborate explanation of what **Quality** is, while others give it a *"Philosophical Touch"*. Most important point for us to recognise is what "**Quality**" meant in the "old" days and what "**Quality**" means in the "*Modern*" age.

a) Old Definition Of Quality

Quality = Conformance to Specification

b) Modern Definition Of Quality

Quality = Fitness For Use

"USER" DECIDE THE "FITNESS".

c) Fitness For Use

"Fitness For Use" is decided by the customer and not by the Manufacturer.

"Fitness For Use", means not only that the product performs its basic function but also that the product has special features that the customer is looking for. To satisfy the latter aspect, market research should be carried out by the enterprise before designing the product, to see what the customer's needs are. For example a "VTR" which functions very well in a country where the electrical voltage fluctuations are minimal might not function at all in a country where voltage fluctuations are large. If you want to penetrate into that market, "VTR" should be designed in such a way as to cater for the large voltage fluctuations. However as far as the former aspect is concerned **if the product cannot perform its basic function then we say that there is a "Non-Conformance".**

The biggest challenge that the manufacturer face is always, whether any amount of "Non-Conformance" is acceptable to the customer, and if so what is that level. **No customer in this world want a "Non-Conforming" product.**

The Japanese approach have been to minimise the non-conformance level to almost zero at the same time tailoring their product to the customer's needs. However the "moral is that whoever comes into the global market first with low price and high reliability sets the standard for others". But does the standard remain there? The answer is "no". This is where many **enterprises have failed, that is, assuming "Quality is a static figure.** Enterprises that have succeeded have always seen **"Quality", as a moving target and has embarked upon "continuous improvement" plan.**

2. BASIC ACTIVITIES UNDER "QUALITY SYSTEM" IN A MANUFACTURING INDUSTRY

1. INCOMING INSPECTION

Include approval of vendors and subsequent development of vendor's quality.

2. PROCESS CONTROL

Include standardisation of process, machine parameters, parts specification, training plan of operators and overall quality plan identifying quality monitors.
Abnormality control.
Concept of cleanliness.

3. REDUCTION OF DEFECTS

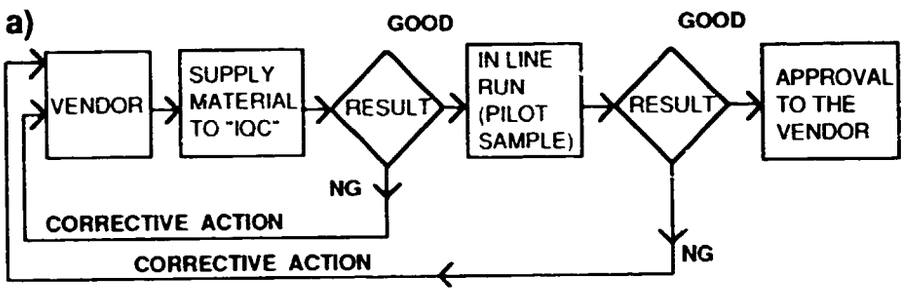
Long Term Improvement Plan.
Small Group Activity.

NOTE:(1)

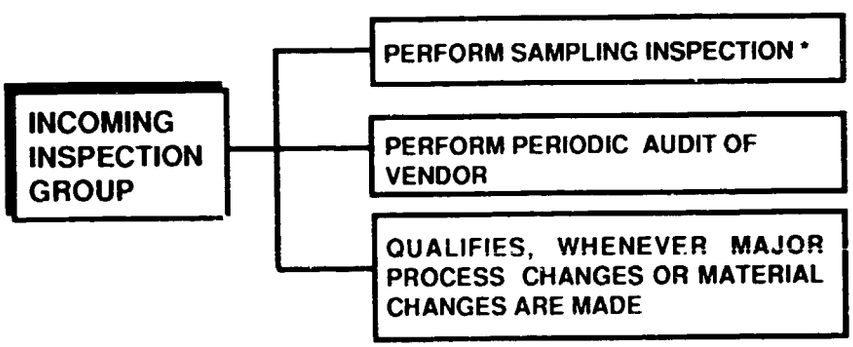
ISO-9000 series of standards gives a more comprehensive list of "Quality elements" required to be satisfied, if compliance to ISO-9001/ISO-9002/ISO-9003 is sought. It is given in Appendix I.

2-1. INCOMING INSPECTION OF MATERIAL

a)



b) **Once Approved, Routine Activity Include**



KEY POINTS TO REMEMBER

1. Modern concept is "Vendor Co-operation" and not "Vendor Confrontation". **Customer help the "Vendor" to build up their quality.**
2. Purchasing must get parts only from approved vendors.

NOTE:-*

If parts are used in complex systems, sometimes 100% inspection is performed. **But the modern concept is to do away with Incoming Inspection.**

2-2. PROCESS CONTROL

One of the most important aspect in manufacturing industries is "Process Control". **Because if processes are not controlled, final outgoing quality cannot be assured.**

2-2-1. Standardisation

Process Control and standardisation goes hand in hand, because **without standardisation there is no control at all.**

Make sure the following elements are standardised.

PROCESS: *Process specifications, operating procedures, testing and inspection procedures.*

MAN: *Operating instructions, training manual.*

MATERIALS: *Purchase specification of parts, drawings.*

MACHINE: *Machine condition setting, preventitive maintenance system, calibration procedures.*

KEY POINTS TO REMEMBER:

1. **Do not make standards which are difficult to follow.** Because human tendency is to ignore "Standards or Procedures" which are difficult to comply with. If Compliance to such strict standards are essential, **then improve the process.**
2. Whenever processes/procedures are changed, standards should be renewed.
3. Even if there are no major changes, standards must still be reviewed periodically to ensure that it is in line with the latest technology.

2-2-2. Concept of Cleanliness ("5S" Concept)

BASIC PRINCIPLES OF CLEANLINESS ("5S")

SEIRI	**DISCARDING UNNECCESARY ITEMS.**
SEITON	**ARRANGE IN GOOD ORDER.**
SEISO	**SWEEPING AND CLEANING.**
SEIKETSU	**KEEPING NEAT AND TIDY.**
SHITSUKE	**WORK ETHICS AND DISCIPLINE**

CONCEPTS OF 5S

"5S" focuses on keeping not only one's work area but also **ONESELF**, clean and tidy at all times.

