

Implementation of the Google Site Tool for Viewing the Maintenance Project Management.

Implementación de la herramienta Google Site para visualizar la gestión de proyectos de mantenimiento.

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ABSTRACT

Keywords:

Asset management, maintenance, reliability, work orders.

In this research work, the Google site tool implementation was carried out to manage maintenance activities and projects in a company dedicated to the production of meat elements located in the department of Cesar in Colombia. To achieve the correct use of the tool, was necessary analyze the management of the company's current assets, by collecting information through maintenance work orders, manuals, technical sheets, knowledge of inspectors, mechanical operators, and information obtained from the internet. Considering the above, all the procedures used by the company were integrated into the Google site online tool based on the accuracy and reliability of the work carried out by the maintenance group The above with the aim of guarantee the visualization of maintenance management remotely and anywhere correctly evaluated the traceability of the information, which contributes to the future of best practices in the activities of maintenance and management of assets and documents, which is reflected in the continuous improvement for the company.

RESUMEN

Palabras clave:

Confiabilidad, gestión de activos, mantenimiento, órdenes de trabajo.

En este trabajo de investigación se llevó a cabo la implementación de la herramienta Google Site para gestionar las actividades y proyectos de mantenimiento en una empresa dedicada a la producción de elementos cárnicos localizada en el departamento del cesar en Colombia. Para lograr el correcto uso de la herramienta, fue necesario analizar la gestión de los activos actuales de la empresa, mediante la recopilación de información a través de órdenes de trabajo de mantenimiento, manuales, fichas técnicas, conocimiento de inspectores, operadores mecánicos, e información obtenida de internet. Considerando lo anterior, todos los procedimientos utilizados por la empresa fueron integrados en la herramienta online de Google Site basándose en la exactitud y confianza del trabajo realizado por el grupo de mantenimiento. Lo anterior con la finalidad de garantizar la visualización de la gestión de mantenimiento de forma remota y en cualquier lugar evaluado de forma correcta la trazabilidad de la información lo que contribuye al futuro de mejores prácticas en las actividades de mantenimiento, gestión de activos y documentos, lo que se ve reflejado en la mejora continua para la empresa.

1. Introduction

One crucial factor in most companies is equipment, machines, and facilities maintenance. This is because maintenance helps to extend the lifespan of machine components and tools, hence lowering the requirement for spare parts, operational expenses, and maintenance shutdowns [1][2]. Thus, a failure mode is specifically characterized as the occurrence of functional breakdown in systems or components [3][4]. Identifying every potential failure mode of the analyzed object is a crucial aspect of failure mode and effect analysis

(FMEA) in reliability design [5]. Presently, there is a greater emphasis on failure mode research in electronic systems compared to mechanical systems since electronic components have a singular function, resulting in limited and predetermined failure modes. Additionally, there is a wealth of existing basic data, specifications, and standards in this field [6].

Accurate prediction capability of mechanical system hazards can greatly enhance the task of predictive maintenance.

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Yet, accurately forecasting system dangers is a reasonably straightforward task that necessitates taking into consideration the frequency of failures and their modes of occurrence. Therefore, when there is limited or no historical failure data available, it becomes challenging to determine the potential failure modes of mechanical system components [7][8].

The maintenance area is equipped with specialized tools and components that enable a faster and more effective preventive and/or corrective maintenance service across the entire plant/company/industry, which are designed to collect information following the standards of all maintenance activities [9]. So as to carry out maintenance activities, an initial assessment is conducted to identify potential areas for improvement, as well as strengths and weaknesses, which aims to ensure the overall effectiveness of the maintenance department and to test the reliability of the services provided by the contractor, Meiker, for the available pieces of equipment in the cold storage plant [10].

This research project focuses on objective 9 of sustainable development, (which is Industry, Innovation, and Infrastructure) [10], as an improvement of maintenance activities that are currently done manually in the company has been evident and has stimulated dynamic and competitive economic forces that create jobs and income, and made easy the adoption and promotion of new technologies and international trade, as well as promote the efficient use of resources, since it recognizes the importance of building resilient infrastructure, promoting sustainable industrialization, and fostering innovation.

