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QUALITY TRAINING [1]

by

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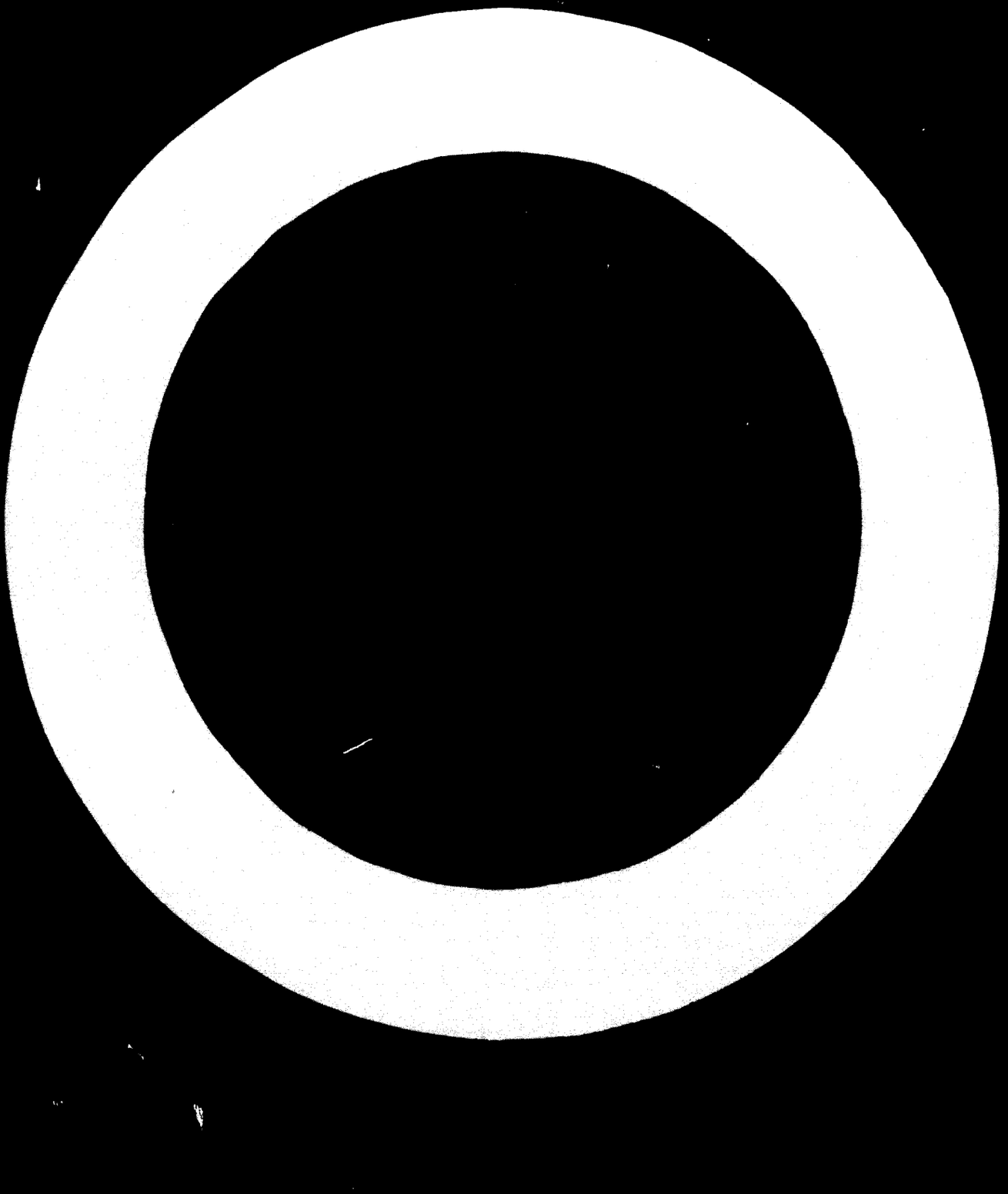


1. Role and Aims of Quality Training

In the last few decades, the attention of organizers of industrial processes has concentrated more and more upon the problems connected with the humanization of work. Even the most efficaciously planned organizational systems have their sharply delineated limits of efficiency, limits which are rarely reached, because of the imperfect exploitation of the human factor as one of the elements.