Inculcate good habits of "5S" spirit by:

- Practising "5S" spirit consistently.
- Be considerate of others.
- Influence others to do so.

SEIRI

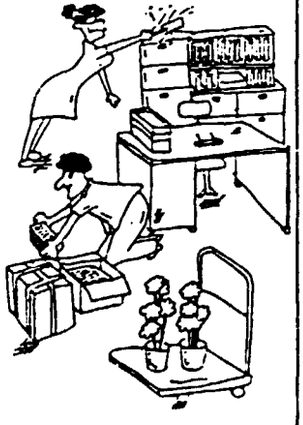
- Sort out and discard all unnecessary items

SEITON

- Arrange the rest in proper order for easy access

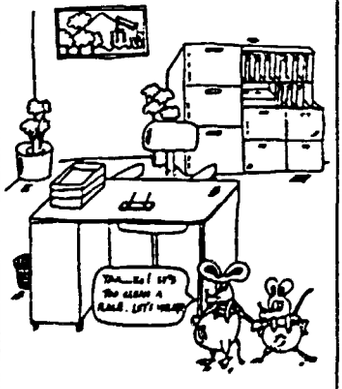
SEISO

- Clean up the work place thoroughly



SEIKETSU

- Maintain a neat and clean working environment



SHITSUKE

- Cultivate proper work ethics and maintain good discipline

GUIDE LINE FOR GOOD HOUSEKEEPING

(Checklist prepared by Hitachi Semiconductor (Kedah) - HISAH, For "5S" check)

GOOD QUALITY BEGINS WITH GOOD HOUSEKEEPING

(1) BASIC PRINCIPLE (- 5S -)

1.1 SEIRI	Discarding
1.2 SEITON	Arrange in good order
1.3 SEISO	Sweeping and cleaning
1.4 SEIKETSU	Keeping neat and tidy
1.5 SHITSUKE	Working discipline

(2) CHECK POINTS

AREA	KEYPOINT	CHECK
1. CORRIDOR	1.1 Define walking paths. 1.2 Do not place anything on the path, even temporarily. 1.3 Walking paths are meant strictly for human transport and transportation of products/materials only. 1.4 Always keep right while walking.	
2. ENTRANCE EXIT	2.1 All entrances/exits are to be clearly indicated. Always follow keep right policy. 2.2 All doors should be able to open ajar. No obstacle should be placed near any door. 2.3 Use the door handle to open/close a door. Do not touch the glass panel.	
3. FLOOR/WALL, CEILING/ DOORS, ETC.	3.1 All damages must be repaired immediately. 3.2 All stains must be cleaned instantly. 3.3 Discard all unwanted items, e.g. screws, tapes, nuts, solder droppings, etc.	
4. MEETING ROOMS	4.1 Erase all writings on the board prior to leaving. 4.2 Ensure OPC is practised. 4.3 Check that nothing is left behind (e.g. paper, microscope, frames, defects, etc.) 4.4 Switch off the lights and air-condition if possible.	
5. PIPING, WIRING	5.1 Tidy up all wirings. Only just enough lengths are to be exposed. Wires should not be lying on the ground. All wires must only travel horizontally, vertically or parallel to walls. 5.2 All pipings must be properly indicated, e.g. N2, electrical, water, hot water and direction of flow should also be indicated. 5.3 Standardise colour of piping, trunking, etc.	

AREA	KEYPOINT	CHECK
6. ARRANGE-MENT OF GOODS	6.1 Every item must have a proper place where it belongs. 6.2 All storage place must be well defined. They should be parallel or perpendicular to the wall. 6.3 Do not lean any product against wall or pillars. 6.4 Do not place anything on top of shelf, cabinet, etc. 6.5 Ensure that products/goods do not have any potential of falling off. If there is such a possibility, please take action before it happens. 6.6 Set the maximum storage quantity allowed, e.g. how many lots are allowed. 6.7 Do not place anything that may block any fire extinguisher, fire break glass, electrical panels, etc. 6.8 Do not hide anything at the back or below any machine, desk, cabinet, etc. 6.9 Take special care when storing fragile/dangerous goods. 6.10 If a machine has wheels, please secure them firmly. 6.11 All machines/desks, etc. must be arranged in a straight line, perpendicular or parallel to one another.	
7. OUR WORKING TABLE	7.1 Working table must not be flooded with files, notes while working. 7.2 All unrelated things must be put aside neatly. 7.3 When leave your working place, please practise OPC. 7.4 Ensure that you are smartly dressed at all times, e.g. do not leave any overall unbuttoned, ensure that mouth piece covers the nose, etc. 7.5 Any piece of paper pinned up on notice board must have 4 pins stucked to the 4 corners and they must be horizontal or vertical. 7.6 Before going back, ensure that no documents/files are left on the table. Ensure that all items are placed neatly where they belong. 7.7 Keep all overalls, jackets inside drawer before leaving.	
8. GENERAL	8.1 All fabricated cabinets and shelves must be of standardised height. 8.2 Do not leave any unnecessary items lying around. 8.3 Do not place anything on the floor directly. 8.4 Do not expose any sharp edge. 8.5 Clearly indicate status of machine, whether operational, trouble, under repair, maintenance, set-up, etc. 8.6 Store things which are only required occasionally away from production area 8.7 After finishing work, put back all items in their designated places. 8.8 Check storage cabinets regularly to ensure things stored inside are neat, tidy and safe 8.9 Indicate clearly the person responsible (e.g. cabinet, electrical panel, etc.) 8.10 All moving objects should have bumpers to avoid scratching the wall and machine surfaces. 8.11 No cellophane tapes are to be used on machines 8.12 All personnel must clean their working place when safety/ cleanliness song is played. 8.13 All OPS and O.I. must be laminated.	

REMARKS : *Please use the above checklist to check your own area of responsibility to make "Hisah "a cleaner, safer and healthier place for manufacturing high quality products.*

AREA COVERED	CHECKED WITH PRIDE BY	DATE

2-2-3. Corrective Action

To what depth you analyse a Quality problem, decide the outcome of corrective action. If investigation is **"Superficial"**, the corrective action also become **"Superficial"**. Corrective action should be aimed at **"Prevention Against Recurrence"** ["PAR"] instead of **"Immediate Remedy"** ["IR"], alone.

