



1. G. ADEDOKUN, 2. T.K. AJIBOYE, 3. O.R. OYENIRAN

QUALITY ASSURANCE AS A STRATEGIC APPROACH TO MINIMISE MAINTENANCE COST

^{1,3}. Department of Electrical/Electronic Engineering Technology, Faculty of Engineering, Osun State College of Technology, Esa-Oke, NIGERIA

². Department of Mechanical Engineering, Faculty of Engineering and Technology, University of Ilorin, Ilorin, NIGERIA

Abstract: Entrepreneur's primary objective is to firmly established itself, maximize profit and minimize maintenance cost of its low-cost best quality products that will generate high demand while maintaining a continuous focus on cost-containment and operating efficiencies. This objective can only be achieved if the products' quality meets standard demand of end users. Many approaches to quality control are not effective. Nonconformities in the factory testing are caused basically by excessive process variation and mistakes. Some approaches to quality control can effectively control process variation, but it cannot prevent most mistakes because mistakes are frequently the dominant source of nonconformities. Since maintenance cost of any product is inversely proportional to its quality; hence, the quality and maintenance of any products cannot be over emphasized to attract their high demand. Experience shows many industrial activities collapsed when they were expected to be at the peak of their production performances and the outcome effect is that, they start to run at a huge loss when they were expected to make profit. Investments on structures will have impact on industrialization when the trend leading to this collapse could be reversed in order to enjoy the full benefits derived from it. Meanwhile, the only strategic approach to minimize maintenance cost is to maximize the quality. An attempt has been made in this paper to discuss maintenance cost minimization from the basics that detect mistakes and enable corrections before nonconformities are generated, achieving the highest degree of quality at minimum maintenance cost.

Keywords: maximize, profit, minimize, maintenance, cost, products, profit

1. INTRODUCTION

The main objective of any entrepreneur is to exploit profit and lessen maintenance cost of their products. Meanwhile, this objective can only be achieved if the products' quality meets standard and specification of end users. Hence, the importance of possessions quality and maintenance cannot be over emphasized to achieve maximum assets availability at minimum cost.

The modern thought of maintenance system is known as *tero-technology*, which is a total systems concept of maintenance. The British standards, BS 3811 (1993), defines *tero-technology* as a combination of management, financial, engineering, and other practices applied to physical assets in pursuit of economic life cycle costs. Industrialists have various ways on how to organize maintenance activities but there are no single best ways.

Quality is defined by Cauchy as conformance to requirement. It is also defined as the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs by International Standard Organization (Jimoh, 2011).

Over the years, many industries are set up with the aim of making profit on investment. But, these have not translated into any significant impact on the country's industrial development and the bane of industrialists has not been due to lack of investments on industry but to the collapse of the available one, as a result of lack of maintenance cultures. Examples in this respect abound in all the public and private established sectors (Obi, 2007).

The course to give way is inherited from the following factors:

- Product are conceived and brought with 'congenital' defects and malformations.

- The product shows instant signs of worsening after delivery, and is left unattended to keep the product in its innovative form.
- Thus, the maintenance cost to return the structure to its inventive form continues to rise in geometrical proportions which may lead to collapse of the structure.

Experience has shown that many industrial activities collapse when they were expected to be at the peak of their production performances. Outcome effect is that, industries start to run at a huge loss when they were expected to make profit. Investments on structures will have impact on industrialization when the trend leading to this collapse could be reversed in order to enjoy the full benefits derivable from it.

Maintenance cost of any product is inversely proportional to its quality (Obi, 2007); the only strategic approach to minimize this cost is to maximize the quality. An attempt has been made in this paper to discuss maintenance cost minimization from the basics and these basic tools can be used to appraise all resources (men, materials, machines, methods and processes) that will assist in maintaining the desired results.

2. OBJECTIVES OF MAINTENANCE

Many industries are set up with aim of making profit. In order to achieve this corporate objective, maximum outputs and good quality of their products have to be achieved at minimal cost (Olaleye, 2003). Maintenance is schedule to service production to achieve these goals. This involves ensuring the effort of the maintenance personnel in close collaboration with production staff:

- That the obtainability and efficiency of facility for quality production at minimal cost index are maximized
- That the means of assessing equipment performance through record keeping and formulation of equipment improvement action are achieved
- The founding of safe working environment
- That the designed life span of equipment is realized; and
- The quick gaining of manpower.

If these functions are not executed, production would be jeopardized.

In decision support, it is important to ask if maintenance is to modify the existing design, or is it for plant improvement modification design? These questions need to be answered and then an institution can proceed on to the next step. The next steps now include repairs either within the workshop capacity or beyond workshop capacity, spare parts procurement, and equipment weak point evaluation.