According to the extent to which the psychology of work is applied to the organization of systems, organizers are divided into two categories:

- the system-oriented
- the people oriented.

This division is not only the result of the subjective views one has of the significance of the human factor; it often also results from the technological structure of a process. It is obvious, that the possibilities of fully exploiting the human initiative of the workers are more limited in processes with fully automized equipment, than in individual production processes, such as for example in the ship-building sector. And it is not less evident, that, in general, the system-oriented organizer is a follower of the X-theory of Mc Gregory, whereas the people-oriented organizer follows Mc Gregory's Y-theory.

training and motivation, these are the two key-problems connected with the human factor in the work process. The degree of qualification of all those working in an enterprise, and that of their involvement in the problems of work constitute the soft--ware of a process, which has a value which is incomparably greater than that of the hard-ware.

The aim of training in the field of quality depends on the trainees as well as on the type of industrial enterprise in as far as its organizational pattern is concerned.

In organizations which are mainly system-oriented, the training aims at creating competences which are indispensable if one wishes to perform functions in the way as described in the process documentation. The personnel of an enterprise constitutes the main object of the training and it takes the form of technological training. This kind of professional training has its own traditions, created contemporarily with the development of industry. The characteristic feature of this type of training is its "non-repeatability"; the training is considered as valid until the technological process changes again.

In the people-oriented organizations, the aim of the training is connected with increasing the worker's qualifications, as this is indispensable for perfecting their own work. The organizer takes as a starting point, that the planned organization of the process is not an ideal one, and that it can considerably be perfected by the people working in the enterprise,

if they display sufficient competence in the field of methodology. Creating the necessary abilities to perform functions described in a process, is considered not as a purpose, but only as a first introductory stage necessary to undertake the work connected with perfecting a process. The characteristic features of this type of training are:

- it is continous, and new sets of methods, useful for the perfecting of work, are added to the content of the training;
- it contains all levels of an enterprise as trainees, i.e.

  executive staff
  workshop personnel
  quality control personnel
  supervision personnel
  workers

- as a constitutive element is included in the organized system of motivation of a zero-defects type, the Saratov method, and a Japanese circles system.
- the subject matter of the training is broader than that of the professional training required for a correct performance of functions described in the technical documentation, and it contains predominantly methods applicable to various branches.

The foloWing pages will be dedicated to a discussion of the training problems which are characteristic for people-oriented organizations because they represent a more modern type of organization and because it also contains elements which they share with system-oriented organizations.

2. Aims, Content, and Forms of Executive Staff Training

The practical activity of an industrial enterprise does not always clearly show that the significance of the problems presented by production quality has now become one of the most important economic issues. The low level or quality of production is very often considered as being caused by apparently objective phenomena such as outdated machine parks, unsatisfactory technological methods, low level of qualification of the workers, etc. In order to programme the quality of production and to plan the necessary means and ways with a view to minimalizing the risk of starting producing an article of bad quality, a number of analytical methods should be mastered, such as:

- forecasting
- organization of market research and of investigating market trends
- organization of scientific research
- organization of information processing systems
- techniques of operative planning
- organization of quality control systems
- problems of the psychology of work,

methods and technique which form the packet of professional qualifications of the executive staff. This is why in many countries quality control is not a separate subject in the training, but executive staff training in the field of quality is rather dealt with as "quality involvement". Japan constitutes a clear exception to this. Its successes in the field of quality can be for the

major part ascribed to the efficient training of executive staff in this field. Further exceptions are those enterprises which apply the so-called zero-defects method, /Zero-Defects, Zerofehler method, Do-it/ which, constituting a certain legal norm for enterprise managements, requires a detailed knowledge on the part of the executive staff in this field, of production quality and of control methods.