"Immediate Remedy" is also required, but corrective action should not stop at that point. But before you perform corrective action, make sure of the following.

1) To observe the failure in detail.

2) To observe the line or process where the failure occured, in detail.

3) To solve the problem with a practical approach suitable to the manufacturing line.

(In "HITACHI", we call it "SANGEN-SHUGI", "GEN PHIN", "GEN BA", "GEN JITSU").

Finally, perform corrective action using the "Seven Tools of Problem Solving" or other-wise known as "QC Story".

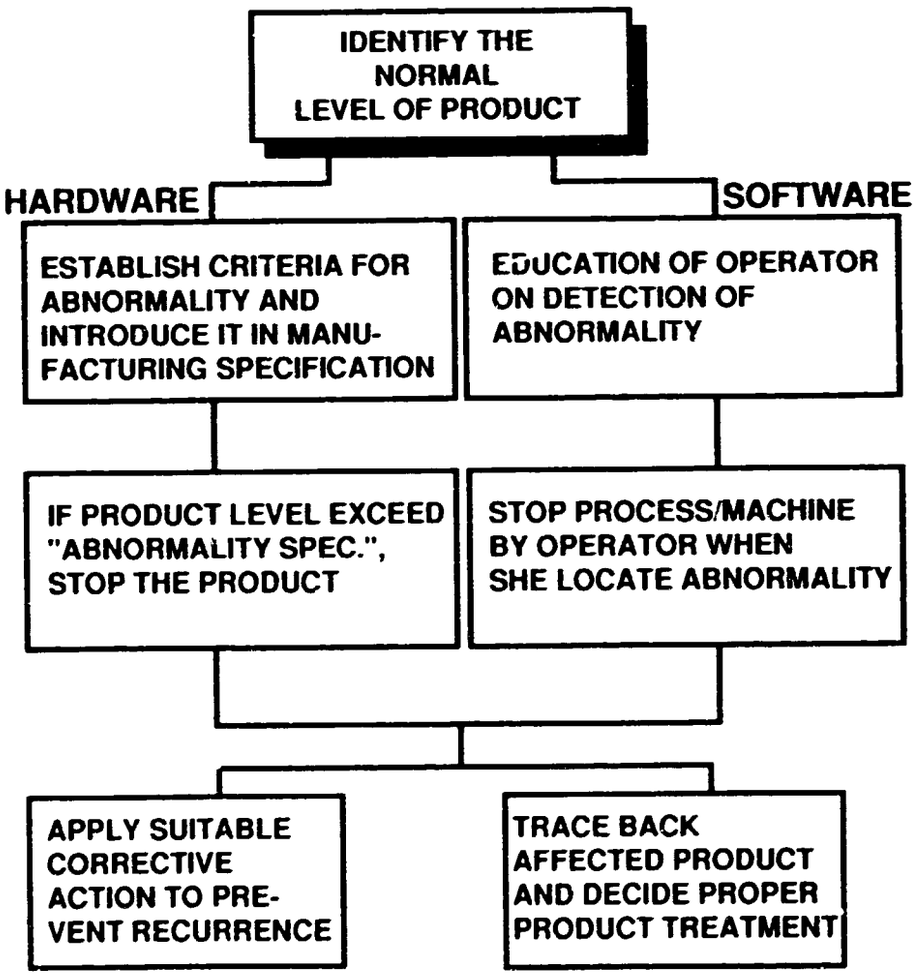
Problem Solving and Corrective Action

SEVEN STEPS OF PROBLEM SOLVING (QC-STORY)

NO.	ITEM	IMPORTANT POINTS TO NOTE
1.	**IDENTIFICATION**	Recognise the "Gravity" of the problem and **background** of the problem. Set up a schedule for improvement.
2.	**OBSERVATION**	**Go to the site to study the actual situation** and collect necessary information.
3.	**ANALYSIS**	Set up hypothesis, test hypothesis, **do experiments to simulate actual situation.**
4.	**ACTION**	Distinguish between "Immediate Remedial Action" and "Prevention Against Recurrence". Ensure that action do not produce side effect.
5.	**CHECK**	Compare data obtained both **before and after corrective action** and check it against the target set.
6.	**STANDARDISATION**	**Standardise the new procedures, new process conditions** which has brought forth the expected result.
7.	**CONCLUSION**	Summarise the remaining problems and make plans to improve them. Reflect on the weaknesses which was noticed during the problem solving.

2-2-4. Abnormality Control

ESTABLISHMENT OF ABNORMALITY DETECTION



2-3. REDUCTION OF DEFECTS

2-3-1. How To Make a Long Term Improvement Plan

1. Find out the existing status (in terms of defectives, or lot rejection percentage, or number of "Non-Conformances").

2. Set a target, which you want to achieve within a stipulated period of time.

3. Draw up an action plan to achieve the target. (Make sure relevant departments are involved in drawing up the plan, so that once the plan is going to be implemented there is already a consensus and committment).

4. Follow up the action plan periodically, **the level of implementation, and level of achievement.** If **Level of Achievement** is not followed up, you might have a situation where all the action plans have been implemented, but target has not been achieved.

