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IMPROVEMENT OF PRODUCTIVE QUALITY THROUGH WORKPLACE DISCUSSION SPACES: THE CASE OF A METAL-MECHANICAL SECTOR COMPANY

Letícia Anselmo de Mattos: leticiacoc@gmail.com; UNIFEI-Itabira
Raoni Rocha Simões: raoni@unifei.edu.br; UNIFEI-Itabira

ABSTRACT

This work was developed at the Assembly/Disassembly station of an electromechanical engine maintenance company, in which there was a gap between management and operation that made it difficult to solve problems, demanding the construction of a better articulation between the two realities. For this purpose, a Workspace Debate was implemented in the
company, so that the operational experience could be integrated into the management strategies, and viable solutions for the identified field problems could be built together. To achieve this goal, an Ergonomic Workplace Analysis (EWA) was carried out, which elucidated a series of regulations and operational strategies — unknown to management — and adopted to protect the production process and the health and safety of workers. One of these regulations was then taken to a Workspace Debate, built to deepen the discussion on operational problems and, above all, to build collective solutions. These results point to an increase in the effectiveness and quality of work when the debate about real work situations is fostered within the organization.

KEYWORDS: dialog, engine, Ergonomic Workplace Analysis, regulations, Workspace Debate.

1. INTRODUCTION

The present study was conducted in a company specializing in the maintenance of small, medium, and large engines. The specific workplace under investigation is the Assembly/Disassembly station, which marks the beginning and end of the engine maintenance line. The mechanics in this department are responsible for disassembling the engine, distributing its various components to other sectors of the company, as well as assembling the engine again at the end of maintenance.

Similar to any organization, there were two distinct logics coexisting within this company. On one side, there was the technical perspective of managers, engineers, and programmers. On the other side, there was the practical viewpoint of field operators who constantly deal with real work and its challenges (LIMA, 2005). It is noticeable, however, that despite sharing the same space, these groups lose the ability to interact with each other and discuss the work.

Discussing work-related issues can bring to light situations that require improvements and the possible solutions found to resolve them (ASSUNÇÃO; LIMA, 2002). While the need for dialogue between different sectors of the company is acknowledged, in practice, there seems to be a distance between them, leading to what is referred to as "Organizational Silence" (MORRISON; MILLIKEN, 2000). This is defined by the lack of disclosure, by those working in operational fields, of work-related risks to those who can address them. In other words, issues identified in the field remain there without the management being aware of them.

Therefore, the objective of this study was to implement a "Workplace Discussion Space" or WDS (ROCHA, 2014) methodology in the company. This qualitative and participatory approach establishes formal spaces within the company for discussing real work. By valuing the expression of the workers, the aim is to gain a deeper understanding of operational problems and construct more effective solutions.

Thus, in an effort to bridge the gap between operations and management, the goal was to give voice to the mechanics in the studied department, connect them with company management, and, based on their knowledge, optimize the organization's procedures. The ultimate aim is to improve the health and safety of individuals and the overall process.

2. METHODOLOGICAL PROCEDURES

This study was conducted at the Assembly/Disassembly station of a company specializing in electrical and mechanical engine maintenance, which consists of 5 assembly mechanics. The starting point for this study was the development of a Work Ergonomic Analysis (WEA) (GUÉRIN et al., 2001), aiming to comprehend the work performed by the assembly mechanics in the company and understand the adopted regulations. This stage lasted for 4 months, involving weekly visits to the company, each lasting approximately 4 hours.

Interviews were conducted with key individuals, including the manager, production supervisor, occupational safety technician, and the five mechanics involved. These interviews aimed to deepen understanding of the overall functioning of the company and the specific work station under analysis.

The focal point of the visits was the observation of the mechanics' activities. As will be demonstrated in the results, data derived from this method elucidated various individual and collective regulations. Despite being a fertile ground for the development of regulations that could facilitate and improve activities, it was noted that many of these regulations were not even known to the management.

To address this gap, a qualitative method centered on valuing the workers' experience and knowledge was adopted: the Workplace Discussion Spaces (WDS).