The aim of executive staff trainings in the field of quality is:

- to introduce methods of analysis concerning the cost of quality, in order to provide quality improvement programmes with properly motivated aims;
- to show organizational and motivation methods of quality improvement programmes, based on the experience of other industries and countries;
- to introduce a basic knowledge of some of the existing quality supervision techniques, which is indispensable for the elaboration of quality control programmes / in Japan e.g. - the statistical methods of quality supervision and audit./

The Table 1 shows the contents of management courses for quality, over a week, by the Rotterdam Kwaliteitsdienst International Training. The executive staff training does not only take the form of a course. The study groups such as organized in Japan in the 60's are also an interesting form of such a training. Teams of several trainees were formed, which made 6-weeks consulting visits to well-known enterprises in different countries. The programme of such visits

enable the executive staff trainees to acquaint themselves in a practical way with modern solutions in quality control problems. Discussion seminars, annual scientific-technological conferences, conferences for special problems, discussion with groups of industrial advisers, etc., all these and other forms of training.

3. Aim and Content of Quality Control Service Training

In the traditional supervision system, oriented towards inspection, the qualifications required of the supervising staff included the ability to read the technical documentation and to use suitable measurement instruments. The modern quality control service is strongly directed towards defect prevention, using a number of statistical control methods, realizing laboratory and exploitation programmes; moreover, the documenting of analysis of information on quality, coming from different production sources and from the post-productive sector, is also a new facet. All this requires a staff with a different qualification profile.

The aim of the quality control people training is:

- to create a specialized service which has at its disposal a whole set of necessary techniques for quality supervision /inspection/ and control;
- to acquaint the quality control people with various methodological and organizational solutions applied in leading industries, providing it thus with the basic material for creating its own solutions.

There must be a differentiation within the enterprise according to the level of employment, in training

programmes for quality control service personnel and they should contain at least two different sub-programmes /1/ for the engineering services and /2/ for inspectors employed in departments.

Basic courses in the field of quality control should comprise the following chapters:

- selection of product acceptance sampling and sampling plans;
- planning of Sheward cards and their application in the control of stability in quality;
- methods to examining the process capability;
- introduction to the analysis of variance and, first of all, the examination of statistical significance of differences, and the linear correlation method.

Depending on the type of technological process, the above mentioned set of techniques should be complemented with:

- investigating the reliability , in machine building industries, and
- experimental design methods, in equipment industries.

Quality control services should perform a task wich is more than the efficient application of inspections and the processing of the resulting data. The training should therefore also take care of further questions which are important for an efficient functioning of this service, such as:

- quality economics;
- process control;
- organizing self-control /control by operator/;

- application of zero-defects methods;
- quality motivation;
- organizing quality control for new products.

Such a course should take from 100 to 150 consultation hours, on the presuppositions that the participants continue their normal work, besides following the course.

The additional quality control service training should contain treatment of some special problems such as:

- workshop metrology;
- standardization and setting up the technical specifications;
- measurement outfit and the management of measurement instruments in an enterprise.

This training should count a different total of consultation hours. In practice organizing course of about 150 hours entirely separated from the practical work meets with difficulties. In order to avoid such problems, it could be advisable to divide the basic course into several "stages". The volume of each stage would depend on the subject treated. The first stage would, thus, require about 20 hours and be organized in the context of a 3-days seminar, treating the problems of acceptence procedures. Such an arrangement of the matter treated during the course has one other advantage: it creates separate thematic blocks, which can be better adapted to different types of participants. Subjects such as acceptance procedure, Shewarth's cards, examination of the capability of a

technological process, together with topics such as:

- Paretto's analysis
- Ishikawa's diagram - cause and effects diagrams and organizing brain-storming sessions

can be successfully used for the training of inspectors who effect inspection of supplies, inter-operational inspection and final inspection. The level of the lectures should be adapted to the qualificetiony of the personnel, especially in mathematics.