5. Even after the target has been achieved, continue to monitor the "Achievement", for a longer period of time.

2-3-2. HISEM Small Group Activities

1. PHILOSOPHY

1.1 FUNDAMENTAL CREDO

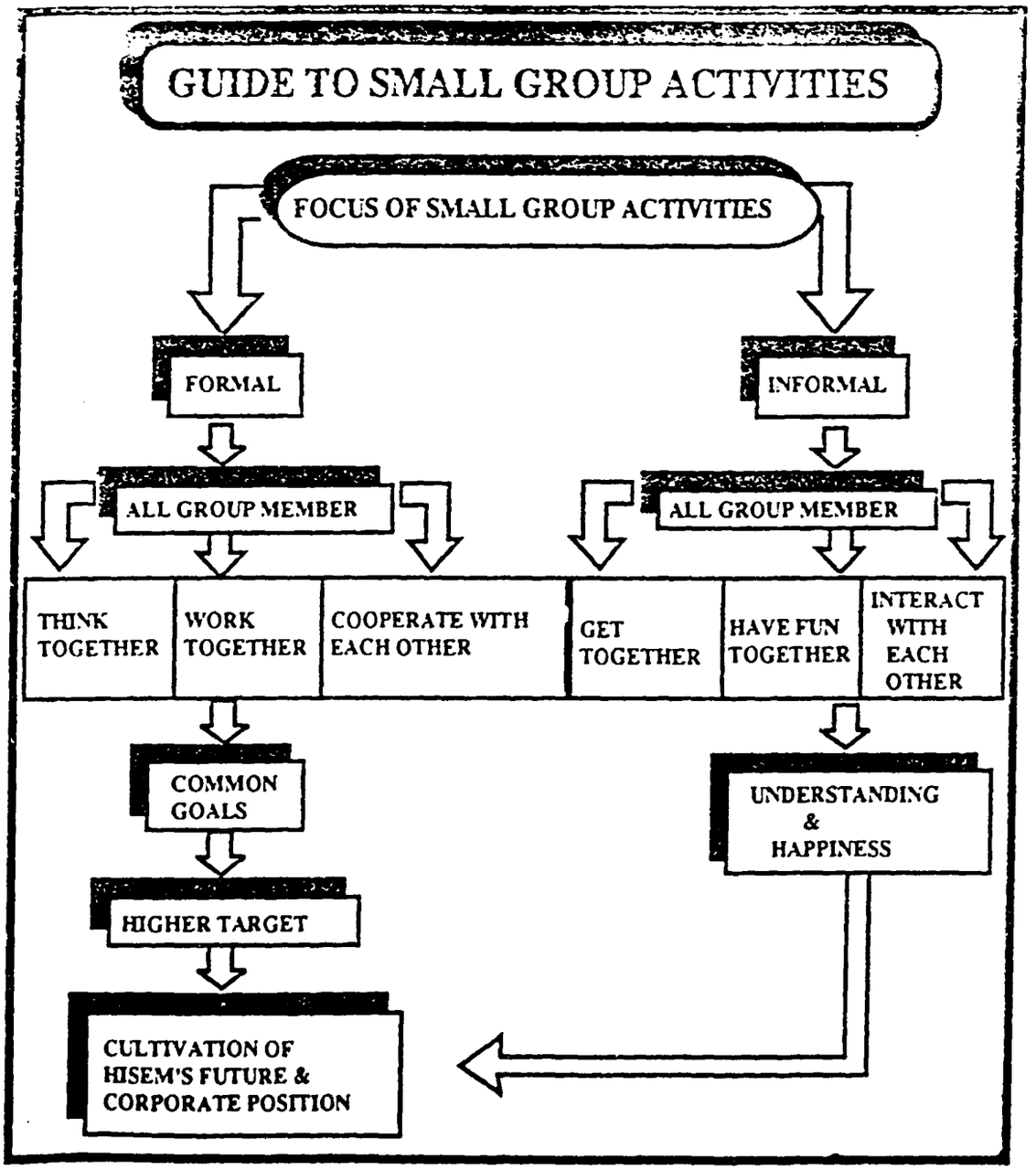
Every worker is an essential part of the company management, who can contribute actively and positively towards improving the company operation as well as elevating the quality of working life.

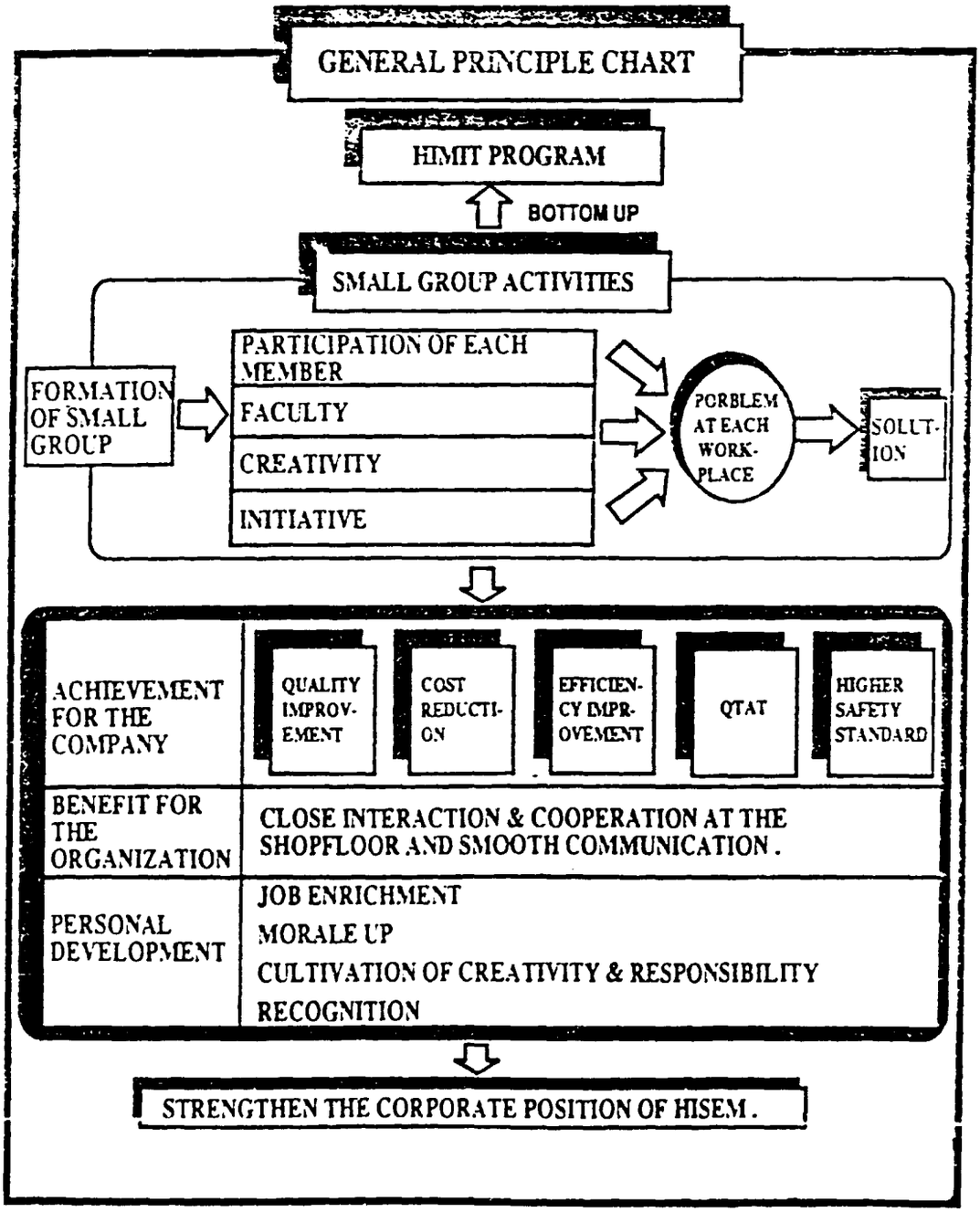
1.2 GROUP SPIRIT

Workers who are working together with friends towards a common goal, find their work more satisfying and are more creative and productive. By cultivating this group spirit, workers are able to find fulfilment in their work.