This method aims to institutionalize informal discussions among workers, allowing field knowledge to contribute to management practices. Weekly WDS sessions were implemented directly at the workplace, lasting approximately 15 minutes each, for a continuous period of 3 months, initiated immediately after the completion of the WEA diagnosis.

The meetings involved the researcher, acting as the discussion mediator, the 5 mechanics from the department, and the production supervisor, thus structuring the WDS within the organization.

3. RESULTS

3.1 The WEA Revealing Operational Regulations

Observations on the work revealed that workers adapt, based on the unpredictable variables of daily tasks, to achieve production goals. These adaptations are divided into two categories according to their underlying objectives: regulations aimed at the efficiency of the production process and the preservation of the health and safety of individuals.

3.1.1 Regulations aimed at the efficiency of the production process: developed to ensure that performance and work quality are not affected by variabilities.

a) Manual loading of engines and parts

Although the company has a mobile bridge for loading engines and parts, there is a consensus among the mechanics to manually load whenever possible, even in pairs. The justification is the impracticality of the bridge and the consequent excessive time spent operating it. There is also a concern about the possibility of the bridge hook damaging the copper wires that make up the electrical part of the motor, located inside the casing. This could lead to the need to redo the entire electrical part, causing rework and subsequent resource loss.

Therefore, whenever a mechanic needs to transport a part or engine, they seek assistance from a colleague, and the transport is done in pairs without using the mobile bridge. According to the mechanics' perspective, this strategy results in an advancement in service and an improvement in its quality. This is because the time spent operating the mobile bridge is saved, and the risk of damage to the electrical system is reduced (Figure 1).

Figure 1 - Manual loading of engines in pairs

Source: Author's own (2016)

b) Sharing of tools

The Assembly/Disassembly department has five workbenches, each equipped with a toolbox. These workbenches are not assigned to specific mechanics, so any of the mechanics can use any of the workbenches. However, it often happens that the necessary tool for a particular task

is missing from the toolbox of the workbench they are using, causing delays or even making the service unfeasible.

To overcome this variability, which occurs frequently, the mechanics have an arrangement to borrow tools from their colleagues. This way, everyone can have access to all the tools they need to perform their maintenance tasks.

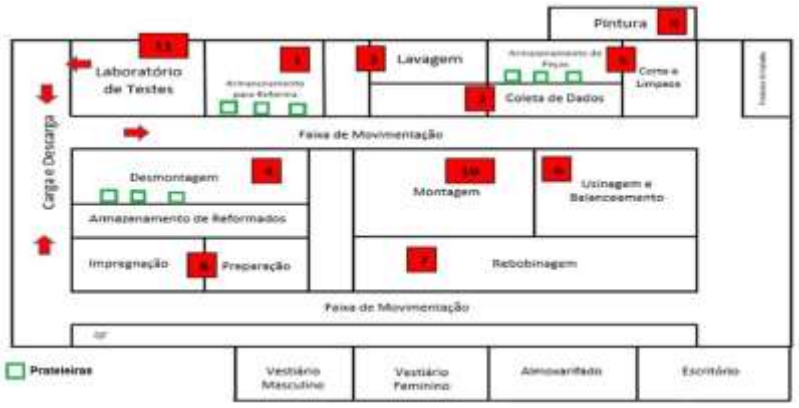
Regarding this tool-sharing arrangement, one of the mechanics expresses, "When we first arrived at the company, there weren't enough tools for everyone, so we all shared tools. Now, each of us has a toolbox at our workstation, but there are still missing tools in the box. So, we have to borrow from a colleague at another workstation."

3.1.2 Regulations created for the preservation of health and safety during the execution of work: developed by mechanics to ensure that the performance of their work activities does not result in accidents or occupational diseases, whether in the short or long term.

a) Heavier engines on the nearest shelves

The company in question has a warehouse-like structure, and the shelves that make up the Storage department are scattered throughout the floor plan, as shown in Figure 2.

Figure 2 - Company layout and arrangement of shelves



Source: Author's own (2016)

A Figura 2 illustrates the shelves available for storage scattered throughout the company (small green squares). The numbering indicates the most common order in which engines and parts move through the sectors for maintenance, although variations are possible. As can be seen, some shelves are located very close to the Assembly/Disassembly department, while others are more distant.