The training in statistical methods, generally does present a number of didactical problems. The engineering and operating staff of the enterprises is usually accustomed to treat phenomena in a deterministic way which is different from the probabilistic formulation which is characteristic for quality problems. On the one hand, the aim of the training is therefore re-education, i.e. to get participants accustomed to a different approach, to reasoning in categories of risk, of the probability of mistakes, and to distributions and their parameters. On the other hand, training in statistical methods should not be identified, as is often done, with a lecture of mathematical statistics. Loading the course with mathematics discourages the participants and takes time which is necessary for procedures such as MIL-105D, distribution papers, etc. Didactical equipment such as distribution generators and decision-games concerning sets of various defects, in which situations similer to those met in a given industrial enterprise are simulated, are very helpful for establishing a just proportion between theory and practice.

4. Aims and Content of training for engineering personnel of enterprises

The quality of production depends on the work performed by a number of subsidiary services such as the section of production planning, construction departments, technological departments, supply, sales and after-sales services sections, etc. It is difficult to speak about a system for preventing low production quality which is fully efficient without including these services into the quality control system. It seems impossible to establish a general programme for these services, because of the professional variety and differences in levels of education. The programme of such a training should contain several "blocks", some of which can be applied to different services, whereas some others are specialized supplements to this basic programme.

The following subjectss.ould be treated in the general blocks:

- concept and principles of total quality control;
- quality economics;
- problems of launching a new product;
- organization of a system of quality information processing;
- concept of zero-defects methods;
- problems of motivation.

Specialized supplements should treat problems such as:

a/ for the economic services:

- the cost of quality and its structure, the final productivity of quality investments;
- market research;
- planning of costs and activities in quality

control;

- using electronic computational techniques for quality control activities.

b/ for designing services:

- organization and methodology of comparative research;
- analysis of reliability;
- tolerance analysis;
- factorial analysis;
- methods of value analysis.

c/ for other maintenance services:

- reliability of the machine park and repairs planning;
- accuracy and precision analysis of the technological process;
- organization of self-control in equipment and repairs departments.

d/ for technological services:

- tolerance analysis;
- current control methods in a technological process;
- planning and organization of self-control;
- metrology and measurement equipment.

5. Quality Treining of Foremen

As the automation of technological processes and modern planning and management methods are in continuous development, a depreciation of the importance of the role of foreman manifests itself. The status of a foreman as a craftsman with qualifications

which are superior to those of his subordinates is shifting towards that of an administrator of performance, more and more occupied with paper work.

The often high professional qualifications of a foreman do not often go hand in hand with the qualifications required for personnel in management and industrial control. As a result, foremen generally form a traditional industrial class which is reluctant to accept any innovation, especially innovations of an organizational character.
On the other hand, as a consequence of the increase in anonymity in production, a foreman is less aware of quality problems than of quantity problems, for which he feels responsible in a concrete and direct way. However, the possibilities of a foreman's influence on the quality of production are numerous. And, what is more, generally these possibilities cannot be replaced by any other organizational solution. Finally, a foreman is a man who decides upon the type of mutual relations between the people within an enterprise. The working climate in an enterprise is influenced first of all by the character of the co-operation of the workers with their foreman, since in their eyes the foreman is the most immediate representative of the enterprise's administration. The way a foreman acts and the management methods he uses are identified, by the personnel, with the management style of the enterprise.

In system-oriented organizations, a foreman is supposed to possess:

- high professional qualifications in the technical realm;
- the ability to demend quantity and quality in the workers' production, in line with the technical documentation.

The people-oriented organizations, this scope of requirements is not sufficient. In these organizations, the main purpose of a foreman-training is to train him to be a leader of a group of people which should improve the course of a production process on the strength of its professional knowledge, its experience and the fact that a workshop is at hand.

Foremen training is hindered by a number of problems which present themselves. One of the fundamental difficulties is the lack of summaries on researches conducted with a view to specific problems such as:

- work studies
- network methods of cperative planning
- statistical methods
- the psychology of work methods.