1.3 SGA PRINCIPLE

The formation of small groups is the first step towards creating a worker oriented atmosphere. Recognising that the worker in the workplace has direct exposure and experience and in a position to identify problems and suggest effective solutions, we are making available an immense resource. By involving the worker in decision making, we are allowing them to contribute positively towards improving the company operation.


GUIDE TO SMALL GROUP ACTIVITIES
FOCUS OF SMALL GROUP ACTIVITIES
FORMAL
INFORMAL
ALL GROUP MEMBER
ALL GROUP MEMBER
THINK TOGETHER
WORK TOGETHER
COOPERATE WITH EACH OTHER
GET TOGETHER
HAVE FUN TOGETHER
INTERACT WITH EACH OTHER
COMMON GOALS
UNDERSTANDING & HAPPINESS
HIGHER TARGET
CULTIVATION OF HISEM'S FUTURE & CORPORATE POSITION


GENERAL PRINCIPLE CHART
HIMIT PROGRAM
BOTTOM UP
SMALL GROUP ACTIVITIES
FORMATION OF SMALL GROUP
PARTICIPATION OF EACH MEMBER
FACULTY
CREATIVITY
INITIATIVE
PORBLEM AT EACH WORK-PLACE
SOLUT-ION
ACHIEVEMENT FOR THE COMPANY
QUALITY IMPROV-EMENT
COST REDUCTI-ON
EFFICIEN-CY IMPR-OVEMENT
QTAT
HIGHER SAFETY STANDARD
BENEFIT FOR THE ORGANIZATION
CLOSE INTERACTION & COOPERATION AT THE SHOPFLOOR AND SMOOTH COMMUNICATION .
PERSONAL DEVELOPMENT
JOB ENRICHMENT
MORALE UP
CULTIVATION OF CREATIVITY & RESPONSIBILITY
RECOGNITION
STRENGTHEN THE CORPORATE POSITION OF HISEM .

HISEM SMALL GROUP ACTIVITIES

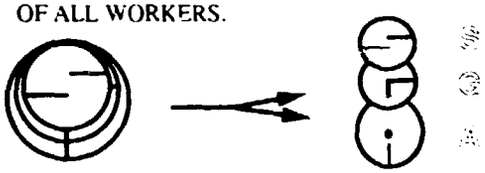
1. KICK OFF DATE : 1ST OCT 84

2. PROGRAMME NAME : **HIMIT**

HISEM **M**ANAGEMENT **I**MPROVEMENT **T**EAM

3. OBJECTIVE : EXPAND THE MANAGEMENT IMPROVEMENT AWARENESS OF ALL WORKERS.

4. LOGO :



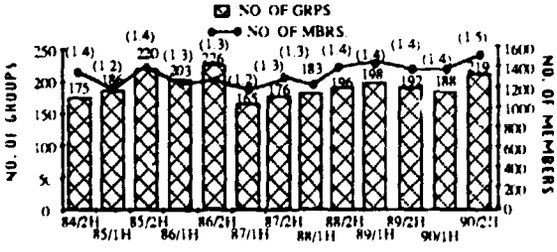
5. SLOGAN : TEAM UP AND GROW (84/2H-86/1H)
BERSAMA KITA BERJAYA (86/2H-88/2H)
BERSAMA KE ARAH KECEMERLANGAN (89/1H ONWARDS)

6. IN FACTORY & OUT-FACTORY SGA ACTIVITIES.

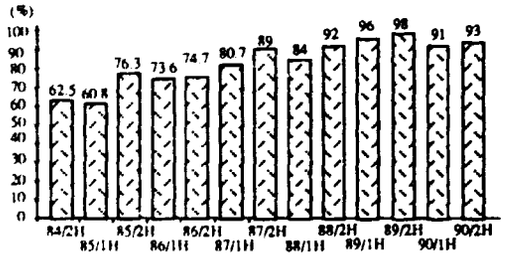
	ITEM \ SLOGAN / PERIOD	TEAM UP & GROW				BERSAMA KITA BERJAYA					BERSAMA KEARAH KECEMERLANGAN			
		84/2H	85/1H	85/2H	86/1H	86/2H	87/1H	87/2H	88/1H	88/2H	89/1H	89/2H	90/1H	90/2H
IN-FACTORY	GROUP LEADERS' TRAINING	O	O					O				O	O	
	FACILITATORS' FORUM			O		O								
	EXCELLENT SUGG PRESENTATION						O		O		O			O
	BRANCH PRESENTATION	O	O	O	O	O	O	O	O	O	O	O	O	O
	COMPANYWIDE PRESENTATION		O		O		O		O		O		O	O
OUT-FAC.	SGA PRESENTATION IN JAPAN		O		O		O		O		O		O	O
	NPC QCC CONVENTION		O		O		O		O		O		O	O