As a strategy, the mechanics have designated the shelves closest to the engine and heavier parts section. This helps avoid carrying loads over long distances since they prefer manual loading whenever possible.

Therefore, when there is a need to move to the more distant shelves, it is done without carrying excessive loads.

b) Heavier engines are placed at the bottom of the shelves.

The shelves accommodate parts of different sizes and weights. Heavy parts, if placed in certain areas of the shelves, can destabilize the structure and pose a risk of tipping, leading to serious accidents if they fall on a worker.

Aware of this, the mechanics have developed the strategy of placing heavy parts at the bottom, in the first divisions of the shelves, to provide stability. This way, other parts can be placed in the upper compartments without the risk of tipping. One of them expresses their approach to organizing the shelves, stating: "If we put a heavy part at the top, the shelf might tip over. So, we put it at the bottom to provide stability for placing the others higher up." Thus, the mechanics prevent accidents and avoid the need to lift the heaviest parts and engines to the top of the shelves.

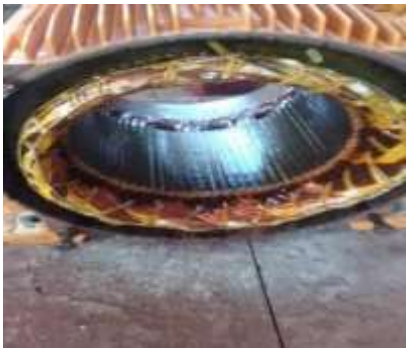
3.2 Work Discussion Spaces: Deepening Understanding and Crafting Solutions

Among all the regulations identified in the previous phase, one was selected for in-depth discussion and seeking a collective solution in a work discussion space: the manual loading of engines and parts. This situation was chosen due to a failed attempt at a solution by the manager and the significant losses associated with this issue. The results of this discussion will be described below.

During the engine maintenance process, it is disassembled, and its components are allocated to different departments. While one treatment is applied to the shaft, another is applied to the casing. At the final assembly stage, the two components are reconnected in the Assembly/Disassembly department. The shaft is transported to the workbench using the mobile bridge and then fitted into the casing placed on it.

The issue arises because the casing houses the most sensitive part of the engine: the electrical system, consisting of a series of copper wire connections that can be easily damaged. If a single wire is broken, the entire electrical part (Figure 3) must be redone, leading to rework and, consequently, resource loss.

Figure 3: Electrical part of the engine enclosed by the casing



Source: Author's own (2017)

At the moment when the shaft is to be placed in the opening of the casing, any vibration of the bridge causes the shaft to sway and collide with the electrical wiring. This collision can break one of the wires, causing complete damage. Because this is a serious issue, the process of joining the shaft to the casing creates tension among the workers, leading two mechanics to manually guide the shaft into the correct position towards the casing

Figure 4 - Manual assistance from mechanics during engine fitting

Source: Author's own (2017)

Thanks to the protection strategies developed by the mechanics, damage to the electrical part is not frequent. However, when it does occur, it has serious consequences and deserves attention: besides rework and resource loss, there have been instances where damaged engines were sent to customers, resulting in the loss of bids.

Due to these issues, a previous attempt was made by the company to solve the problem. The manager, armed with his knowledge in Mechanical Engineering, independently developed a protection for the electrical part. This protection involved using an insulating material to surround the electrical part, intending to shield it from potential mechanical shocks from the shaft. However, the idea failed because the material used was too malleable and did not absorb impacts, leading to damages despite its presence.

One of the mechanics commented on the management's attempt to solve problems in isolation, stating: "This always happens... he (the manager) does something without talking to us, and when you see it, it doesn't work." This practical example underscores the need to incorporate the knowledge and experience of field operators in building improvements, a goal that the Work Discussion Spaces (EDT) aim to achieve.

