

# SCM: THE SUSTAINABILITY-CENTERED MAINTENANCE (AN INNOVATIVE AND STRATEGIC APPROACH TO THE MAINTENANCE MANAGEMENT)

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## Abstract

Nowadays, all different areas in business world agree about the paramount importance of Maintenance Function. At the same time, the progressive worth of the Activity opens a greater number of ways pointed up to the conquest of its scientific status. Considering such issues, this paper deals with the Maintenance Management and the challenges that it has been called to respond, as a result of intricate scenarios where high competition, fast changes in social-economical environments and shortage of natural resources have to be faced by all organizations in search for survival and perennial continuity. Taking into account such concerns, the problems related to organizational Sustainability are analyzed in their typical nuances (environmental, social and economical), and an integrated model of Maintenance management system is proposed, in order to decisively contribute for the excellence in present and future corporate performance. Based upon a broad revision of the related literature to investigate the practices concerning the usual policies for Maintenance management, this innovative and strategic approach for the Activity is presented, with more extensive and integrated characteristics to be settled in complement to those traditionally used, to assure the business sustainability for all organizations. This model is called "*SCM: The Sustainability-Centered Maintenance*" and, in order to describe its functional process, influences of factors such as Quality, Training, Physical Resources, Management Performance and Maintenance Policies are herein analysed.

**Keywords:** Sustainability; Innovation; Management; Strategy; Maintenance.

## 1. Introduction

Along the history, human kind has been showing that its best efforts of development arise in times of crisis, when it seems that its creative potentialities most stand out and bloom. Maintenance, a typically human creation, could not escape from this context. Since its formal establishment, almost as a bastard daughter of the "*Production Empire*" installed by the Industrial Revolution, it has experienced impressive changes till arrive to the modern existing structures. Four milestones could be considered fundamental in signaling these changes, all of them born from the need of optimization imposed by crisis situations [1, 2, 9, 10]:

- Maintenance birth as Corrective Maintenance;
- Preventive Maintenance advent;
- Predictive Maintenance arising;
- Reliability-Centered Maintenance / Industrial Asset Management spreading.

Many other aspects are important in this process of continuous evolution - such as the development of Quality mentality, the Maintenance-Production integration stated in TPM (Total Productive Maintenance) philosophy and the progressive valorization of Training processes in the context - but this quartet can properly summarize the so-called "*crisis-powered progress*" [2].

Those past experiences and the planet's present situation, which experiences difficulties such as continuous reduction of natural resources, extremely severe problems related to global warming and the consequent absence of wide horizons, with 2.8 billion people living with less than US\$ 2.00 a day [8, 13, 17], allow the assumption of next-coming great conquests, could they be social, technological or even in the Maintenance area, which is being pointed out as the best investment for Sustainable Development [10].

Considering these incubated effervescence conditions and the Sustainability questions, imperatives and requirements, the effective conquest of science category by Maintenance shall be foreseen as possible, changing the Activity into the "*Systems Medicine*" [2, 3]. In this process, the participation of modern Maintenance philosophies and policies - such as Reliability-Centered Maintenance and Industrial Asset Management - is extremely important, as well as other strategies, methodologies, disciplines and practices which are occupying ever larger spaces in the workshops and offices of the Sector, but which have been still acting in a disordered and pulverized way [6, 9, 11, 16].

If all these efforts should be integrated and driven towards the education, qualification and empowerment of Maintenance professionals, promoting the necessary awareness for this deep transformation, the intended objective will certainly be very close, where that same specialists, traditionally accustomed to make "triggers", will finally play the role that was always reserved to them: the one of "*Systems and Machines Physicians*" [2, 3]. The performing ways of these disciplines - Quality, Training, Physical Resources, Management

Performance and Maintenance Policies - in questing for this proposed integration are discussed as follows.

## **2. The legitimate quality as a transformation agent**

The definition of Quality brings the meditation about clients' role in the proposed change: "*Adequacy to use*" [7, 9]. Thus, the clients must signalize, indicating the way to be followed by Maintenance to achieve the negotiated Quality level. This is the correct starting point for the implementation of a well-structured Quality Management System for Maintenance activities.

The required transformation to achieve this level necessarily passes by Maintenance professionals' awareness of the paramount importance of the final product - i.e., Maintenance services - with the expected Quality. The Maintenance crews will be proud of its work only if the correspondent contributions for the final product and Quality objectives are made clear to each one.