Ultimately, in this technical research project, the Google Site tool was implemented for viewing the maintenance project management carried out by the contractor Meiker under the rationale of managing maintenance to promote proper procedures when reaching agreements with customers or companies, which is crucial for maximizing efforts in providing efficient and high-quality service by ensuring excellent results. Similarly, this tool plays a role in advancing the implementation of optimal methods in maintenance activities, as well as in managing assets and documents.

2. Methods and Materials

2.1. Maintenance Activities

Maintenance refers to a set of methods that aim to preserve equipment and facilities for as long as possible, ensuring they operate at their best, remain in good shape, and fulfill their intended purpose. Maintenance has been adopted since the early 1800s, undergoing many stages to optimize processes. During the early stages of the Industrial Revolution, the operators were responsible for repairing the equipment. However, as the machines became more durable and

maintenance became more sophisticated, companies started to focus more on asset maintenance (asset management). The establishment of the initial equipment maintenance departments in companies did not depend on waiting for equipment failure to occur before implementing corrective measures. Instead, the focus was always on maintaining the equipment in optimal condition, maximizing its operational lifespan, and minimizing failures during operation (availability) [15].

Once the list of the company's equipment that requires maintenance is determined, the specific location of each item and its significance in the maintenance process are identified. The subsequent measure to be taken into consideration for the upkeep of the equipment in its prime state involves considering the many sorts of maintenance that are usually employed.

- Corrective maintenance.
- Preventive maintenance.
- Predictive maintenance
- Statutory Maintenance
- Reliability-Centered Maintenance (RCM)
- Total Productive Maintenance (TPM)

Typically, in the industrial sector, maintenance focuses on reliability, which means that maintenance management follows a philosophy that determines the timing of activities for the most important assets in an operational environment [16].

Reliability-centered maintenance (RCM) is a systematic approach to managing operations and maintenance by creating structured programs that prioritize equipment reliability, considering its design and construction. The RCM approach offers a very efficient maintenance program specifically tailored to preserve the initial reliability of the equipment and, consequently, its availability [16]. Given the information provided above, it is important to consider the following considerations.

- Remove mechanical failures.
- Reduce labor expenses in the repair process by ensuring maintenance managers effectively prevent machine malfunctions.
- Facilitate the collaboration and synchronization of production departments through the implementation of scheduling and maintenance practices aimed at optimizing plant efficiency.
- Enhance direct operating profit by minimizing maintenance expenses.
- Share reliable sources that provide information on factory output capacity by assessing the current condition of plant machinery and equipment.

However, TPN is specifically developed to ensure continuous operation of machinery and equipment in

order to optimize overall plant efficiency. It is particularly effective in situations where there are minimal breakdowns and a significant amount of downtime, which can result in substantial financial losses. TPM, or Total Productive Maintenance, refers to the maintenance activities carried out by all employees in a business, ranging from operators to top management. The goal of TPM is to enhance equipment performance and availability in a safe manner. [16]

The implementation of TPM fosters a sense of shared responsibility within the team, motivating the company's employees to actively and proactively engage in ensuring equipment availability. The conventional TPM methodology, seen in Figure 1, was established during the 1970s and integrates the 5S philosophy as a novel concept and encompasses eight fundamental activities, commonly referred to as pillars.

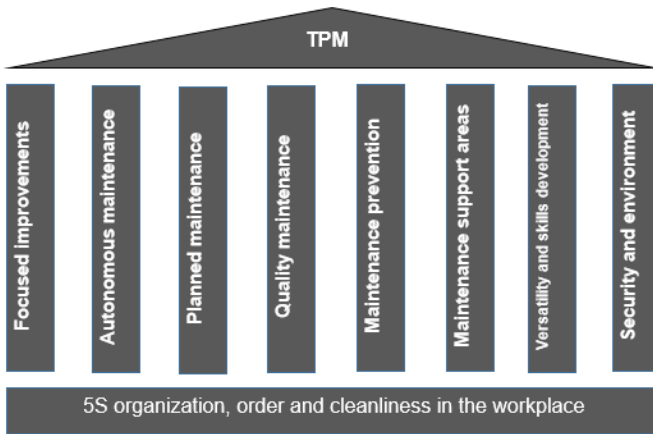


Figure 1. TPM Approach and Classification. Source: [17].

