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Impact of Safety-Maintenance Practices on the Overall Performance of an Industry

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Abstract

The study aims to evaluate how safety-maintenance practices affect the mechanical engineering industry's overall performance in Ghana. The study used a descriptive survey design technique to ascertain the type of maintenance engineering that was practiced in Ghanaian mechanical engineering workshops at the time of the study. In the mechanical engineering workshops, respondents provided both qualitative and quantitative data using a variety of data collecting instruments, with the quantitative approach being more common. The study employed Kumasi, Tamale, and Accra's mechanical engineering workshops as a case study. The number of mechanical engineering workshop enterprises that made up the sample size for the questionnaire administration was sixty (60), chosen at random from the AGI membership registry. Primary data was gathered using interview guides and questionnaires. To analyse the data, descriptive statistics were employed. According to the study's findings, mechanical engineering companies combined different maintenance techniques in order to best fit their organisational culture and equipment. Preventive shut-down, with a mean score of 4.78 and RII = 0.98, placing first (1st) in the Likert rating order, is the most frequently used maintenance system by respondents. The maintenance procedures employed by mechanical engineering organisations were influenced not only by their equipment and organisational culture but also by other factors such as cost, personnel expertise and external partnerships.

Keywords

Safety-Maintenance Practices, Mechanical Engineering Industry, Ghana, Maintenance Engineering, Organizational Culture, Equipment Maintenance, Preventive Maintenance, Maintenance Strategies

1. Introduction

The transition of society from an agrarian to an industrial one is accompanied

by a rise in technological innovation, especially with the development of large-scale energy and metallurgical production. This leads to the inevitable and welcomed proliferation of factories, which makes society more dependent on the manufacturing of goods and services and an increase in the proportion of the population employed in the industrial sector. Given these trends, even the smallest industrial event is thought to have a profound impact on society.

The industrial environment is extremely dangerous for workers, equipment, and the environment because of the physical nature of the task as well as the complexity of heavy machinery, moving objects, or hazardous substances. Consequently, it appears that workplace accidents are inevitable in an industrial setting. A sudden, unforeseen event that typically causes property damage, wasted production time, injuries, and fatalities is called an industrial accident.

Every industrial facility or piece of equipment has a predefined expected quality of performance, and in order to meet this standard, specific maintenance supports must be provided. Additionally, every industrial piece of equipment or facility must adhere to certain behavioural expectations for safety [1]. It is now crucial for industry to create and implement an efficient maintenance and safety culture due to the growing specialisation and complexity of the facilities and equipment used [2].

The primary causes of significant work-related accidents and illnesses each year are a lack of appropriate and effective maintenance as well as a lack of a safety culture. Inadequate maintenance and safety protocols within the sector can result in fatal accidents or health issues that affect workers, the business as a whole, families, communities, and the country at large. These events can also have extremely negative socioeconomic ramifications. Industrial accident risk can be decreased by putting policies and procedures in place to lower risks through investment and the establishment of efficient maintenance and safety systems.

Occupational health and safety, however, is rarely acknowledged by industries as a critical factor in determining the course of national growth [3]. The majority of African nations struggle with workplace safety and health regulations. Notable are the few attempts made by the governments and com. According to [4], there is a widespread belief that Ghanaians do not practise proper maintenance practices in their manufacturing companies because they do not have a culture of maintenance. As a result, workplace safety and maintenance issues receive relatively little attention, as shown by the numerous risks, illnesses, and dangers related to occupational safety and health that exist in the nation.

The many disastrous industrial mishaps and accidents that are publicised on a daily basis serve as proof. As reported in Rantanen (2000) and Addaquay (2004), Dr. Jukka Takala of the ILO calculates that there are 250 million accidents worldwide each year, resulting in 335,000 fatalities. According to the International Labour Organisation (ILO), which is cited by HESAPRO (2013), approximately 2.2 million people worldwide pass away from work-related illnesses and

accidents each year, along with 270 million suffering from serious non-fatal injuries and 160 million becoming ill for varying lengths of time. Moreover, according to HESAPRO, the ILO calculated that the overall expenses of these mishaps and illnesses equal almost 4% of global GDP.