3. ENGINEERING MAINTENANCE PROBLEMS

It should be pointed out that maintenance, generally in this part of the world; has some constraints which hinder the smooth and effective running of any industrial set up. The most important of these constraints include:

- Non-availability of spare parts and consumables
- Lack of understanding of the maintenance crew
- Inadequate experience of engineering staff
- Inadequate training of engineering personnel thereby resulting in lack of exposure
- Manpower shortages
- Difficulty in getting foreign exchange to update equipment and procure spare parts
- Inadequate re-numeration for engineering personnel which leads to their non-commitment and at times nonchalant attitudes to work
- Lack of modern fault detecting equipment to monitor sensitive parts of machines like bearing and gears before resulting to failure leading to costly breakdowns.

4. QUALITY OF PRODUCT AND MAINTENANCE COST RELATIONSHIP

The less the defects or deformities in a structure at time of conception and delivery, the less the cost of maintenance during its life (Obi, 2007). Hence, the usefulness and longevity or otherwise of the life of a structure and the cost of upholding it, when in use, is determined by its quality at delivery. Thus, quality and maintenance cost are linked and inter-related. It can be noted that maximizing the former is the central means of minimizing the later. Since conception and delivery proceeds life, the strategic approach to minimize maintenance cost during life is therefore to maximize quality during conception, planning and delivery.

Therefore, if maintenance cost is to be minimized, the central thrust of approach is to ensure that the project response to these conception goals.

- a. Fruitful delivery of the structure with no or minimum flaws
- b. Competence of being put the structure into wanted used over a long period of time with little or no maintenance.

5. MINIMIZATION OF MAINTENANCE COST OF THE PRODUCT TECHNIQUES

In constructing any structure, the main resources involved are funds, personnel, equipment/tools and materials. In as much as maximization of quality results to minimization of maintenance cost, any strategies to minimize maintenance costs will dwell eventually on the effective use and application of these stated factors. The application of personnel and equipment on materials produces the structure, while funds are used to procure the other three.

Therefore, if a healthy qualitative structure is to be delivered, it is practically important to ensure the following from the basics (Obi, 2007).

- ✓ Good planning and design
- ✓ Employment of appropriate personnel
- ✓ Provision of appropriate equipment
- ✓ Provision of adequate funds and judicious use of it
- ✓ Quality assurance on materials and workmanship
- ✓ Effective enforcement of measures on budgetary control and quality assurance

Good Planning and Design

For any works, a proper plan and design must be touched and checked by professionals that are trained in the pertinent field, for if the design is faulty, the project will be delivered with congenital defects, which will increase maintenance's cost of the product during its life cycle.

Employment of appropriate personnel

The personnel are most important resource in executing any project. This is so, because they are to manage the resources, funds, operate equipment and also keep the equipment in operable conditions. Thus, if competitive projects are to be delivered on schedule and in healthy state, utmost importance, are the personnel.

Therefore, the employer must show and demonstrate ability in setting up and managing modern organization comprising of professionals of various categories. There must be the preparedness

to invest on the recruitment, training and motivation of personnel; that is, the head of the team must possess special skills and ability to organize, control, motivate, train and develop staff. Furthermore, the right categories of personnel must be employed.

All with primary aim of maximizing and sustaining their interests and, hence, enhance the quality of their works.

In addition, the employer must keep a happy work force such as there must be in place adequate immediate compensations for the skilled, semi-skilled/unskilled staff as they are to manage the resources on the project

Procurement of appropriate Equipment

Having the appropriate equipment is important if good quality product is to be delivered. When funds are available, necessary equipment can be procured, but when funds are not sufficiently available, the necessary equipment could be hired. They must, at all times be in operable conditions. In order to attain this optimum condition:

- (i) There must be a good storage of spare parts for the machineries/equipment
- (ii) A pool of experienced technicians who can effect, immediate repairs or replacement on this equipment must be taken into consideration.

This is a factor that bears significant, albeit indirect effect on the status of the delivery of the structure, and hence on subsequent maintenance costs.

Provision of adequate funds and judicious use of it

Availability of funds is an important factor to the success of any initiative product development.

For those who have been involved in product developments, the complaint is that insufficient funds are usually provided by policy makers. As a result, the operators end up with low quality, defective products with subsequent high cost of maintenance.

The view of this writer is that the failure of such operators to deliver has not been centrally due to lack of funds. Rather, the failures have been due to lack of accountability, and further to the lack of physical evidence to show, for the funds made available. Even, in the cases where there are

physical evidences on ground, these are usually of low quality. The result of this is that the public and the policy makers are neither impressed nor discouraged.

The situation on funding for product, especially in public institutions will improve when operators show results for every fund made available.

The above does not remove the fact that conscious efforts must be made to allocate sufficient funds for project so identified.

