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Quality Improvement in Medium Scale Metal Industries in Indonesia.



Result of a Study on Solutions to Quality Problems in Medium Scale Metal Industries on Western Java; and the Applicability of Quality Control Circles in this Context.

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Preface

This paper presents results of a study on solutions to quality problems in six medium scale metal companies on Western Java. The research project has been a joint effort of members of the Bandung Institute of Technology (ITB) in Indonesia and the Twente University of Technology (UT) in the Netherlands. Professor Hardjoko Wirjomartono and dr. Taufiq Rochim of the ITB, and professor E.W. Hommes, professor E.J. de Bruijn, and drs. J.B.F. Gieskes of the UT have contributed to the successful execution of the project. From Oktober 1990 till February 1991 three small scale, six medium scale, and two modern large scale metal industries have been studied in and around Jakarta and Bandung.

Medium scale metal industries are important contributors to industrialization processes in developing countries. They provide manufacturers with small machinery, components and spare parts and carry out custom-made construction and repair. These metal products are often locally designed and low cost and are indispensable for the preservation of local manufacturing in other sectors of industry. It is obvious that quality problems like the lack of interchangeability of parts, nonconformances to specification and a bad performance not only hamper the prospects of the medium scale supplier of metal products but also hinder the development of other vital industrial sectors.

In Indonesia e.g. many medium scale metal industries supply local producers in the textile, leather, food processing and agricultural sector with equipment like sewing machines, tea and rubber machines, sugar plants, vessels and boilers, and flushing gates. Another group of purchasers in the Indonesian case are the large scale modern metal (often automotive) industries. Directed by a prescribed local content value (percentage of endproduct produced locally) these large scale industries contract out the production of components and parts to local medium scale subcontractors. The importance of the medium scale metal industry is also discerned in the current Indonesian development plan, Repelita V, in which the Indonesian government stresses the development of these (small and) medium scale metal industries.

In the remainder of this paper I discuss the most apparent quality problems and causes in the medium scale metal industries visited; a more detailed analysis is described in [Arendsen 91]. Taking into account factors impeding improvement in this situation, I suggest a feasible improvement strategy. Finally I comment on the applicability of quality control circles (QCC's) in this context and I suggest the use of a management-oriented approach on QCC's.

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Medium Scale Metal Industries in Indonesia

The size of the six companies studied, varies between 70 and 280 employees. They all concentrate activities on metalworking processes like machining, welding, plating, and assembling (casting and forging industries have been omitted in this study). The majority of the industries uses a job shop or small series production organization and all but one have their own engineering department. Nearly all companies employ quality control personnel (varying from 2 till 10 employees) who in general are being held responsible for the quality level of delivered products. The quality control activities of the industries visited can be characterized according to five aspects.

Characterization of the quality control effort

- Main attention on aspect of product quality
Durability, performance, attributes, maintainability, appearance, conformance, and reliability are mentioned by Garvin as the main constituents of product quality. At the moment the medium scale metal industries in Indonesia concentrate efforts on product performance and product attributes.
- Goal of quality control
In all cases the goal of quality control activities in the companies is the reduction of bad products delivered. (Some industries complain about their unqualified inspectors letting bad products pass final inspection.)
- Object of quality control
In nearly all cases the scope of control activities remains restricted to product features, especially dimensional. A major problem in all companies is the obscurity of product specifications and product designs, which do not provide a clear frame of reference for decisions on the attained product quality level.
- System of quality control
Quality control in all companies visited is aimed at detecting product failures in order to rework or reject.
- Quality function
The tasks and responsibilities of the quality control personnel are restricted to inspection activities.

Quality problems

Based on observations in the medium scale industries I identify two groups of major quality problems: internal and external product failures. These failures present nonconformances to requirements occurring inside or outside the company. About 60% of all failures concern dimensional problems like the out-of-tolerance of parts delivered, or the misfit of components during final assembly. Approximately 40% of the failures concern material, functional or esthetical problems like wrong material hardness used, refusal during trial run, or improper product finishing.

These failures cause internal and external rework and rejects (companies indicated internal rework rates being 35% of the total amount of products, and some customer reports showed 20% external rejects), a low interchangeability of components and parts and customer complaints. This results in loss of scarce material, time, money, and market.

Causes

Problem analysis showed that Man and Method/Means-related causes are accountable for more than 75% of the mentioned problems, whereas Machine and Material-related causes for only 25% of the nonconformances.