Over 337 million workplace accidents and occupational diseases result in over 2.3 million fatalities yearly, according to the International Labour Organisation (ILO). The issue that this study aims to solve is how adhering to proper maintenance procedures affects an industry's overall productivity. In order to reduce, if not completely eliminate, occupational accidents and the problems and challenges they are associated with, employers, management, workers, and other stakeholders must be motivated by the information the study provides to invest in and adhere to industry-specific maintenance and safety requirements. The goal of the study is to raise awareness among stakeholders by evaluating the influence that safety-maintenance procedures have on an industry's overall performance.

1.1. Effective Maintenance Management

Maintenance is the culmination of all the acts required to maintain or repair a machine, system, or piece of equipment to the designated operating state in order to maximise its useful life. As per the definition provided by the British Standard Glossary of terms (3811:2013), maintenance encompasses all technical and administrative measures, including supervisory actions that are aimed at either preserving or returning an object to its original state, enabling it to fulfil its intended function.

"Combination of all technical, administrative and managerial actions during the life cycle of an item intended to retain it in, or restore it to, a state in which it can perform the required function" is what maintenance entails, according to European Standard EN 13306, as cited in European Agency for Safety and Health at work hereafter referred to as EASHW (2010). According to [5], maintenance is defined as the amalgamation of technical and administrative efforts, including supervision, aimed at maintaining or restoring an object to a state that allows it to fulfil a necessary function. It entails maintaining and repairing current machinery, structures, and facilities to keep them in a safe, functional state as intended [6] [7].

According to [8], industrial maintenance work is therefore required to maintain the machinery, plant, and equipment in safe and appropriate operational conditions. If human resources management and non-human resources management are to continue operating continually, it is considered to be extremely important and necessary. The aforementioned suggests that for maintenance to be successful and comprehensive, management and administrative inputs must be added to its technical aspects. As a result, maintenance management and maintenance engineering are growing in importance. Reference [5] states that for maintenance performance to be at its best, these two maintenance-related

factors must work well together. Therefore, maintenance management is a data-intensive task.

According to EASHW (2010), the term "maintenance" refers to a broad range of activities carried out in a variety of industries and workplace settings. According to this, maintenance is essential to ensuring continuous productivity, producing high-quality products, maintaining a company's competitiveness, and detecting faults. In the industrial setting, maintenance activities include inspection, testing, measurement, replacement, adjustment, repair, upkeep, and replacement of parts. However, it also directly affects and has a close relationship with occupational safety and health (EASHW, 2010).

The degree to which maintenance objectives are satisfied in terms of meeting internal, external, and customer requirements is referred to as maintenance effectiveness [9]. Regular and efficient maintenance is crucial to keeping equipment and the work environment safe and dependable. It also plays a significant role in removing workplace dangers and creating safer and healthier working conditions (EASHW, 2010). When depreciation is guaranteed, a well-maintained culture makes sure that equipment continues to operate as intended. Implementing fundamental maintenance methods that are both efficient and effective can result in significant cost reductions [10].

While industrial machinery and equipment breakdown and failure cannot be completely avoided, it can be minimised with appropriate maintenance practices, correct repair, and preventive maintenance. Additionally, improved performance, increased dependability, and an extended equipment usable life would pay for the expense of preventive maintenance many times over. As to [11], there could be a reduction in downtime even during peak operating hours.

Industry faces the challenge of meeting insatiable societal demands in this era of dynamic global transformations, where the world is becoming a global village with accompanying competition everywhere. Industry cannot afford to be burdened and crippled by avoidable breakdowns, which not only make it difficult or impossible to meet production schedules and targets, but also impose additional costs on industry both directly and indirectly. Therefore, industrial maintenance programmes need to be well-planned in order to ensure that plant machinery and equipment are available and used.

Maintaining dependable and effective production gear and equipment is a major source of profit for any manufacturer, according to Manufacturing Maintenance Solutions (MMS). The maintenance team's performance has a significant impact on schedule optimisation, on-time delivery, product quality, and direct labour productivity. Reliable equipment is essential for managing more advanced production trends like lean and just-in-time (JIT). Regretfully, establishing industry best practices and altering the culture of plant maintenance is a challenging and drawn-out process in which more businesses fall short of success than succeed.

