Single Column (Page),1.5 spaced, 12 pt Times New Roman, word format. 6-7 pages (3000 – 4200 words maximum) only

16 pt Times New Roman, Bold, Capitalize each word, Centre.

# Food Hygiene and Safety Know

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14 pt Times New Roman, Centre, Normal face, Sentence case, Asterisk (*) for corresponding author, Superscript number for indicating affiliations of authors and coauthors, Must be in one line

Superscript number for indicating affiliations of authors and coauthors

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## ABSTRACT

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Food hygiene [illegible] part of food industry particularly in catering sector as food served must be tasty as well as safe for the consumers. Then company suffers from revenue loss. So, maintenance plans have been made well, in advance to prevent the losses due to breakdowns. In order to achieve flats free output particularly when the production system grows and the production quantity increases. These plans of activities must carried out to ensure that the machines and plants of production are working continuously. All concerning activities including the maintenance priorities as well as preventive and corrective maintenance, plans are carried out with optimal maintenance policies. The objective of th[illegible]eness of plant, equipment, engineering and maintenance personnel t[illegible]

References are not allowed in Abstract part.

**KEYWORDS**: Maintenance, Performance Management, Optimal Maintenance

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## INTRODUCTION

The growth and diversity of production as well as the enhancement of productivity and the competitive power under the market scenario, which are getting harder among the basic aim of production plant. Today management has mo quality and cost. Machinery and equipment are used in the prod vices constitute the large majority of most industry's capital.[1] It is extremely important to avoid failure rate during actual operation because it can be dangerous or disastrous. Maintenance of the systems are efficiently used to prevent the losses resulting from the failures during the production. The halting of machines and plants due to breakdown/ failure or the fact that they work below the production capacity causes significant losses for an production units**.** To evaluate the perform maintenance; the following components are required, spare parts, trained personnel, facilities, tool and test equipment. These resources are mandatory to get appropriate maintenance. Maintenance actions can be generally divided into two types: corrective maintenance (CM) and preventive maintenance (PM). For a deteriorating repairable system, the corrective maintenance is conducted upon failure to recover the system from a failure, whereas the preventive maintenance is performed at the plan time to improve the reliability of the system. Corrective maintenance, periodic maintenance and conditional based maintenance are mostly encountered in practice ctive maintenance is applied with maintenance being performed po are parts depend on the failure behavior of the assets only.[2] It is different if maintenance is performed preventively. As far as periodic maintenance is concern, it is combination of deterministic demand of spare parts for periodic maintenance interventions and some random demands when a component breaks down prior to the preventive maintenance. Maintenance interventions may mean various things but here it considers/takes as a replacement of a failed component by a spare part. The random nature of degradation behavior of production units can be cure by maintenance only. Generally it is considered that a component can be categorized in three states, good, defect and failed. The time that the component remains good, the time to defect has a certain distribution, however the time that the component remains in the defect state the delay time has an other distribution. Such degradation behavior is monitored by inspection. The time to failure of the component is the convolution of the time to defect and the delay time[3, 4].

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## LITERATURE REVIEW

In the literature, numerous studies of maintenance and repair optimization have been performed assuming minimal repairs between PMs. Alsyouf[1] illustrated how an effective maintenance policy could influence the productivity and profitability of a manufacturing process.

Bupe[3] considered the safety issues in maintenance with the freedom from danger, protection from the risk and injury during the process of carrying out maintenance procedures**.** Cheng and Chen[4] the periodic preventive maintenance Policy for deteriorating systems by using improvement factor model has been fo[illegible] Dekker[5] gave detail maintenance analysis and it's optimal application. Gupta et al.[6] The[illegible] between preventive maintenance and manufacturing system performance relatio[illegible] maintenance and [illegible]eyed. Jaturonnatee et al[7] an optimal preventi[illegible]ough corrective mi[illegible]eased equipments have been discussed.

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## THE MAINTENANCE STRATEGY

The rapid changes are coming in production systems which needs to keep up with the modified systems and environment the maintenance strategy therefore needs to be reviewed periodically. Furthermore, the strategy should be customized, which implies that it should consider all relevant factors of the situation. Every company have their own maintenance strategy and up course it is unique for each company but the underlying structure needed to develop such strategy may be very comparable. The maintenance strategy development process starts with stating the maintenance philosophy which is an expression of the maintenance function's role within the company and the chosen approach for how to fulfill it. The main objective of the maintenance function is driving force for production.