The most apparent Man-related causes in this case are the lack of standardized production methods and instructions, and the low level of (technical) education and training of foremen and operators. In general 50% of the employees has attended elementary school (SD) or less. About 15% to 20% has finished a secondary technical schooling (STM) and the rest the lower and/or higher secondary school (SMP, SMA). Besides the technical knowledge, the managerial knowledge of personnel in the medium scale metal industries is limited too. As a result planning, control and problem solving with respect to quality is not adequate yet [Juran 88].

Distinct Method/Means-related causes are the insufficient use of standards on terminology (drawing practice, limits and fits), specification (raw material, parts and components), sampling and inspection, and the lack of adequate measuring instruments. The need for standardization and the use of standards in engineering companies was already formulated by Wirjomartono [Wirjomartono 79]: 'It is very likely that standardization is one of the important activities needed for the improvement of the engineering industry in Indonesia'. This statement is still applicable to the current situation in the medium scale metal industries in Indonesia.

In essence the majority of the 4-M causes detected (related to Man, Machine, Material, or Method/Means) are due to the disfunctioning of three organizational processes:

- Makeability assessment
Product specifications do not match with the available capabilities of men, machines, instruments, or procedures. Few orders are being judged on their makeability. Therefore trial-and-error production, inventivity, and a forgiving customer in the end have to lead to the sale of the product.
- Specification of the aimed-at quality
In many cases customers are not able to provide a precise specification of their wishes. The product design in those cases is based on mere ideas or a physical example. The resulting drawings are often incomplete or tolerances have been omitted. When no exact aimed-at quality level is specified, in the end no one can judge the quality of the end product.
- Planned action and control
Although in nearly all cases various employees pointed to one or two specific problem sources (a certain machine or tool) no corrective action was being taken by their superiors. Management processes guided by a 'Plan-Do-Check-Act' sequence do not exist, they are mere 'Do-and-Check'.

Company management can be held responsible for the proper functioning of these organizational processes and in this case is therefore directly accountable for the majority of the quality problems in their company [Juran 88].

Factors impeding improvement

Feasible quality improvement strategies take into account factors hampering change. Based on the analysis on three levels of observation, the national, institutional, and industrial level, I derived factors impeding improvement in the Indonesian medium scale metal industry. The most important ones are:

- Market
Although large scale modern industries complain about the product quality level of their medium scale metal subcontractors (not conform requirements), many other customers do not. These customers, that constitute a large part of total demand, ask for low cost (low grade) products and perceive product quality as fit for use. This situation at the market place does not provide any reason or incentive for quality improvement by the medium scale metal industries.
- Industrial development policy
Part of the above mentioned gap between modern large and medium scale metal industries is due to the one-sided focus on high-tech export-oriented industrialization. The traditional small and medium scale industries have not yet caught up with modernization efforts as hoped for (caused by market relations as shown above).
- Assistance for medium scale industry
Activities of the institutions visited are being concentrated on large modern companies, modern approaches and concepts, and lack cooperation and support from medium scale industries.
- Management
In general there is a lack of professionalism and awareness. Many company leaders remain focused on trading and 'managing the government bureaucracy' rather than planning and controlling company activities. Nearly all companies indicated they did not perceive any quality problems.

These and other factors [Arendsen 91] form the prior conditions for improvement activities in the medium scale metal industry. The analysis of these factors indicates that improvement activities at the moment probably will have little support from the parties concerned.

Feasible Improvement Strategy

Taking the above factors into account I suggest three steps of improvement. These steps aim at the improvement of the functioning of the three mentioned organizational processes and relate to the increase of awareness, quality specification and quality planning [Juran 88], [Stephens 88].

- Step 1: Awareness and commitment

The objective of the first step is to rouse management awareness and its commitment to the need for change. Management support is one of the major preconditions for change in this case. The main incentive for cooperation will be cost reduction by setting clear goals for the reduction of failure rates. Other activities during this step are: the visit to a pilot project to show results, and discussion of the current failure rates and its consequences for company profit.

- Step 2: Standardization and exposure

The objective of the second step is to meet the prerequisites for change. This will be the improvement of two organizational processes, makeability assessment and the specification of aimed-at quality. In large extent this means defining 'how things will be done in our company'. So, agreements, procedures and standards on drawing practice, tolerances, measuring, raw material, inspection, and responsibilities have to be introduced. As showed by Wirjomartono [Wirjomartono 79] the use of these standards will lead to cost reduction, quality improvement, and the reduction of time for maintenance. Other activities are: the visit to a customer, pilots on problem analysis and correction, and experiments with variable payment systems.