As the change of the Maintenance concept is proposed, the correspondent team workers will be placed at an evidence position. Just the discovery that they are being considered important will awake the motivation to participate actively in the process of change, in which they will become, in a first stage, real patients, even to acquire a complete understanding of their evolution to "*Systems and Machines Physician*" [2, 3]. After all, Pasteur had to inoculate himself to prove the efficiency of his discovery, and Freud to analyze himself to create his psychoanalysis technique [4].

As a consequence of this awareness, the engagement of all participants in the project of Function transmutation into the "*Systems Medicine*" [2, 3] can be more easily obtained, since it will have, in its behalf, the professionals pride, and, as a guarantee, their responsibility in calling to themselves the rebirth of Quality Assurance concept.

## **3. The role of training, qualification and empowerment**

For this Maintenance management approach, it shall be emphasized that the foreseen changes may not happen just in the conceptual side, but they must include deep alterations of behavioral order [7, 14]. All investment towards this proposed model will be fruitless if Maintenance personnel are not motivated to effectively participate in the related efforts [11, 12, 13].

In this context, Training appears as one of the solidest foundations in which the expected qualitative jump will have to support itself, in order to develop a new mentality, compatible with the role to be played by the Maintenance professionals. The new programs to be implemented must then worry not only about technical teaching, but also about the sociological issues which may be ministered.

Thus, a special care must be bestowed to the learning of relationship competences - interpersonal, with the

clients, with the machines and also with the environment [5]. It is necessary to understand that this new era will not allow the existence of large spaces for personal conflicts which might put in risk the spirit of integration, fundamental to the success of all Maintenance Organizations. The existence of a climate of harmony with the clients will also be of paramount importance; besides, the old axiom "*the client is always right*" will never be so true, and the Maintenance professionals shall understand and respect it, so that their new posture could also be respected and understood.

On the other hand, the relationship with the machines must incorporate remarkable modifications. The machines, devices and systems must be faced as true "*patients*" and, as so, they must be worthy of a very deep attention, even when a minimal problem arises. As we know from the medical experience, the disdain and disrespect with a patient leads, often, to his death

It is also important the acquisition of knowledge related to deal with the outside environment - physical, political or social. The Maintenance crews shall be mindful to these different outside influences and, for that, Training may provide them with subsidies to allow the internalization of a holistic view of the Activity and the environment in which it is inserted [6].

It is still relevant to highlight the position of Training concerning the conflict "specialization vs. general practice", where the programs to be ministered shall contemplate a large span of knowledge, skills and attitudes to establish appropriate competence levels [5] that may be more consolidated in activity areas considered as preferential, according to individual endowments.

## **4. The importance of physical resources as a bottom-line for changes**

A "*Systems and Machines Physician*" [2, 3] will not be able to work without the aid of instruments compatible with a scientific performance. Thus, the operational conditions monitoring will be the main support for the perfect carrying out of Maintenance attributions, assuring exact diagnosis of eventual malfunctions and definition of the best "*treatment*" to follow - from the prescription of "*common remedies*" (re-tightening, cleaning, balancing, alignment) up to the needs for "*surgical interventions*" (overhauls, replacements).

For that, the Maintenance organizations must depend on sophisticated instrumental for measurement, recording and analysis of operational parameters, as well as on qualified personnel to manipulate it. It is clear the word "sophisticated" always provokes shivers, since it is ineffaceable associated to high costs. However, the cost-benefit analysis within the scope herein presented is extremely advantageous, taking into account the objective of including the Maintenance Function in the Human Sciences list, with the consequent fundamental contribution to organizational Sustainability.

The important contributions of Information Technology must also be strongly considered in this changing

process. Since the computers introduction in Maintenance, in the 70's, a range of facilities ever larger has being offered to its professionals [15]. Nowadays, an impressive quantity of computerized tools - such as specific hardware/software, websites and on-line services in Internet for communication and spreading of similar problems and respective solutions in real time - is available for supporting the Function scheduling, execution, control and research. Thus, the proposed transformation will not happen without the massive employ of these resources, which the Maintenance crews must be entirely able to use, also to improve their own performance.

Nevertheless, good tools are not sufficient to have good professionals if they are not associated with good work practices [5, 7]. Thus, it will be also essential the establishment of job written procedures to compose an actual Maintenance Manual, holding the description of "how" to execute each task and, as a consequence, allowing jobs systematization, better evaluation of teams efficiency/productivity and better work scheduling. As a real case of Function valorization, with favorable deployments for business Sustainability, it can be quoted the Maintenance procedures included in the Operations Manual of ELETRONUCLEAR Angra 1 and Angra 2 Nuclear Power Plants, in the Southeast of Brazil - a legal requirement that decisively contributed to modify the local Maintenance organization profile.