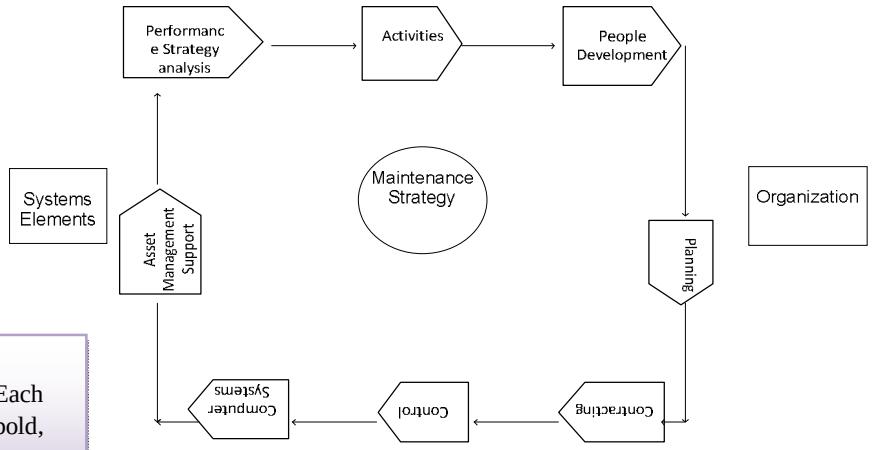


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**Figure1. Maintenance Strategy and Corresponding Practices**

## MAINTENANCE EVOLUTION/POLICY

Due to the increasing consciousness of maintenance management, this process has undergone successive changes over recent years, describe in fig. 1. A maintenance policy is one of the most important part of effective maintenance management. It is essential for continuity of operation and a clear understanding of the maintenance management program, regardless of the size of a maintenance organization. Maintenance can be classified into two categories: Preventive maintenance and corrective maintenance. Preventive maintenance is performed in order to keep the system in a condition that is consistent with the required levels of performance and reliability. This is achieved by regular checking all the operating systems, cleaning, adjusting, Lubricating and etc,. The objective of the maintenance procedure is to keep the system up-to-date so that desire production can be achieved. It's purpose is to restore system operation as soon as possible after failure by replacing, repairing or adjusting the components which have caused interruption or breakdown of the system.

## TYPE OF MAINTENANCE

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### *Corrective Maintenance*

Corrective Maintenance, is usually causes an emergency interruption of service and it must be repaired or replaced immediately. Corrective Maintenance is very expensive operation and more costly than scheduled repairs.

Although every effort is made for engineering systems as reliable as possible through design, preventive maintenance and so on and time to time they do fail. Consequently, they are repaired to their operational state. Thus, repair or corrective maintenance is an important component of maintenance activity. Corrective Maintenance may be defined as the remedial action carried out due to failure or deficiencies discovered during preventive maintenance to repair an equipment/item to its operational state. There are five components responsible for corrective Maintenance shown in figure 5.

Reduction in corrective maintenance time is useful to improve maintenance effectiveness. Corrective Maintenance is composed of five sequential steps, which discussed below

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**Table: 1 compressive strength test result**

| Mix | **Material by Weight** | | |
|---|---|---|---|
| | **% of coconut shell ash and egg shell powder** | **Cement (Kg)** | **Waste coconut shell ash and egg shell powder (Kg)** |
| M40 | 0% | 477 | 0 |
| | 5% | 453.15 | 20.65 |
| | 10% | 429.30 | 47.7 |
| | 15% | 405.55 | 71.55 |
| | 20% | 381.6 | 95.4 |
| | 25% | 357.75 | 119.25 |

