CMMS- STREAMLINING MAINTENANCE MANAGEMENT FOR FOOD AND BEVERAGE INDUSTRY TO CAPTURE BREAKDOWNS

Animek Shaurya

New Jersey, USA

ABSTRACT

CMMS stands for Computerized Maintenance Management System. In today's world, when technology is advancing each day at an astonishing rate, any organization must have a detailed knowledge and understanding of its current state of machinery, the number of resources spent on the production floor to maintain equipment reliability, and resource allocation. CMMS is a critical and powerful tool that assists and helps any manufacturing industry to make full use of its capabilities, manage or direct workforce, improve the machine reliability, find innovative ways to improve productivity, stay in compliance with food and dietary regulatory standards as per the safe quality foods (SQF) and national sanitation foundation (NSF) standards and achieve series of goal and benefits the organization overall. Today, the food and beverage industry has grown tremendously and is the backbone of the manufacturing industry. Every company looks at creative ways to help them excel by selecting a reliable CMMS that suits their operations and processes to make educated decisions by monitoring their KPIs. This theoretical study aims to provide a building framework to set up plant maintenance modules to manage work orders, including emergency breakdowns and scheduled maintenance repairs in the food and beverage industry.

KEYWORDS

CMMS, Maintenance, Reliability, Work order system, KPI

1. INTRODUCTION

In the current market, all the food and beverage companies are continuously researching and working towards finding and optimizing their existing processes and improving their machine efficiency. To achieve these targets, selecting and implementing a reliable CMMS to support the plant maintenance program is crucial. Numerous aspects of any CMMS currently available in the market are essential to know before implementing it in an industry, such as exploring its evolution, components, benefits, and how to choose the right system for any organization. CMMS is a software package application that centralizes and automates maintenance tasks by maintaining a database of information collected from various operations and helping maintenance technicians perform their jobs. It optimizes the scheduling and tracking maintenance work performed through internal or external resources. It also provides data-driven insights using various analytical methods to improve asset reliability and productivity. The digitization of information through a robust maintenance management system helps the organization monitor equipment performance and reduce operational costs. It gives tools to make decisions. Maintenance staff utilizes the CMMS to create and manage work orders, create work requests, and perform inventory control. Its real-time data and reporting functionality also helps management make smarter asset management decisions [6]. For example, management can calculate the cost of equipment replacements and compare it to preventative maintenance costs for each asset [6]. This paper focuses on defining a layout for setting up a Computerized

Maintenance Management System (CMMS) for plant maintenance activities for emergency and scheduled breakdowns in a food and beverage industry where safety and quality for the product are critical elements of the company's business statement. This study will help various companies in the sector to adopt a pre-defined model and process of managing their day-to-day work order system and how to record information for machines that could help them improve their organization through an increase in productivity, managing critical control point (CCP), delivering safe product to the consumers.

2. BUSINESS LAYOUT AND CHALLENGES

For this study, we considered a food and beverage company. In Figure 1, critical bodies of a manufacturing operation are shown, which interact with one another to ensure the company's smooth operation in producing and packaging products and delivering them to the customer. Processing and packaging, along with the scheduling section, are responsible for creating a detailed plan of the product that needs to be produced and packaged based on orders received through the various clients. The quality section ensures that the products manufactured at the facility comply with all the standards mentioned by various food and dietary governing bodies like NSF and SQF. The warehouse department manages the storage and logistics of raw products, packaging materials, and finished goods. The Maintenance department ensures smooth operations, reduces downtime, and maximizes equipment performance. In today's fast-paced digital age, leveraging technology is critical to repeatedly achieving high standards and quality products.

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Figure 1. Key areas of a plant

This manufacturing facility faced several challenges related to its maintenance program. Some of the key challenges are listed below-

2.1. Lack of Visibility

The management and maintenance team need more understanding and visibility, knowing when and which equipment needs to be maintained. The lack of proper understanding and knowledge of this leads to unplanned downtime, increased costs, and decreased productivity.

2.2. Inadequate Planning

The lack of planning of maintenance activities results in insufficient resources or parts needed to complete a job, leading to delays, increased costs, and decreased productivity.

2.3. Lack of Standardization

A lack of standard operating procedures or preventive maintenance checklists associated with each asset that needs periodic maintenance creates a lack of proper documentation and guides that would help maintenance technicians perform their duties when the machine is available, leading to errors, increased costs, and decreased productivity.

2.4. Poor Communication

The various sections of a plant need more effective communication that leads not only when a problem needs immediate attention but also when the management is unaware of the progress of any maintenance task being performed in the facility; that can lead to unplanned downtime, increased costs, and decreased productivity.