7. HIMIT BUDGETWISE STATISTICS.

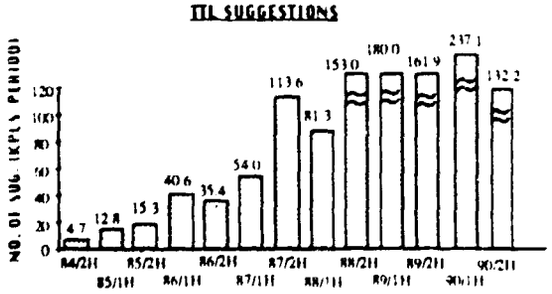
TTL GRPS & MEMBERSHIP



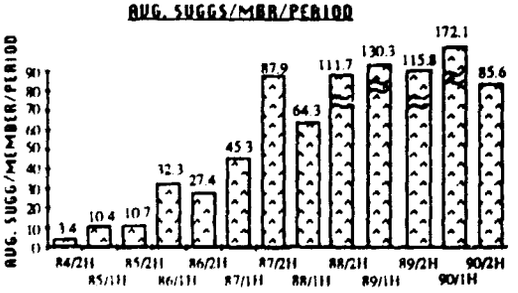
PARTICIPATION RATE



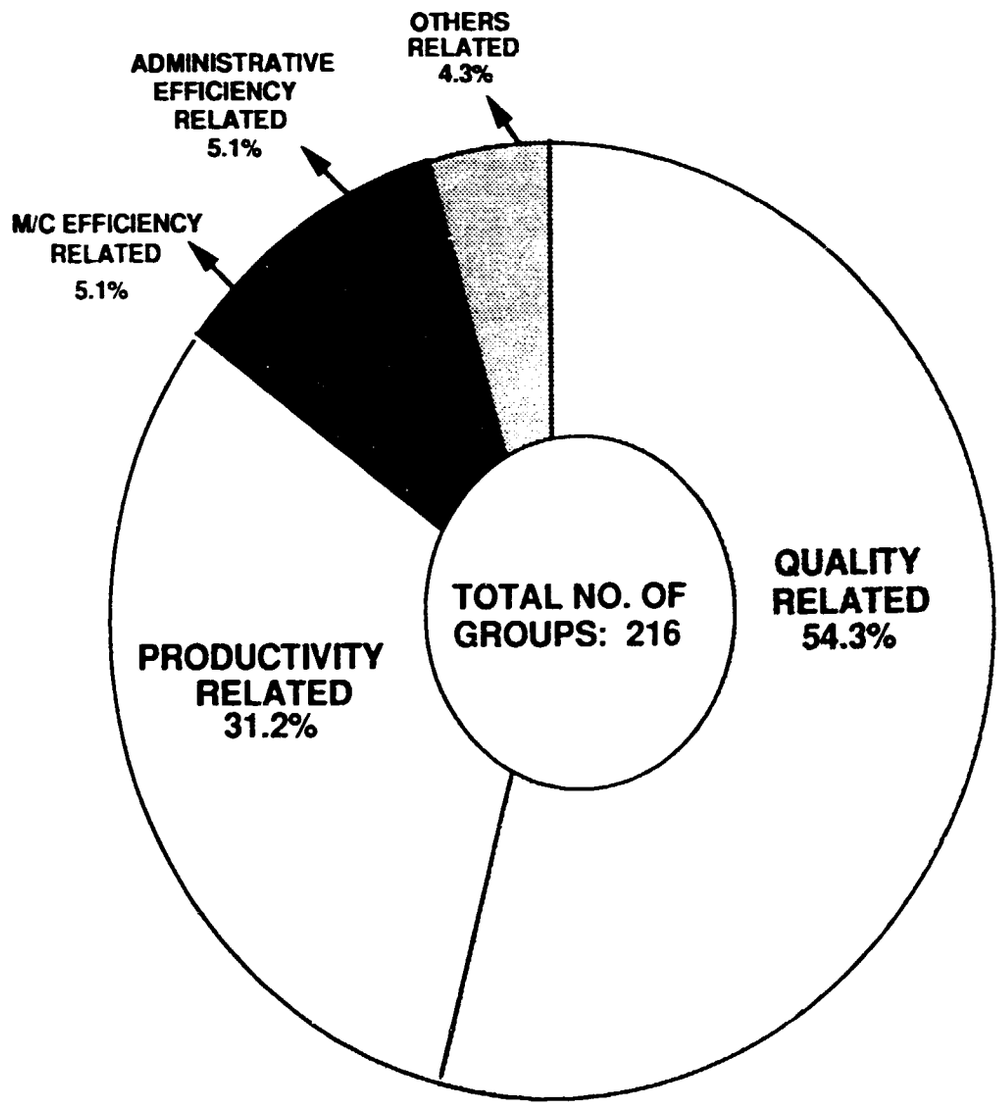
TTL SUGGESTIONS



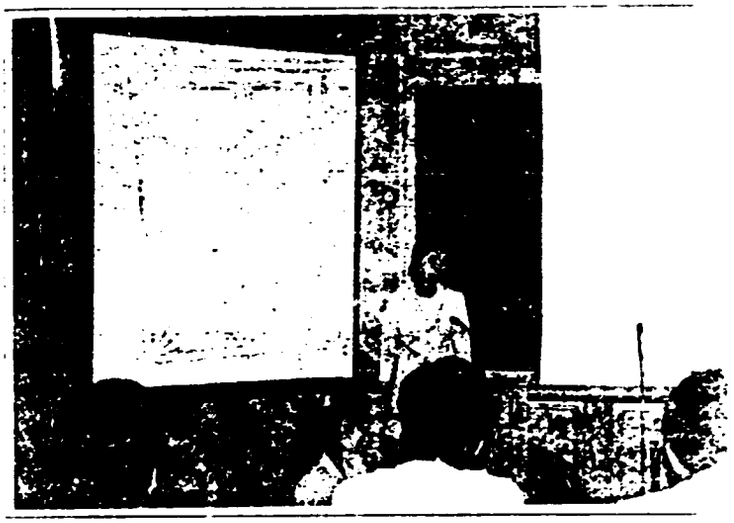
AVG. SUGGS/MBR/PERIOD



BREAK DOWN OF GROUP THEMES AS SELECTED AND WORKED ON BY INDIVIDUAL GROUPS



SGA ACTIVITIES



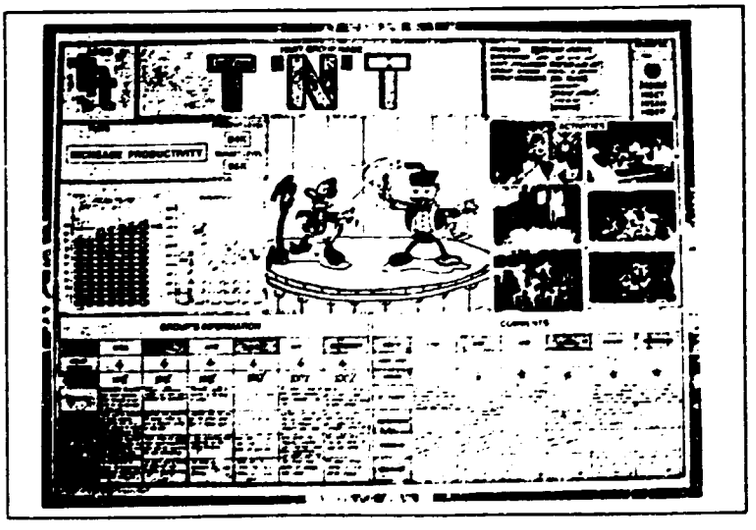
SGA PRESENTATION

WINNER OF HIMIT COMPANY WIDE SGA PRESENTATION RECEIVING HER AWARD

SGA ACTIVITIES

POSTERS OF VARIOUS SGA GROUPS

SGA POSTER



QUALITY AWARENESS CAMPAIGN

"Quality Awareness Campaign" was launched in 1985 in Hitachi Semiconductor (M) Sdn. Bhd. (HISEM), as a means to promote awareness of "Quality" among employees. "Quality System", established in the processes normally impart a certain sense of awareness among employees towards quality. However cultural differences between Japan and Malaysia necessitate added promotional activities for "Quality Awareness" in Malaysia. This has resulted in the form of "Quality Awareness Campaign" in "HISEM" which mainly emphasises on disseminating latest information on "Quality" to employees. It also involves in organising competitions and seminars in which employees participate; feedback, from those activities, are used for further promotion of quality. Whole campaign activities can be classified under three main categories.

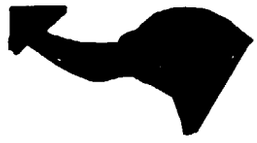
NO.	ITEMS	PLAN
1.	**PUBLICITY**	**Issue Leaflets to all employees pertaining to latest information on "Quality Activities" in Hisem.**
2.	**EDUCATION**	**Organise "Quality Awareness Seminars", and "Education on Basic SPC Tools".**
3.	**COMPETITION**	**Organise "Inter Process Competition" and "Quality Quiz".**