The summaries could be written in a cleer, simple way without distoring the content of the results reached and which would thus be fit for practical application.

The next difficulty has to do with the dimensions of a group in a large industry. The percentage of foremen in many branches reaches 10% of the total number of employees, whereas, on the other hand, the success of a training depends on the participation of all the

foremen employed in an enterprise. A training can therefore not take the form of a traditional course with its relatively small output.

And, finally, a third problem is presented by the necessity to overcome the psychological barrier which has formed in the mentality of foremen. This is a barrier, constructed by traditionalism, reluctance to accept innovations and modern scientific methods, etc. This problem makes itself felt when one is dealing with the necessity of solving the motivation problem, which must absolutely be solved, if one wishes to inspire a foremen with a view to additional efforts connected with acquiring new knowledge as well as applying it in practice.

Japan gives us an example as to how the above mentioned problem can be solved. In Japan, the role of a foreman in a complex system started to draw attention in 1956. A radio course for foremen was organized. This approach provided an opportunity for a large scale general training on the one hand and for elaboration of training materials, written by the best specialists in each field in one country. The content of the course comprised fundamental knowledge of work studies, organization, motivation and co-operation problems, methods of analysis and of quality control. The success of this course and that of a series of instructive publications lead to the starting, in 1962, of a special monthly for foremen, on quality control /a monthly which was a variant of a

periodical on statistical methods/. This periodical, "Gemba to Quality Control", has played an important role in propagating one of the most interesting [illegible] of the Japanese system of quality control, i.e. that of the quality-circles. The build-up of quality-circles was provided, to a large extent, for the solution of the problems presented by the [illegible]'s motivation. Quality-circles are groups of workers, voluntarily organized, and directed by foremen /although there are exceptions to this rule/ with a view to:

- improving the management capacities of a foreman and of the workers through self-education and individual efforts towards a full use of the materials contained in "Gemba to Quality Control";
- intensifying the motivation with a view to quality, of the workers, and especially sensitizing them for the quality problem and the satisfaction improvement gives;
- creating a network of teams which, within an enterprise, set an example and which do investigate the reasons which cause or might cause lack of quality.

The tasks the quality-circles have to perform are:

- improvement of the quality of products;
- reduction of defects;
- decrease of material costs;
- increase in productivity.

A clearly defined task provides the groundwork for active training aimed at developing the ability to define a problem, to analyse the effectivity of a solution found and to analyse methods of problem-solving and initiation.

The training in analytical techniques includes: Pareto's analysis, Ishikawa's diagram, the histogram of distribution, instruction papers, control charts, simple network methods, work studies methods and methods for evaluating economical effects.

Usually the choice of quality-circles as to their subject is spontaneous. Investigations show, that a foreman and workers in about 60% of the cases, undertake to concentrate on limiting losses due to defects and in 40% of the cases on reducing costs and increasing productivity. The efficiency of performed tasks ranges from US$ 250 to US$ 100,000 per performed task per year / the average efficiency of the circles being evaluated at US$ 56,000 per task, per year /.

The average number of performed tasks per year is of 4. It is easy to evaluate the economical effects of this active form of training when considering the fact that the number of quality-circles in Japan is evaluated at about 240,000.

Motivation is based mainly on the satisfaction given by the fulfillement of a task and the results obtained. Reports of task performance are published in enterprise bulletins and the most interesting cases are presented in more detail during quality-circles meetings.

6. Training for Shop Floor Workers

In the example of the quality-circles, the problem of training workers has already been partly discussed, since this problem is closely linked with the train-

ing of foremen and with their attitude in the technological process.

Self-education is considered to be the most effective form of raising the personnel's qualification. When for example, a technical school, connected with an enterprise, is able to prepare 1.5 workers every year, then it is also possible to raise qualifications of the personnel numbering several thousands of people with the help of self-educational forms.

The training of workers is concentrated on two aims:

- introducing self-supervision;
- improving work by a cause-removal programme, supported by self-supervision and by definite methods of activity.