Ignoring maintenance causes expensive repairs and faster depreciation of ex-

pensive and precious equipment, which in turn has far-reaching negative effects on productivity overall. It also causes frequent breakdowns. Furthermore, as more complex and specialised technology and equipment are developed, their cost rises along with them, making idle downtime increasingly costly [12]. Once more, fatal accidents or health issues might result from poor or non-existent maintenance (EASHW, 2010). Thus, for industrial well-being in general, a high level of maintenance efficiency is not only desirable but also absolutely necessary [13]. EASHW (2010) raises awareness even further that maintenance is a high-risk activity in and of itself and that it must be carried out safely, taking the necessary precautions to safeguard maintenance personnel and other onlookers.

The culture of maintenance is a crucial component that directly contributes to improved facility performance by elevating maintenance performance [1]. The internal atmosphere between management and employees that facilitates efficient maintenance management through the exchange of ideas, values, and beliefs across all members of the organisation is known as the "maintenance culture" [14]. A system, piece of machinery, or structure's upkeep, preservation, and protection are the foundations of a maintenance culture, which is a way of thinking and acting that can be identified by the behaviours of each individual.

All organisations that provide maintenance services should incorporate cultural beliefs, values, norms, practices, and attitudes connected to maintenance work [15]. Human resource development was the foundation for the process that established the maintenance culture. A technological technique that supports the avoidance or correction of engineering systems' premature failure with the least amount of time and money while maintaining system performance and safety requirements is the major emphasis of the maintenance culture idea.

A human resources organisational structure is necessary for the development of a strong maintenance culture in the sector. The effectiveness of the human element is dependent on a variety of aspects, including motivation, interpersonal interactions, training, and retraining, as well as factors such as qualification and company focus and objectives. Research has shown that a strong maintenance system typically supports an efficient manufacturing system. Thus, maintenance culture is a crucial component of the industry's attempt to increase profitability [16].

The significant downtime of machinery due to breakdowns and stoppages was found to be one of the main causes of the low utilisation of installed machines and equipment, according to a United Nations Industrial Development Organisation report on maintenance and repairs in developing nations. The study noted that the physical infrastructures' usable lives were decreased and their deterioration accelerated due to inadequate maintenance. It also stated that enhancing maintenance cultures in developing countries would be among the most crucial and successful ways to promote industrial development [17].

Effective maintenance, according to [18], presupposes that production policy, corporate policy, and other possibly conflicting needs and restrictions within the organisation all play a role in determining maintenance targets and tactic [19]-[21].

1.2. Types of Maintenance Practices

In order to determine which kind of maintenance should be implemented, when to do it, and how frequently it could be done, maintenance plan development is required once the maintenance objectives have been specified. Maintenance decisions can be broadly characterised in terms of maintenance actions (basic elementary work), maintenance rules, and maintenance concepts [22].

Industry managers must understand how the maintenance process's inputs and results relate to each other in terms of how they contribute overall to manufacturing performance and corporate strategic goals [8] [23]. The maintenance function provides a fine explanation of this link (constructed of related maintenance practices followed by the established productivity enhancement strategy). The maintenance role, therefore, sets the standard for and highlights the kind of maintenance procedures that employees inside the organisation should adhere to.

The most efficient maintenance techniques should be incorporated into the maintenance function and continuously practiced on the work floor to maximise the efficacy of the result. This emphasises how crucial it is to choose a maintenance role that is both efficient and ongoing for any productivity development approach that is put into practice. According to [24], in order to guarantee the health of any machinery, plant, equipment, or facility used by an organisation, it is imperative that the policy be well-defined and adhered to. He provided more evidence for his claim that a maintenance policy should be chosen or adopted in a way that best meets the demands of the organisation and can be carried out successfully and economically [13].