The 5S is a work philosophy implemented in workshops and offices, which focuses on promoting order and cleanliness, as well as identifying anomalies in the workplace. Its simplicity allows for individual or team participation, intending to enhance the work environment, ensure the safety of individuals and equipment, and improve the overall productivity of the company [18].

Figure 2 presents a concise overview of the 5S philosophy, which outlines the specific elements of Japanese culture that provide structure and coherence to maintenance work dynamics. Sorting involves eliminating any unnecessary items from the workstation. Set in order: eliminate any non-essential items in the workspace. Shine, elevate the degree of cleanliness in the various areas. Standardize: establish a uniform criterion for the preceding three processes and, finally, Discipline: ensure consistent application of standards.

JAPANESE WORD	TRANSLATION	BENEFITS
SEIRI 整理	ORGANIZE OR CLASSIFY	Reduce interruption in production flow Faster response times Free up physical space Decrease defects Reduced stock management Create safe work areas Reduce risk factors Improve accountability and commitment
SEITON 整頓	ORDER	Eliminating accidents caused by items left in places where they should not be Reduce the likelihood of making a mistake when trying to locate an item Create a culture or visual thinking that helps to establish and act based on standards and visible signs used for the location of elements.
SEISO 清掃	CLEAN	Increased useful life of equipment and installations Reduced likelihood of contracting diseases Fewer accidents Better appearance Help to avoid further damage to the ecology
SEIKETSU 清潔	STANDARDIZE	Knowledge produced over the years is stored Improving the well-being of the personnel by creating a habit of keeping the work place spotless on a permanent basis. Operators learn to know the equipment and work elements in depth. Cleaning errors that can lead to accidents or unnecessary occupational hazards are avoided.
SHITSUKE 躰	DISCIPLINE	Avoid reprimands and sanctions Improved operator efficiency Personnel are more appreciated by managers and colleagues Improve our image

Figure 2. 5S Philosophy. Source: [18].

2.2. Unit Diagnosis

The company's maintenance or project group is responsible for planning and designing activities that promote worker safety awareness, ensuring compliance with safe procedures at work, and lastly, overseeing the collection of information from technicians through daily reports of each activity, Maintenance Work Orders (OTM), OTM Compliance, Weekly Maintenance Routes, Schedule of activities, and Equipment Life Sheets, etc.

In light of the above, it is crucial to engage in activities that support the implementation of the Google Site tool for viewing the management of meat food maintenance projects in the Meiker contractor, as this tool serves as a key element in creating a platform for projects, team websites, public websites, and more, all without the need for designers, programmers, or computer specialists, which greatly simplifies asset and maintenance activity management for the company and maintenance group.

Table 1 outlines the diagnosis of the maintenance group using the SWOT matrix, a tool that aids in identifying the company's vulnerabilities, opportunities, strengths, and threats, as well as establishing the key areas of work.

Table 1. Matrix Analysis DOFA

WEAKNESSES	OPPORTUNITIES
Insufficient organization in the execution of maintenance plans. Absence of a plan for development. This indicates that adhering to the predetermined deadlines for executing the necessary tasks is impracticable.	Consistently enhance the methodology for conducting planned activities to reduce the duration of machine and equipment execution Organize the employees' schedules to optimize the efficiency of their tasks and therefore productivity
STRENGTHS	THREATS
We have highly skilled professionals with vast expertise in maintenance across multiple industries, ready to promptly carry out any necessary procedures that may arise. Our team of specialists enables us to offer support in addressing any issues that may arise in the field.	Inadequate intervention by the mechanic during equipment maintenance Omitting maintenance procedure and scheduled operations.