The motivation necessary to self-education is created by the atmosphere which decides within an enterprise of the attitude the personnel has to quality. This atmosphere can be improved by organizing self-education in the form of contests in professional knowledge, held every year, following a system of elimination within the departments and concluding by a finale with a festive character. An example of such an approach is given by the Polish method of zero-defects work, Do-Ro, in which the training programme contains the following stages:

a/ Preparation of a list of questions for specific professional groups of workers, by operating personnel and foremen. These questions include problems connected with correct performance and with meeting the requirements stated in the documentation. An additional series

concern simple economic problems connected with production [illegible] material cost, working [illegible], value of losses caused by defects, etc.;

b/ preparation of the answers to these questions by the workers themselves, with the help of materials from the library of the enterprise, with the aid of a foreman and of consultations with operating personnel, and of a text-book prepared for the workers of an enterprise;

c/ organization of inter-department contests with prizes for the workers who prove to have the best commend of the required knowledge;

d/ organization of a contest for the whole plant, with prizes, in which the workers of an enterprise which, as to their command of knowledge, are the best ones, are chosen among the winners of the contest in the department.

In Poland such contests are organized in the food industry and other light industry. In 1970, the organizing of professional knowledge contests, of an inter-plants character, for foremen, has started.

7. Comprehensive Training Programmes in an Enterprise

A quality training for selected groups of employees has only a limited efficiency. A complex quality control involves the activity of many services and it is not enough that only some services are active in order to ensure a good level of quality.

The training programmes for various levels and services should be arranged so as to constitute a comprehensive whole, structured in such a way that specific thematic blocks for the various services are interrelated, in order to lay a basis for mutual understanding and communication.

The problem of comprehensive training in an enterprise demands special attention in case zero-defects methods are initiated.

These methods comprise:

- description of various, detailed characteristics for specific services;
- arranging the tasks at the basis of competition;
- arranging measures for work quality which form the basis of comparison in competition;
- motivation programme;
- improvement programme;
- programme of organizational and technical changes in an enterprise.

The initiation of these methods requires a thorough understanding of same by all the personnel of an enterprise and therefore organizing a training on the substance of these methods and on a number of issues connected with them, is necessary.

3. Quality training activities on a national scale

Several tasks in the organization of training programmes can generally be solved by individual enterprises. Some of these are:

- compiling a draft of [illegible];
- preparing training materials;
- organizing conferences which become a platform for the exchange of experiences and supply materials which improve the contents of training programmes.

These tasks are performed either by specialized social organizations or by governmental agencies. In most of the Western European countries, enterprises, experts and people professionally involved in quality problems are members of specialized social organizations connected with quality control. In the socialist countries, the role of these organizations is performed by:

- special state agencies, created with view to organizing quality control activities;
- technical organizations;
- economic institutes;
- specialized centers for professional training and improvement.