### *Scheduled Maintenance*

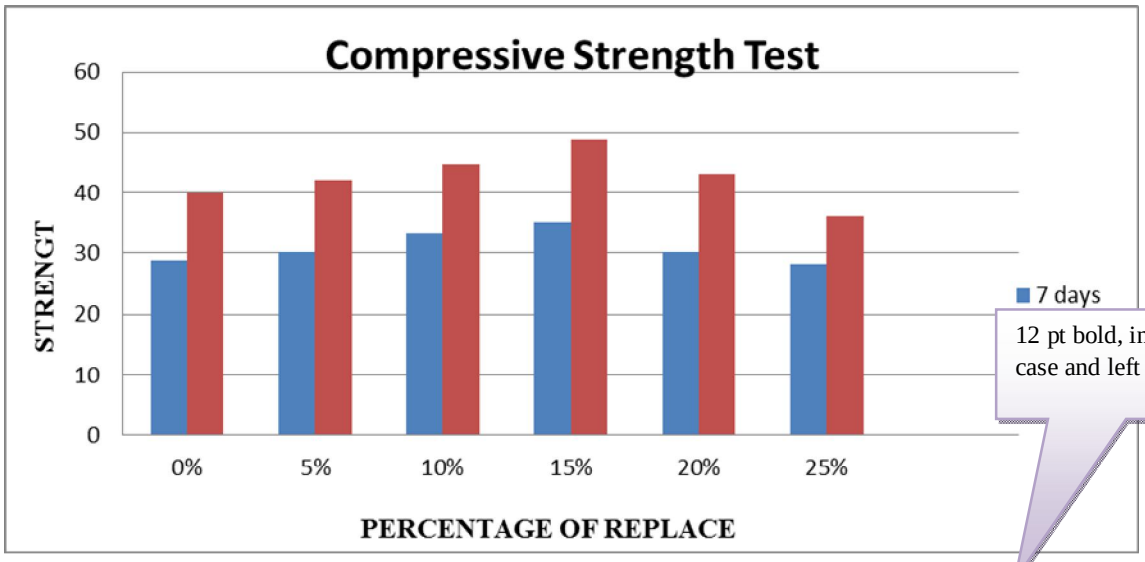
Preventive maintenance carried out in accordance with an established time schedule or established number of units of use.

### *Predetermined Maintenance*

Preventive maintenance carried out without previously condition investigations and in accordance with established intervals of time or number of units of use.

### *Condition Based Maintenance*

Preventive maintenance consisting of performance and parameter monitoring and the subsequent actions. The performance and parameter monitoring may be scheduled on request or continuously.




**Graph.1: Compressive Strength of Various Percentage of Replacement**

## *Predictive Maintenance and Operator Maintenance*

There are two additional types of maintenance, which are important to emphasize

**Operator Maintenance**

Maintenance carried ou

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**Predictive Maintenance**

Condition based maintenance carried out following a forecast derived from the analysis and evaluation of significant parameters of the degradation of the item. According to predictive maintenance basically to check if something is going to fail. Predictive maintenance is therefore proactive, i.e. the tasks are performed before a failure occurred and thereby the failure is prevented. Conditions that can cause deterioration and lead to failure are searched for in predictive maintenance. Predictive maintenance means improving product quality, productivity, and overall effectiveness in production and manufacturing plants. Predictive maintenance is an attitude or philosophy which uses the actual operating condition of equipment and systems within a plant to optimize total operation of the plant. Equipment is used to monitor the condition of other equipment.

**Proactive Maintenance**

Proactive maintenance is different from traditionally known as predictive and preventive maintenance. It is contrary to corrective tasks which deal with the already failed state. Proactive maintenance is based on theoretical risk analyses. The tasks undertaken before a failure occurs, in order to prevent the item from getting into a failed state proper counter measures are taken to avoid

failures. The characteristics of proactive maintenance are a control over the maintenance resources. With the advent of correct maintenance sched f what is required of the maintenance resources v

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## PERFORMANCE MANAGEMENT C

Performance indicators will be monitor s fulfill the required standard.