Maintenance activities for equipment, machines, and facilities are crucial for companies as they extend the lifespan of these assets and reduce the need for spare parts, costs, and maintenance work. The contractor Meiker, offers manufacturing, assembly, maintenance, and design services for the meat products (cold storage plant) in Aguachica, whose aim is to offer comprehensive solutions to support the continuity and growth in the maintenance process and in workplaces such as metalworking, welding, electricity, and painting by conducting technical and scientific training studies to enhance project management skills. The Google Site tool was utilized due to its cost-free and web-based nature, which enables the creation of a website where users can conveniently assemble a wide range of information, including videos, calendars, presentations, files, and texts, in a centralized and efficient manner. However, the benefits of utilizing digital technology for maintenance have significantly increased due to advancements in plant development over the past few decades. Additionally, the emergence of the Internet has provided access to more crucial tools and information. Many managers, particularly, across the country utilize digital solutions to oversee equipment status and mitigate performance concerns in maintenance management because customers in this industry have grown accustomed to immediate service and the ability to obtain current information in real-time [19].

Through the use of digital technology, processes can be monitored from a distance, enabling operations teams to implement predictive maintenance, which allows issues to be identified and resolved before machines experience a breakdown. Digitization also enhances the knowledge of maintenance teams on their equipment, particularly when combined with reality. An essential element in the development or implementation of maintenance tools is to formulate a strategic plan that facilitates the incorporation of maintenance teams responsible for multiple sites that necessitate access to asset data. Also, it is crucial and

indispensable that the information can be readily exchanged among team members to guarantee informed decision-making. In addition, contemporary communication solutions, both nationally and internationally, can transmit notifications to desktop computers, laptops, tablets, and smartphones so that staff members can promptly access equipment from any location.

3.Outcomes and Discussions.

3.1. Collection of data regarding maintenance operations

At first, data on equipment and machines were gathered from manuals, technical data sheets, input from inspectors, mechanics, operators, and information obtained from the internet. This information was then used to implement the Google Site tool for viewing maintenance project management at the Meiker contractor's cold storage plant.

Once the area and location of the equipment and/or tools, as well as their operation and current condition, are known, the process of developing maintenance tasks begins, as this involves organizing all the information into different sections and designated areas to ensure better control and facilitate the development and specification of maintenance planning activities. On the other hand, firstly, it is initiated the tour by examining the various tasks carried out by the contractor, including the upkeep of the corrals, corral chute, weighing scale, hydraulic pumps of corrals, unfit cattle elevator, and chute associated with the chute and corrals, Secondly, it is explored the desensitized area, which encompasses stretcher boxes, spiral downspouts of cattle hobbles, sinks, sterilizers, rails, metal platforms, pneumatic platforms, cold water and hot water piping, sterilizers, rails, metal platforms, and pneumatic platforms.

Thirdly, it is about the transfer zone where the hoisting cattle handles are kept. This area is specifically designed to facilitate the slaughter operation by enabling the safe lifting and suspension of the cattle. Fourthly, it consists of the white viscera area, red viscera area, head part, leg part, and viscera removal area. Therefore, inspection tables, cooking kettles, belly blenders, refiners, cutter conveyor carts, and bovine conveyor carts are placed there. Ultimately, a thorough examination is conducted on the refrigeration chambers, encompassing the inspection of beams, tracks, access doors, track switches, evaporator unit, and all associated electrical connections.

Furthermore, these actions involve the meticulous planning of various activities, including the scheduling of activities, maintenance work orders (OTM), control formats for OTM, ensuring OTM compliance throughout the year, generating weekly maintenance reports, and establishing weekly maintenance routes. This comprehensive virtual tool serves as a centralized platform for managing and monitoring

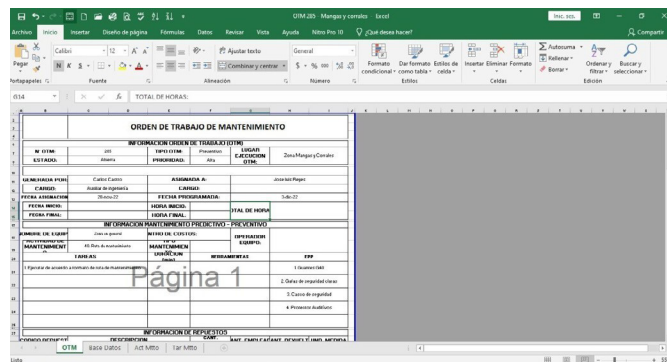
the entire process in an organized manner, providing valuable insights for project indicators.