Therefore, the discussion space became a tool used to bridge management and operations. Through the discussion between the two parties, a new protection solution was conceptualized. As a result of the debate, collective solutions were proposed regarding the necessary characteristics of the protection: it should be rigid to withstand the impact of the hook, flexible to mold to the cylindrical shape of the casing, soft to avoid damaging the wiring itself, adjustable to fit all motor sizes, and thin, as the space between the shaft and the casing is small.

5 CONCLUSONS

This study validates the need to incorporate the knowledge of field workers in the company's decision-making. It demonstrates that, despite the norms and rules that workers must adhere to, losses in the maintenance process are avoided not due to the efficiency of these norms, but because workers, armed with their experience, individually or collectively construct strategies to "bypass" variabilities and make the work happen in the best possible way, despite the adversities brought by the environment.

This reaffirms Borges' statement (2004) that "work, in fact, is never just mere

execution" (p.43). In reality, individuals imprint their knowledge and values on it, trying in every way to ensure quality in the service they provide while seeking to protect themselves.

Moreover, it was possible to perceive that simple and economically viable actions can make a difference in the daily life of a company, such as fostering open and frequent discussions about work, involving all those involved in its performance.

Finally, this research presents some limitations: it requires interest from all participants to actively engage in the proposed methodology, sufficient time for all participants to step away from their activities and participate in the discussions, the continuity of Work Discussion Spaces (EDT) beyond the research period, and the ongoing commitment of the company and its collaborators to continue discussing ideas, elucidating problems, and building solutions on their own.

REFERENCES

ABRAHÃO, J. Reestruturação produtiva e variabilidade do trabalho: Uma abordagem da Ergonomia. **Psicologia: Teoria e Pesquisa**, Brasília, v.16, n.1, p. 49-54, jan/abr. 2000.

ARAÚJO, L. G. **Tecnologias de Gestão Organizacional**. São Paulo: Atlas, 2006.

ASSUNÇÃO, A. A.; OLIVEIRA, A. D. Intensificação do trabalho e saúde dos professores. **Educação & Sociedade**. maio/ago., 2009. Disponível em: <http://www.redalyc.org/articulo.oa?id=87313702003>. Acesso em: 22 fev. 2018.

ASSUNÇÃO, A. A.; LIMA, F. A. P. A contribuição da ergonomia para identificação, redução e eliminação da nocividade do trabalho. In: MENDES, R. (Org.). **Patologia do trabalho**. 2. ed. São Paulo: Atheneu, v. 2, p. 1767-1789. 2002.

BORGES, M. S. Trabalho e gestão de si – para além dos recursos humanos. **Caderno de Psicologia Social do Trabalho**. v. 7, p.41-49. 2004.

DETCHESSAHAR, M. Quand discuter, c'est produire... Pour une théorie de l'espace de discussion en situation de gestion. **Revue Française de Gestion**, n. 132, p. 32-43, 2001.

GUÉRIN et al. **Compreender o Trabalho para Transformá-lo: a prática da Ergonomia**. 1.ed. São Paulo: Blucher, 2001. 200p.

LIMA, F. Norma e Atividade Humana: modelos dinâmicos da prescrição e historicidade das situações de trabalho. **Trabalho e abordagem pluridisciplinar,** Campinas, p.51-68, out. 2005.

MOLLO, V. Uso dos recursos, adaptação dos saberes e gestão da autonomia na decisão terapêutica. **Revista Plur(e)al**, v. 1, n. 1, p.28-31, 2005.

MORISSON, E.; MILIKEN, F. Organizational silence: a barrier to change and development in a pluralistic world. **The Academy of Management Review**, v. 25, n. 4, p. 706-725, 2000.

REASON, James; PARKER, Dianne; LAWTON, Rebecca. **Organizational controls and safety: The varieties of rule-related behaviour**. Journal of occupational and organizational psychology, 1998. 297 p.

ROCHA, R. Du silence organisationnel au débat structuré sur le travail: les effets sur la sécurité et sur l'organisation. 2014. **Tese (Doutorado em Ergonomia) – Universidade de Bordeaux**, Bordeaux, 2014.

ROCHA, R.; MOLLO, V.; DANIELLOU, F. Work debate spaces: A tool for developing a participatory safety management. **Applied Ergonomics**, 107-114. 2005.