## 5. Leadership/management performance in questing for the new order

Considering the characteristics of these postulated attitudes for Maintenance personnel - proactive participation, awareness, engagement and ownership - and taking into account that the change is a process which must be deeply assumed by the "patients", an autocratic management seems to be out of tune with the proposed model, since an authoritarian posture from the leader will certainly inhibit the creativeness, spontaneity and involvement of the crew. Thus, there is a style of management well-defined for this proposal: the sharing leadership, with decision authority and adequate support provided by the corporate administration [2, 4, 10].

The success of Maintenance personnel as "*Systems and Machines Physicians*" [2, 3] depends on cooperation, mutual trust, responsibility and discipline, and these values are often susceptible to inadequate management performances. Thus, the model conduction in the approach herein proposed seems to be absolutely vital, and, for that, the Maintenance Manager must consider the establishment of a "*Systems Psychology*" [2, 3], with duties similar to the ones of a psychoanalyst. It is necessary to know how to "*listen to man-machine systems*" to find out how it "*thinks*", in order to correctly act upon to improve it. Therefore, the "*psychological managers*" must also worry about the social aspects of their personnel, avoiding "ready" and imposed attitudes, ignoring the conventional and searching new angles of vision, the detail, the motivation, the involvement with commitment, to allow the development of the required climate of confidence, harmony and respect to sustain the ideas already described.

Taking into account this context, the modification to be introduced must occur as much in execution and supervision personnel as in Managers and Leaders, which will lead different crews with rebuilt posture and mentality, requiring new shared and integrated management attitudes. For that, a very important role is taken by a correct, efficient, intelligent and adequate Communications process, in order to align the Manager's messages with the new interlocutors' attitudes [4].

## 6. Choosing the best maintenance policy

In order to obtain the maximum fitting of Sustainability-Centered Maintenance into the analogy herein proposed, it seems to be extremely necessary to integrate all existent Maintenance policies in a well-structured model, with the work practices being very similar to the ones adopted in Medicine - such as the equivalency between systems monitoring and the medical check-ups for human malfunctions detection. Therefore, trending analysis of monitored operational parameters allow to identify "*diseases*" symptoms, which, allied to equipment history assessment (the anamnesis), conducts to more accurate "*diagnosis*" (determination of root causes) and to prescription of the best applicable "*therapy*" in each particular case, enabling more precise ("where" and "how") and opportune ("when") interventions.

To meet these recommendations, it is still fundamental the active participation of SCM in all stages of every project, as well as Medicine itself does, where the human medical attendance is carried out since conception and gestation ("*design*") until adult phase ("*production*"), passing through childhood ("*erection*") and adolescence ("*commissioning*"). Why do not do the same with the "*Systems Medicine*" [2, 3]? Doubtlessly, if the Maintenance policy procedures are structured within this framework, a great jump should be done in the direction of a better quality for the products and services, besides a lower consumption of the necessary production resources, optimizing the increase in business Sustainability.

## 7. Conclusions - institutional and strategic questions associated to SCM

Nowadays, when institutional and strategic questions of paramount importance - such as global warming, sustainable development, safety, environment, health and planet lasting - are deeply discussed worldwide [12, 13], it seems that strong transfigurations will still arise, demanding paradigmatic modifications, methods revision, advanced forecasting evaluation and new values/beliefs adoption.

This context clearly indicates that one of the best strategies to be followed by any organization is to spend a large amount of its resources and investments in establishing appropriate and favorable conditions to an effective implementation of the **Sustainability-Centered Maintenance**.

Being so, this paper was aimed in pointing out the excellent perspectives for an innovative and strategic

approach to the Maintenance management, plotting an analogy between the Function and the human science which is closest to it: the Medicine, which can clearly be defined as "Maintenance of the Human Being", with SCM being therefore considered as "Systems Medicine"<sup>®</sup> [2, 3]. As it was herein described, such a new focus for the Activity will not happen just in the conceptual field, but must fundamentally occur in the behavioral side of the question, through the mentality, posture and attitude changes of all Maintenance members.

The efforts to implement this proposal shall not come forth in an isolated form. Doubtlessly, to assure consistent results, an integrated and systemic approach in all related areas is mandatory, responding to present corporate challenges, decisively contributing to business Sustainability and offering the conditions for the consolidation of an advanced technology, which will be perfectly structured to improve the quality of human life all over the world.

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