Budgetary Control

One of the major reasons for low quality product is due less to inadequate funding, but more to lack of financial discipline. The overall imprint is that funds for project developments are usually siphoned away through vouchers, with no consequences on ground. Invariably, policy makers do not allocate enough funds, all in belief that it is not worth it. Thus, to break this series, there must be a preparation that ensures a minimum level of expenditure control, so as to restore the sureness of the policy makers and the public.

When this sureness is restored, there will be fewer reserves to allocate or provide adequate funds. Operators can then proceed to produce good quality works.

In order to achieve this, before the beginning of works on any project

- (i) All work matters must be ascertained and obviously defined
- (ii) The quantities/amounts of each of the items must be recognized or at least fairly precisely projected by experienced personnel
- (iii) The cost of unit of each work item must be established using current market prices
- (iv) All these three factors will then be engaged to develop a 'Bill of Works Measurements and Evaluations' (BWME) and to obtain an overall estimate for the project in question.

Further in proceeding with the development of the project:

- a. Claims for all works executed must be backed by a BWME, specifying details and costs
- b. The work done so claimed must be inspected and certified by an Independent Department within or from outside the client's organization
- c. When the presentations claimed to have been done, have been adjudged satisfactory, both in

terms of the quantity and quality, the next level of request can be entertained by the funding authority.

Quality Assurance on Materials and Workmanship

Funds, personnel and equipment are applied to materials in numerous ways to produce the project. If the final product of these applications is to be healthy the procedures for the applications must meet professional standards; and the materials on which these resources are being applied must be of the standard quality. The same applies to workmanship. The standards are there, well-defined, and documented.

Good workmanship on poor materials result in poor quality product, so also is the application of poor workmanship; on good materials.

Thus, project leaders must at all times during execution comply with established standards both on materials and workmanship.

Enforcement of Quality Assurance and Budgetary Control Measures

The public is always deeply negative about investment on project as such investments either do not deliver, or in few cases, deliver with serious congenital defects. Either in the public or private sector, one fundamental drawback in the development of good quality job is lack of adequate budgetary and quality control measures. In most cases, the same department identifies the project, prepares the request for the project, prepares the request for the funds, receives the fund, executes the project, monitors and certifies the project. The drawback in this arrangement is obvious.

Therefore, if quality is to be assured, there must be an arrangement that provides for the enforcement of quality assurance and budgetary control measures:

- ✓ A section, separate from, and independent of, the executing section must be responsible for quality/budgetary
- ✓ The subdivision will be responsible for verifying, inspecting and certifying quantity and quality of work done.

If need be, the client may engage agents from outside the organization to undertake the assignments listed above. This is particularly so if there are not sufficient of the required personnel

within the organization. The Due Process Office is performing functions close to what is described above.

However, the present Due Process arrangement emphasizes more on budgetary than on quality control, and this is particularly so at the federal level. The texture, quantity and quality of the project is left with the Implementing Agency.

The thrust of the message here is how budgetary control can be employed as additional muscle to ensure and enhance quality.

It is instructive to note that the Osun State Due Process Office is a step ahead in this respect. Apart from budgetary control aspects, the office engages external experts in various disciplines to monitor and ensure quality of project being put in place by the government (Obi, 2007).

6. SUMMARY/CONCLUSION

In spite of the enormous investments of the country on infrastructures, the expected spin-off on industrialization remained indefinable, because, not long after installation, the structures collapse owing to lack of maintenance caused by prohibitive cost of putting aright inherent and congenital defects.

As the cost of maintenance tolerates inverse proportion to quality, the tactical approach to minimize maintenance cost, and safeguards catalytic effect of infrastructure developments on industrialization is to augment and exploit quality. Therefore, thought full labors must be made from beginning of works on the project through to completion to safeguard good quality works at every phase.

In command to attain this:

- a. A good plan of the project must be in place with clear descriptions of all work matters to be implemented.
- b. Appropriate Personnel and Equipment must be active in putting the project in place.
- c. Normal tests must be conducted on resources to inaugurate quality; also the rules and guidelines on workmanship must be severely engaged and trailed.
- d. There is need for restoration of mutual confidence between the operators and the policy makers.

- e. A preparation must be in place that provides for the implementation of budgetary control and quality assurance measures.

The general conclusion, so, is that:

- ✓ Decent planning and design,
- ✓ Service of appropriate Personnel and Equipment
- ✓ Provision of adequate funds and judicious use of its
- ✓ Quality assurance on materials and workmanship
- ✓ Real implementation of measures on budgetary control and quality assurance are vital active measures, which should be taken to maximize quality and ensure that projects are brought in healthy state. Consequently, the life of the product will be protracted, and the cost of custody it in its unique form will be reduced to the minimum. The product will therefore be in the place to play the expected catalytic role in the process of industrialization.

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University "POLITEHNICA" Timisoara,
Faculty of Engineering Hunedoara,
5, Revolutiei,
331128, Hunedoara, ROMANIA
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