Figure 3 and Figure 4 depict the correlation between various sectors, including slaughter or processing, washing, and refrigeration, carried out by the contractor Meiker, which are presented in an Excel file through an annual activity schedule, which is indicated by a numbering system accompanied by corresponding colors, as described below:

1. The maintenance route refers to the designated area where maintenance activities are scheduled to take place on a weekly basis.
2. The lubrication route refers to the maintenance team responsible for lubrication in the cold storage plant, which is separate from the contractor Meiker S.A.S.
3. Route executed, as shown in Figure 3a, this color corresponds to the compliance with the correct time and schedule of the maintenance route.
4. Route not executed, establishes that the route could not be carried out in the established time and schedule due to technician occupation or external work issues.

Figure 3b displays the OTMs in a document that formalizes the work performed by the Meiker group, which includes detailed information about the work, by using consecutive monitoring such as the technician assigned to each task, the corresponding work week, the area where the activity is carried out, the personal protection elements used, the date of assignment, the scheduled date, and the technician's signature at the end of the OTM. This document serves as evidence of the day-to-day work performed in the cold storage plant and can be evaluated by the customer or an audit [20].

a).



b).

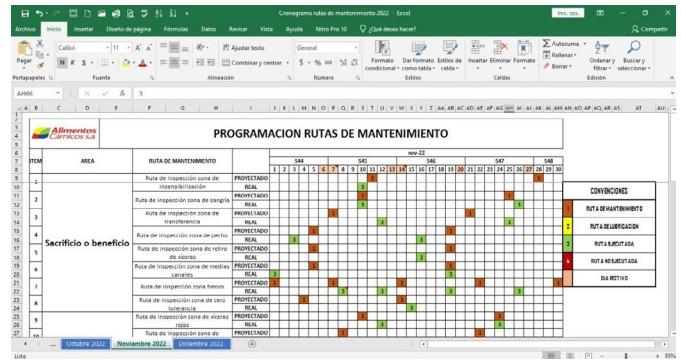


Figure 3. a) Schedule of activities for maintenance routes and OTMs.

3.2. Documentation management in Google Sites

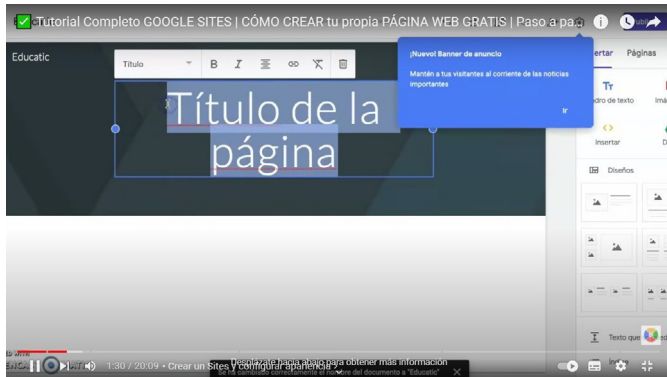
The data and information gathered from maintenance files, as well as the physical information provided by the Meiker project coordinator, were used to create a comprehensive visualization of the tool on the YouTube platform. This begins with an introduction to all the features offered by Google, and then, the desired appearance and design to be implemented are configured, after that, all the maintenance content, such as the schedule of activities, OTM, weekly maintenance route, and organizational chart of the Aguachica Meiker zone, is added. [21]. Ultimately, the save function was chosen, and a key aspect of this tool is its ability to facilitate sharing with other files or emails, enhancing the socialization of the implemented work plan for the cold storage plant [22].

Subsequently, I will provide a detailed explanation of how to create the Google Site tool for the maintenance process of the Meiker contractor's cold storage plant.