To overcome all the challenges mentioned above, a robust CMMS must be defined and implemented to ensure alignment of operational requirements. The few basic features of any CMMS are as follows-

- Notification or work request
- Emergency or Scheduled work orders
- Preventive Maintenance
- Planning and Scheduling
- Assets management
- Inventory management
- Reports and Graphs
- Cost Tracking and Budgeting

3. PROCESS DEFINITION AND LAYOUT

Before defining an overall process layout for a maintenance management system, it is critical to understand the key elements that are integral to defining the process. These will help in setting the foundations of a robust Maintenance management system. They are as follows-

3.1. Asset Structure

The layout of all the assets in a facility is one of the most critical building blocks of a well-managed CMMS. In this, we create a database of equipment installed in a facility and assign a unique identifier to each equipment used as a reference for creating work orders.

3.2. Type of Work Orders

This study has considered three different types of orders used in the plant. They are Emergency orders, Scheduled orders, and Preventive Maintenance orders. Figure 2 explains the differences between the three work order types and where they can be applied.

3.2.1. Emergency WO

An emergency work order scenario is used when there is a sudden breakdown on the production floor, and a maintenance technician is called upon to repair the machine and restore it to operation.

3.2.2. Scheduled WO

The scheduled work order scenario is used when anyone in the facility notices any issues related to a machine or process and requests maintenance assistance to fix the issue. These types of issues do not pose an immediate threat to machinery operation to cause a breakdown, but if not rectified in a specific period, it might lead to a significant breakdown.

3.2.3. Preventive Maintenance

The preventative maintenance scenario is used for creating a preventive maintenance task list and performing maintenance operations on a given equipment at a given frequency. This scenario requires planned downtime of the machine to perform thorough inspection and repair as per the task list created through consulting OEM and by analysing and studying issues from past experiences. This helps in reducing emergency breakdowns that happen during the production run.

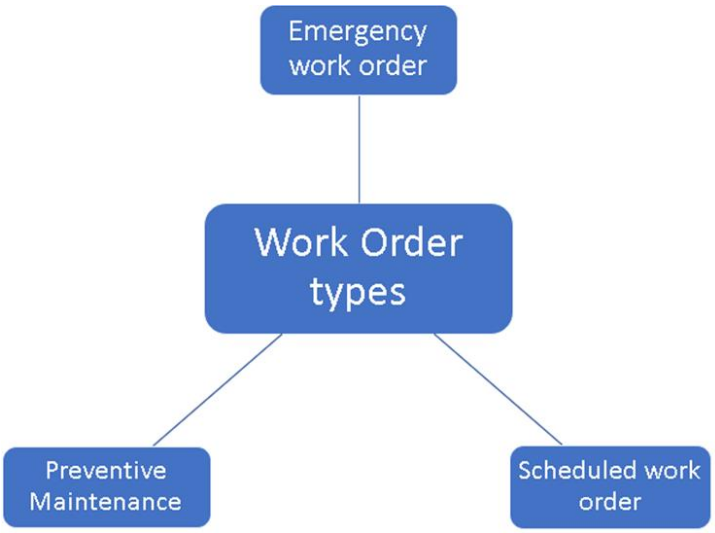

Figure 2. Types of work order in CMMS

3.3. Work Center

In this study, we have considered different work centers to categorize the work performed by various departments across the facility correctly. They are -

3.3.1. Maintenance

It includes any mechanical or electrical work that needs to be performed by the maintenance department.

3.3.2. Facility

This includes any work that needs to be performed for the facility like repair of doors, windows, floors etc.

3.3.3. Utility

This includes any work that needs to be performed for the auxiliary equipment like boiler, air compressors, chiller system etc.

3.3.4. Sanitation

This includes any work that needs to be performed related to housekeeping and sanitation area.

3.3.5. Contractor

This includes any work that needs to be performed through the help of an outside contractor resources.

3.4. Activity Type

In the Food and beverage industry, it is essential to keep track of all repair activities done on equipment surfaces considered food contact surfaces. As per USDA, a food contact surface is any surface that may come in direct contact with exposed meat or poultry products. Examples include conveyor belts, tabletops, saw blades, augers, and stuffers. We differentiate the work performed in the facility through internal or external resources based on the part of the machine on which the work is being performed, such as food contact vs non-food contact type. This helps in proper documentation of the work and helps the organization to comply with various food and dietary standards.

3.5. Cost Center

The cost center attribute links Maintenance activities to financial aspects of the organization, giving a detailed analysis of the expenditure on maintaining a specific asset. This helps businesses decide how to improve productivity and deliver quality products to customers.

3.6. Roles for Users

Based on their job responsibilities, many different users are set up in the system. They have access to specific modules and processes in the system to perform tasks assigned to them individually.