QUALITY AWARENESS CAMPAIGN

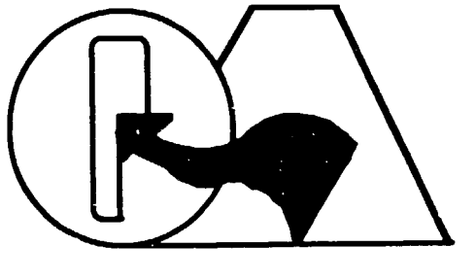
1. KICK OFF DATE : 3RD JUNE 1985

2. THEME: QUALITY TODAY FOR A BETTER TOMORROW

3. LOGO:



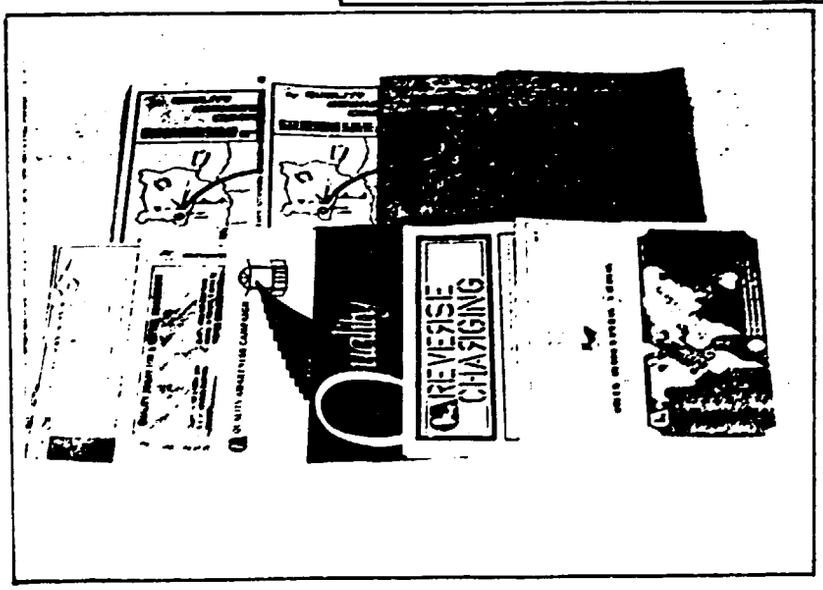
= UP



Q = QUALITY
A = AWARENESS
C = CAMPAIGN

QAC PUBLICITY

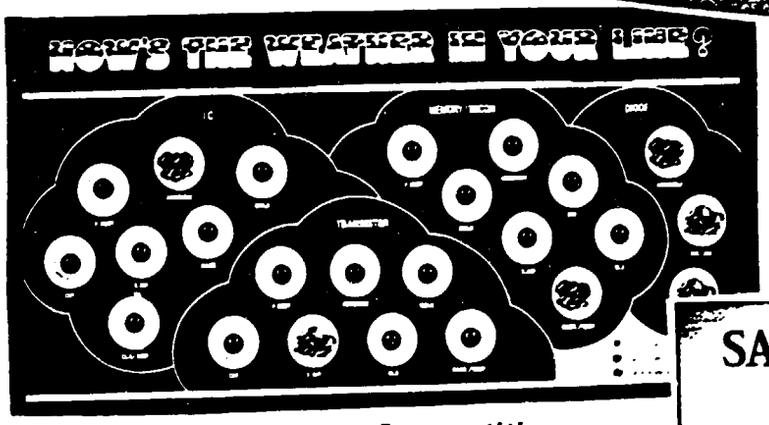
ISSUING OF QAC LEAFLETS AND BOOKLETS



QAC LEAFLETS AND BOOKLETS

QAC PUBLICITY

Publicity Board

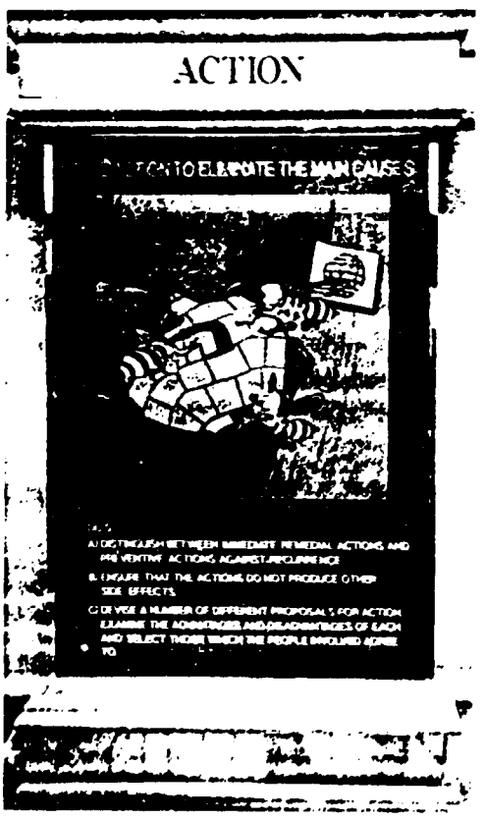


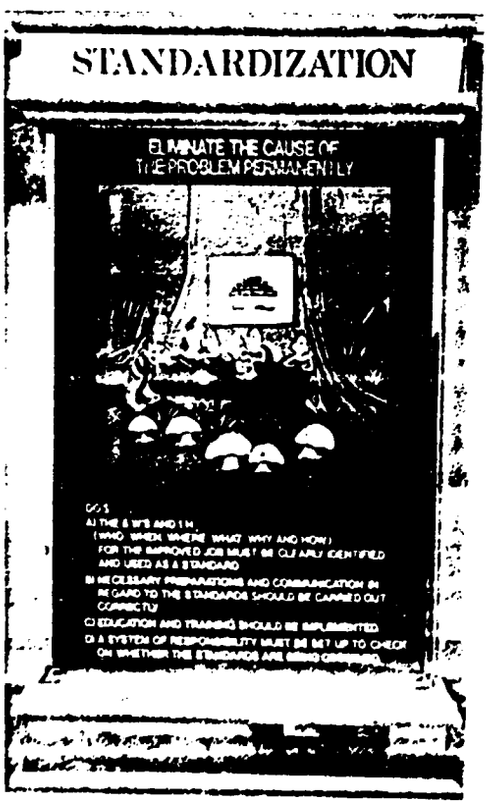
Interline Process Competition

Sangen Shugi

QC STORY - 7 STEPS OF PROBLEM SOLVING

Display Boards





3. UNIQUE CONCEPTS OF MANUFACTURING UNDER "JAPANESE APPROACH"

	CONCEPTS	EXPLANATION
1.	**Build Quality in Design, during product development.**	Elaborate discussions are held between "Design" and "Quality Assurance" during the "Design Phase of Product.
2.	**Build in Quality during production by "Production Department". Production is responsible for "Quality" and not "Quality Control".**	Manufacturing check product by themselves without waiting for "Quality Control" to find out mistake.
3.	**Build in "Cleanliness and Tidiness" using "5S" Concept in the line.**	Minute details of layout of the line is taken care of. Japanese believe that if "Minute" details are taken care of, automatically "Big" things are taken care of.
4.	**Destroy "Sectionalism" and promote "Group Activity".**	Have "Cross Functional" teams to tackle key issues. Let the managers think of the company as a whole instead of their own department.
5.	**Management based on "Respect For Humanity".**	Worker is respected, his ideas are accepted and implemented through "Small Group Activity". Managing Director and worker eat in the same canteen.
6.	**"Customer is King".**	When the customer complaints, response is very fast. Visit the customer and explain the failure mechanism and corrective action. "AQL" is only for business purpose, since even a single failure calls for corrective action.

4. TIPS TO LOCAL INDUSTRIES TO PROMOTE "QUALITY" EFFICIENTLY

1. Establish detailed procedures of operation, including machine maintenance, machine parameter setting, etc. **and standardise them.**

2. Establish training programmes and training manual. **Human resources are the company's most valuable assets.** Developing them reap long term benefit to the company.

3. **Continously improve** efficiency of operation, be it "Manufacturing", be it "Service Industry" or be it "Administrative Work". Measure your "Achievements" against "Targets" and once the "Target" has been achieved, challenge for a more ambitious "Target".