**Table1. Priorities of maintenance**

| Categorization of Maintenance Priorities | Response Time | Performance indicators |
|---|---|---|
| **First priority**<br>Serious safety issues<br>Irreplaceable loss of organization<br>Major asset damage | Within one hour | Quick response<br>Achieve 90% output in specified time |
| **Second priority**<br>Low risk safety hazards<br>Replaceable loss to organization<br>Malfunction of equipment | Within two working days | Outstanding work<br>Achieve 60% output in specified time<br>Minimize the asset replacement value |
| **Third priority**<br>Asset requires maintenance not urgently<br>Minimal risk to organization<br>Damage is under control(negligible) | Within one working week | Maintenance index<br>Facilities Condition<br>Risk Management |
| **Fourth priority**<br>Routine Maintenance<br>Programmed work<br>No loss to organization<br>Work scheduled as per agreement with customer | Not specified | Condition Auditing<br>Maintenance Customer service rating<br>Asset life cycle |

These standards control-by-control center on priority basis, which depends on information received from the requestor. The number of factors may affect completion of a work request, such as parts may need to be ordered or equipment may need to be taken to another location for repair. The volume received by a control center may also affect response and completion time. Priorities may distinguish in the following manner.

## OPTIMAL MAINTENANCE POLICIES

The objective of maintenance is to improve the system availability and mean time between failure to minimize failure frequency and downtime. Stochastic approach of system is considered to study the maintenance policies. Generally, it is represented by system maintenance cost rate,

discounted cost rate and system reliability, availability, MTBF and failure frequency. Various factors which may affect an optimal maintenance policy is depicted in Fig. 9. If system is working in series then there exist some shut-off-rules. When a series system fails its require immediate repair and all other components remain in suspended mode, thereby longer down time and worse reliability measures. However, a parallel system fails, the system will still function even if a component is not repaired immediately. Proper maintenance schedule should adopt by the production units. Which incorporate various maintenance policy mention below.

## OVERALL EQUIPMENT EFFECTIVENESS

The total productive maintenance (TPM) concept given by Nakajima (1988) for overall equipment effectiveness (OEE) for measuring productivity of manufacturing equipments. OEE is a method to analyze the most popular equipment performance indicator capable of measuring different production losses, and identify possible limitations (Hansen, 2002). It also evaluate the percentage effectiveness of the manufacturing process. The OEE concept has become increasingly popular and has been widely used as a quantitative tool essential for measurement equipments‟ performance in industries. The important maintenance factors in the OEE are availability, performance efficiency and quality.

$$\text{OEE} = \text{Availability (A) X Performance (P) X Quality (Q)} \qquad (1)$$

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Performance efficiency is the amount of pr… the expected amount of products it would have pr… products not require rework ~~(Gazdziak, 2010)~~. Thus, following equations describe availability, performance efficiency and quality.

$$Availability\ (A) = \frac{Scheduled\ \text{Pr}oductionTime - Unplanned\ FailureTime}{Scheduled\text{Pr}oductionTime} \qquad (2)$$

$$Performanc\,e\ Efficiency\ \ (PE) = \frac{Complete\ time\ \times \text{Pr}\,oducts\ \text{Pr}\,ocessed}{\text{Pr}\,oduction\ \ Time} \qquad (3)$$

$$Quality\ \ (Q) = \frac{\text{Pr}\,oducts\ \text{Pr}\,ocessed\ - \mathbf{P}roducts\ need\ to\ rework}{\text{Pr}\,oducts\ \text{Pr}\,ocessed} \qquad (4)$$

In the first instance OEE should be applied to bottlenecks or other critical equipment. When driven correctly, as a fact of monitoring and improving the OEE, these areas will make significant

improvements to the overall performance of the manufacturing line (Hansen, 2002). One of the most critical success factors influencing survival, profitability, and competitive advantage of manufacturing organization is to select proper maintenance policy. OEE is mostly used in one of the policies.

## CONCLUSION

Maintenance is very crucial for manufacturing units without it qualitative and quantitative production cannot be desire. There are certain points which has to put emphasize on maintenance related tasks

- Effective communication of information relating to maintenance tasks.
- Proper communication amongst workers working in noisy environment.
- Workers should avoid horse play and unsafe working habits.
- Appropriate tools should be used in performing maintenance tasks and it has no any substitution.
- Unsafe maintenance procedures should be performed by knowledgeable and experienced maintenance personnel.

***Journal Articles Format:*** Author(s) of article (surname initials). Title of article. Journal title abbreviated Year of publication; volume number (issue number):page numbers.

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