Table 1. explains the steps involved in an Emergency Maintenance (Break down) process when it is related to food contact surface of an equipment-

Table 1. Emergency breakdown work order process (Food Contact).

Steps	Process Description	Responsible
1	Notification Creation	Processing/packaging Team
2	Review of Notification (optional)	Maintenance Technician
3	Close the notification (if false)	Maintenance Technician
3	Maintenance Technician checks the notification and converts to Work order	Maintenance Technician
4	Work Order Operation + labor time confirmation, Spare Part consumption, document update.	Maintenance Technician
5	Release to Production	Processing/packaging Team
6	Food contact - Quality Review	Quality group
7	Work Order Technical Completion	Maintenance team leader

Table 2 explain the steps involved in an Emergency Maintenance (Break down) process when it is related to Non-food contact surface of an equipment-

Table 2. Emergency breakdown work order process (Non-Food Contact)

Steps	Process Description	Responsible
1	Notification Created	Processing/packaging Team
2	Review of Notification(optional)	Maintenance Technician
3	Close the notification (if false)	Maintenance Technician
3	Maintenance Technician checks the notification and converts to Work order	Maintenance Technician
4	Work Order Operation + labor time confirmation, Spare Part consumption, document update.	Maintenance Technician
5	Release to Production	Processing/packaging Team
6	Work Order Technical Completion	Maintenance team leader

Table 3 explain the steps involved in a Scheduled Maintenance (Break down) process when it is related to food contact surface of an equipment-

Table 3. Scheduled breakdown work order process (Food Contact)

Steps	Process Description	Responsible
1	Notification Created	Processing/packaging Team
2	Review of Notification	Maintenance Planner
3	Close the notification (if false)	Maintenance Planner
4	Assign Work Order to Maintenance Team Leader	Maintenance Planner
5	WO Release to mechanic	Maintenance team leader
6	Work Order Operation + labor time confirmation, Spare Part consumption, document update.	Maintenance Technician
7	Release to Production	Processing/packaging Team
8	Food contact - Quality Review	Quality Group
9	Work Order Technical Completion	Maintenance team leader

Table 4 explain the steps involved in a Scheduled Maintenance (Break down) process when it is related to Non-food contact surface of an equipment-

Table 4. Scheduled breakdown work order process (Non-Food Contact)

Steps	Process Description	Responsible
1	Notification Created	Processing/packaging Team
2	Review of Notification	Maintenance Planner
3	Close the notification (if false)	Maintenance Planner
4	Assign Work Order to Team Leader	Maintenance Planner
5	WO Release to mechanic	Maintenance team leader
6	Work Order Operation + labor time confirmation, Spare Part consumption, document update.	Maintenance Technician
7	Release to Production	Processing/packaging Team
8	Work Order Technical Completion	Maintenance team leader

Figures 3 and 4 show the process flow of a maintenance notification created and followed by conversion to a work order and completion.