4. Promote "Group Activity", rather than "Individualism". Motivate your employees through "Small Group Activity", and make them feel a part of the enterprise. "Small Group Activity" or "QC Circles" alone do not improve Quality and so are the banners and pledges and "Campaigns"; but they improve the morale of the employee so that you get full employee participation in meeting the corporate objectives.

5. Welcome changes with a positive attitude. But always remember, **to confirm, that "Changes" do not make any "Compromise" on product Quality or service you are rendering.**

6. Upgrade your technology with local as well as borrowed Knowhow. Whatever "Advanced Process Control Methods" you have, the **"Final or Achieved Reliability" can never be better than "Intrinsic Reliability" and the "Intrinsic Reliability" is decided by the technology in "Design". As such modern Quality Control is based on "Build in Quality During Product Development".**

7. Have cross-functional groups or task forces to work on specific projects so as to maximise the utlisation of your best human resources.

5. CONCLUSION

Multinational Japanese Corporations in Malaysia have been able to inculcate the true spirit of "Japanese Approach" to "Quality" to the local staff and produce products of high quality and reliability. Many of these products are going back to the "demanding" Japanese markets and competing successfully with products manufactured in Japan. There is no reason why the local industries in Malaysia cannot make use of these "Knowhow" available in the market to steer their enterprises towards competing in the world market. Even though this paper highlight on the "Process Control Oriented" approach towards quality it has to be re-iterated that in order to compete in the world market "Quality" should be built in during design and the feedback of the "Wants and Needs" of the market must come from market research.

APPENDIX I

ISO-9002 QUALITY ELEMENTS

1. MANAGEMENT RESPONSIBILITY
2. QUALITY SYSTEM
3. CONTRACT REVIEW
4. DOCUMENT CONTROL
5. PURCHASING
6. PURCHASER SUPPLIED PRODUCT
7. PRODUCT IDENTIFICATION AND TRACEABILITY
8. PROCESS CONTROL
9. INSPECTION AND TESTING
10. INSPECTION, MEASURING AND TEST EQUIPMENT
11. INSPECTION AND TEST STATUS
12. CONTROL OF NON CONFORMING PRODUCT
13. CORRECTIVE ACTION
14. HANDLING, STORAGE, PACKAGING AND DELIVERY
15. QUALITY RECORDS
16. INTERNAL QUALITY AUDITS
17. TRAINING
18. STATISTICAL TECHNIQUES