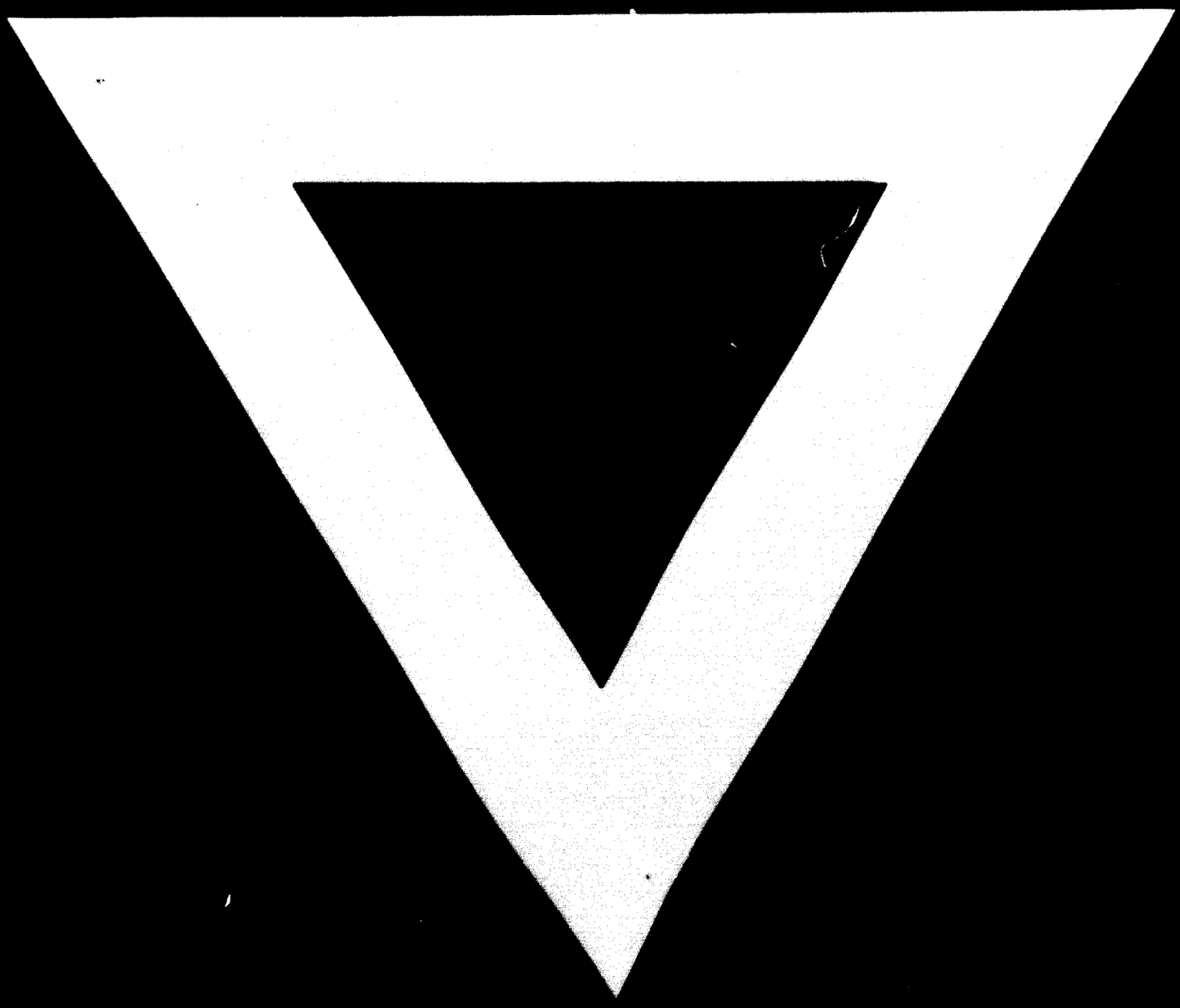
In this way, the training organized within enterprises is completed by inter-branch and branch courses, organized for the personnel of similar qualifications levels and of identical levels of employment in industry.

An additional issue connected with the training is the organization of studies on a graduate level, concerning quality control and supervision techniques, with activities which stimulate the elaboration of text books and the publication of professional periodicals specialized in quality problems.

Table 1

The contents of courses for managers

The quality function
Quality policy and objectives
Organising for control
Debugging new products
Reliability planning
Managing reliability
Improving quality
Building quality motivation
Improving quality-mindedness
Optimising quality costs
Managing the staff quality activities
Vendor relations
Executive reports on quality
Exemples from specific industries
Control:
  The job shop
  Mechanical industries
  Process industries
  Offices operations
Breakthrough
Creating change and preventing change
Quality, planning and control
Customer relations
Quality, reliability and share market
Reliability improvement
Maintainability
Organising for quality
Identifying the vital few problems
Coordination of company efforts
Managing inspection and test
Manpower for quality:
  Selection, testing, training
Roads to quality leadership
International trends:
  Western European practice
  American practice
  Japanese practice
  Socialist countries
  Developing countries
The quality manager's job



8. 5. 72