- Step 3: Analysis and action

The objective of this step is the introduction of correction based on the analysis of product and process data. Attention will more and more be focused on the (production) process: the machine set-up, the quality of tools used, and the workmanship all influence the product quality level. Other activities are the monitoring of failure rates and the analysis and elimination of causes. Caused by the use of standards and decreasing failure rates in the end profits will rise.

This improvement strategy does not aim at the gratuitously introduction of modern quality control concepts in medium scale metal industry, which is not feasible nor desirable. It does aim at rousing appreciation for quality control and the step by step introduction of basic quality control techniques, based on the determination of true needs [Juran 88]. The following figure shows the status of quality control effort in medium scale metal companies after the suggested steps of change, compared to the current status as described above.

| Aspects | Before change (now) | After change (future) |
|---|---|--|
| Main attention on aspect of quality control | Performance Attributes | Conformance Reliability Durability |
| Goal of quality control | Minimize amount of bad products delivered | Minimize amount and cost of failures |
| Object of quality control | Product | Production process |
| System of quality control | Detection | Correction |
| Quality function | Inspection | Inspection and analysis |

Figure 1 Current and future status of company quality control efforts

For the majority of the companies I studied this process of change will take a very long time (5 to 10 years). Even if these companies are willing and have committed themselves to improvement, the process may be too lengthy, management commitment may disappear, or operators may become indifferent. It is therefore necessary to stress tangible results during every step of the process. I suggest the current industrial service centres like the Metal Industries Development Centre in Bandung should get a role in the execution of this programme [Bruijn 86].

The Use of Quality Control Circles

Can the QCC concept be used in this situation to enhance the success of improvement activities? Research has shown us that the QCC concept is not yet applicable in medium scale metal industries in Indonesia. The study describes three aspects hindering the introduction of QCC's in this particular context:

- As shown in figure 1, current quality control effort today is still totally product-oriented. The QCC concept can only bear fruit when company members can improve and control (process) conditions in their direct working environment. This is not possible yet in the medium scale metal industries visited.
- Japanese managers were the first to notice that in order to introduce successfully modern quality control concepts in their companies, it was inevitable to dismantle their Taylor-like organizations. This was possible because the premises of this management system had become obsolete in Japan. But nowadays in many developing countries including Indonesia, these premises still hold. The premises are: foreman and workman lack the technological literacy needed to plan work methods, to establish standards of a day's work, etc; the standard of living is so low that payments can provide a powerful stimulus to employees to meet standards; and the economic power of the employers is sufficient to prevail over employee resistance to this system of management. As long as these premises hold in Indonesian society and in the medium scale metal industries, the introduction of the QCC concept will be hard.
- In the companies visited no signs of employee participation or management delegation occurred. In [IQMA 90] is stated that 'it is necessary for employees to involve management in a two way communication, in which they are allowed to participate', and relating this to the current Indonesian situation 'as long as a condition like that has not been created yet, it will be extremely difficult to develop QCC's successfully'.

In this case the introduction of an adapted QCC concept in medium scale industries might be useful. As stated above an active role of company management in these industries is vital for the successful implementation of the three steps of improvement. But at the moment:

- management blames others and holds them responsible for product failures;
- management has little awareness and knowledge on the concepts of quality control;
- a lack of communication within management teams hinders mutual decision making.

I suggests that along with the three steps of improvement 'management quality control circles' (MQCC's) should be introduced. Every company could start with one MQCC containing the five or six 'top' managers. MQCC's on other management layers in the organization can be introduced at a later stage. These MQCC's are first of all directed towards the basics of quality control and should address four E-aspects:

- Education
Management can be trained in using simple techniques like Pareto and fishbone-diagrams for data analysis and process control.
- Experience
Management can gain experience by using and applying these techniques and tools to their own problem situation and with the help of experienced facilitators one can design company specific solutions.
- Ensemble
One can train mutual decision making and problem solving.
- Example
This management involvement in quality control activities might rouse interest in benefits of other quality control concepts and may serve as an example for employee involvement.

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By improving the performance of medium scale industries, their product quality level, and the management quality of their quality management, this sector may become a major force in Indonesia's industrial development process.

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