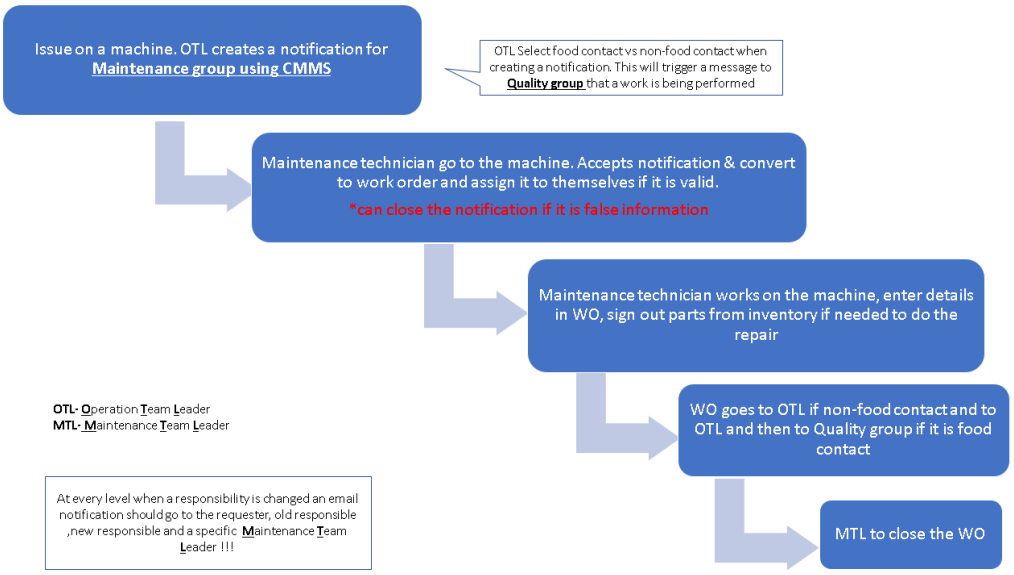

Figure 3. Process flow for emergency work order

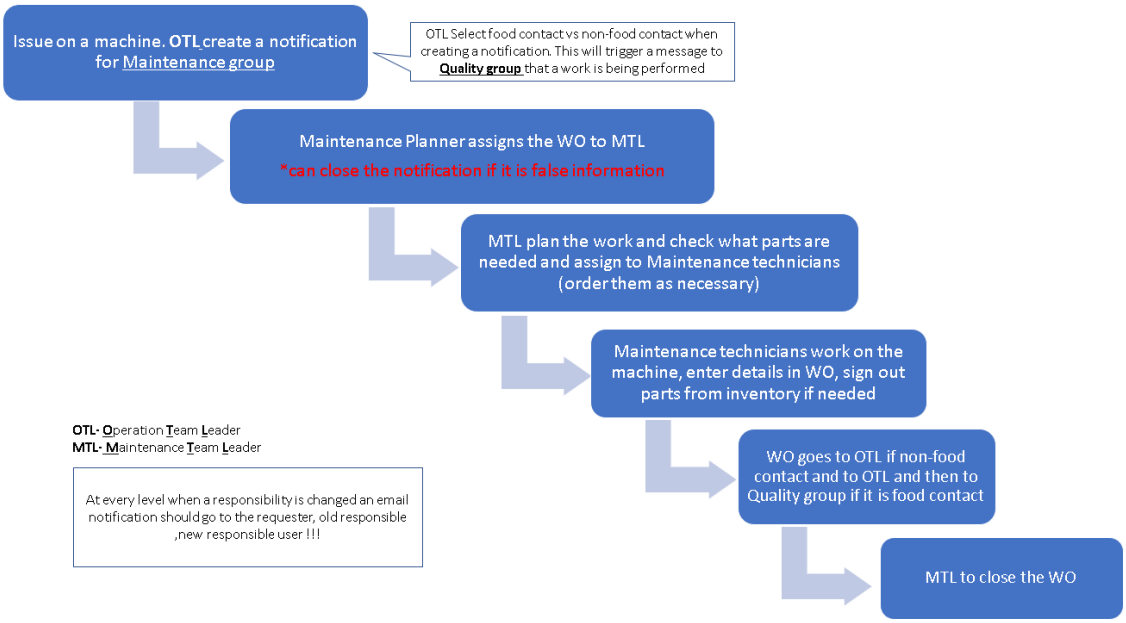

Figure 4. – Process flow for scheduled work order

4. CONCLUSIONS

Computerized maintenance management system (CMMS) is a powerful tool that can help manufacturing industries improve maintenance processes and achieve various goals. It provides a centralized platform to streamline work order management. It gives tools to maintenance personnel to assign work orders efficiently, track their progress, and ensure timely completion [7]. This streamlined workflow improves communication, reduces manual errors, and increases productivity [7]. A robust work order system helps to improve equipment reliability. It creates a database of information using previous breakdowns. It helps technicians to learn and get trained on how to resolve a repetitive issue and formulate strategies to perform a root cause analysis to

eliminate the main reason for the failure. It helps to extend equipment life, minimize costly breakdowns, and optimize plant productivity.

CMMS for food manufacturing allows users to plan, schedule, and record preventive maintenance activities on each piece of equipment effectively [6]. It also offers to manage spare parts used in repair activities and helps maintain a stock of critical spares that reduce repair time in emergency breakdown situations. Efficient inventory management is crucial to ensuring uninterrupted plant operations [7]. CMMS software streamlines the procurement process, minimizes stockouts, and reduces carrying costs by tracking stock levels, issuing purchase orders, and managing supplier information [7]. It offers robust reporting and analytics capabilities that help management make data-driven decisions by generating comprehensive reports on maintenance activities, equipment downtime, and costs. It analyzes areas that require improvement and captures the performance trends. This study would help industries build and establish their work order management system efficiently to conduct repair activities and collect data.

An easy CMMS package and a good process layout will be a game changer in any manufacturing industry. It will help grow the business at an exponential rate through the delivery of quality products to the customers.

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AUTHORS

Planning & Reliability Engineer at a leading maker of brand-name snacks and confectionery. Instrumental in developing the Preventive Maintenance program and streamlining inventory management and procurement of spare parts. Goal-oriented and innovative professional with a broad-based background in production and manufacturing, new product development, and inventory monitoring. Aims to respond to new challenges, contribute to the industrial engineering sector, and effectively utilize Six Sigma methodologies to complete projects, meet objectives, and streamline operations. Holds a master's degree in industrial & and systems Engineering from Rutgers University and a bachelor's degree in production & and industrial engineering from the National Institute of Technology, Jamshedpur