1. To use the Google Site website creation feature, simply click on the "sites" option in your inbox. This will immediately display the templates required to establish your Google Site.
2. Upon entering the template, you will notice a sidebar on the right containing several elements for customizing your website. Within the "insert" option, you will discover a text box, photos, and embed, to access a Google Drive file.
3. On the right side, there is a content block that has many options such as an index, image carousel, button, divider line, placeholder, YouTube, calendar, map, and more.
4. Within the page section, primary headings and subheadings are edited.
5. In the theme area, we may provide the primary colors needed for the web page and lithography.
6. Ultimately, after completing the editing process, include the project and/or company name, together with relevant words, documents, Excel files, and

photographs to showcase your design of the Google Site tool. In this particular scenario, the focus should be on maintenance project management.

a).



b).

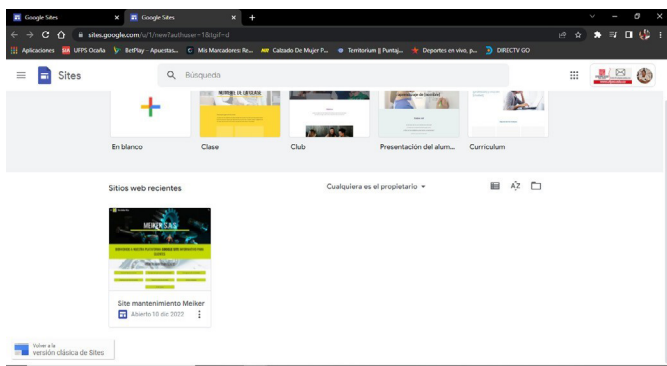


Figure 4. a) Integration of headings and other tools for modifying the webpage, b) guidelines for the functionality of the Google Site tool.

After gathering all the necessary information, the initial task was to arrange it systematically, enabling faster retrieval of the files when needed. Afterward, the information was organized into a hierarchical structure, categorizing all the files of the company, which enabled the establishment of folders, as depicted in Figure 5.



Figure 5. Google site login page designed for the contractor Meiker.

Figure 6 depicts the comprehensive maintenance management processes undertaken by the Meiker contractor at the cold storage plant, such as maintenance routes, activity execution time, activity schedule, maintenance report, and other related aspects.

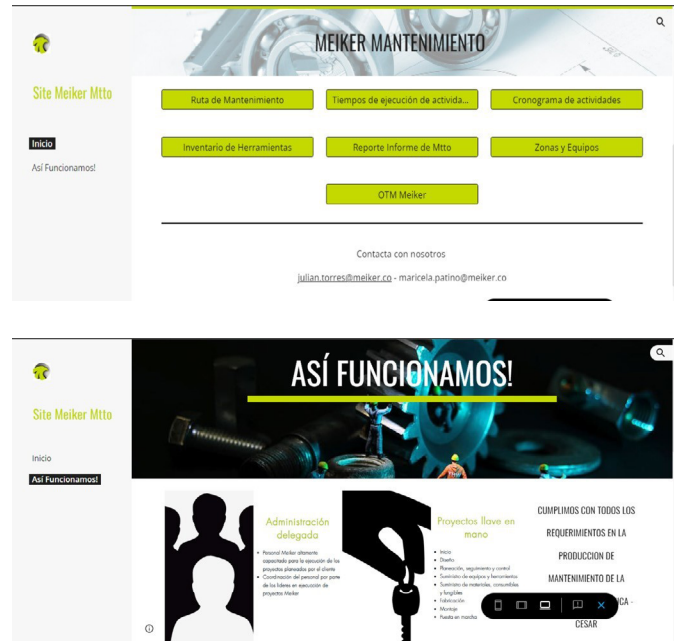


Figure 6. a) Forms including maintenance-related data utilized at the Aguachica plant, and b) Operational procedures and criteria fulfilled by the Meiker contractor for its customers across the country.

4. Conclusions

The organization of activities assigned to the contractor Meiker in the plant was made more efficient and optimal by collecting information and converting it into a web page, which allows easier access to the information, saving time in the search process.

The Google Site tool is implemented to provide support for the maintenance management of the cold storage plant and its main objective is to enable technicians to have a clear understanding of their daily routine work, including scheduling and administrative processes related to maintenance.

During the process of implementing the tool, it is critical to share all the activities and ideas of the maintenance group in the company. This will help establish a more effective strategy for the entire Meiker group, and ensure that their respective maintenance activities, status, and daily routines are documented chronologically and easily accessible.

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