The choice of a maintenance system is influenced by the company's priorities and requirements, plant condition, age, internal resource levels, safety, and other statutory regulations [5]. Maintenance systems are also directly linked to resources available to the industry in order to achieve stated maintenance objectives. Two primary categories can be used to broadly classify maintenance systems: planned (proactive) maintenance systems and unplanned (reactive) maintenance systems. This is illustrated in **Figure 1** below:

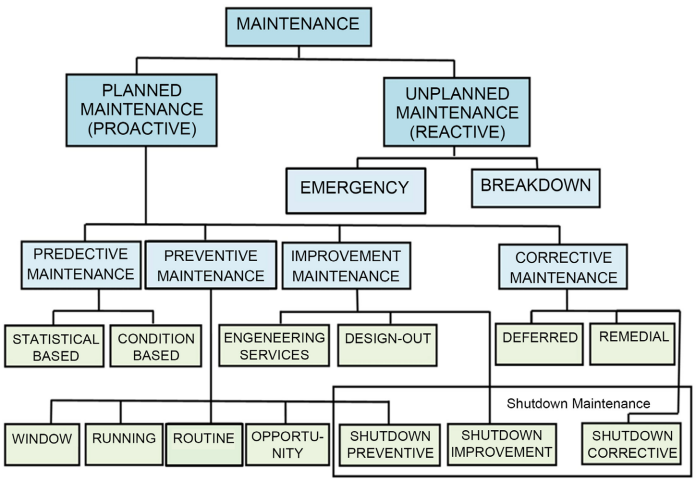

Figure 1. Types of maintenance systems. Source: Mobley (2004).

An unscheduled maintenance event is what sets things off, and there are a lot of issues that come with doing unplanned maintenance. This kind of maintenance is often inefficient since it is neither scheduled nor planned. To remedy the equipment, time must be dedicated to investigating (*i.e.*, inspecting and evaluating) the issue and creating a maintenance schedule. It's also possible that time will be lost waiting on supplies, parts, or additional workers to finish the repair job. Additionally, unscheduled maintenance might be highly costly. The extra expenses stem from the waiting time, the premium charges for expedited part ordering and shipment, and the potential overtime payments needed for additional or specialised staff to finish the job.

Furthermore, as the malfunctioning machine in question is likely to have an adverse effect on the functioning of other areas of the plant, the expenses associated with production loss must also be included in the cost of this kind of maintenance. In the event that no maintenance planning is done, the reactive maintenance approach takes precedence. At some point, a machine will break down and require this kind of maintenance, even though it is intended that this form of maintenance be discouraged and avoided in the planned maintenance methods. This bears all the extra expenses related to this kind of upkeep. Emergencies and breakdowns (run-to-failure) are the principal maintenance systems covered by unscheduled (or reactive) maintenance jobs.

1.2.1. Unplanned Maintenance

Reactive or unplanned maintenance is defined as maintenance performed without following a set plan. It's the "corrective work required in the short-term to restore a 'asset' to working condition so that it can continue to deliver the required service or to maintain its level of security and integrity". It describes the actions used to fix, replace, or restore a machine or facility following a failure in order to get it back to a minimal level of acceptable performance. It happens with every plan for asset maintenance.

An example of this kind of maintenance, as well as the difficulty it might bring, is when a car breaks down on the side of the road in the middle of a journey, necessitating a wait for a mechanic to arrive and fix it. This system primarily uses event-driven tasks (Mobley, 2004). Sometimes unplanned maintenance is also known as run-to-failure, reactive, corrective, or breakdown maintenance.

1.2.2. Planned Maintenance

Planned maintenance is different from unscheduled maintenance in that it is scheduled and recorded to be completed prior to a breakdown. Planned maintenance, according to Wikipedia, is a scheduled service visit performed by a qualified and appropriate agent to make sure an item of equipment is running appropriately and prevent unplanned breakdowns and downtime. Planned maintenance, according to [25], is a structured form of upkeep that handles additional duties including record-keeping and control.

They restate that the work is scheduled in advance for this kind of mainte-

nance in order to prevent unforeseen malfunctions. It determines not just the "what," "when," and "who" of maintenance work, but also who will perform it. Maintenance can no longer negatively impact the facility's operations because the planning procedure optimises work efficiency. All planned maintenance systems, in general, include tasks that schedule, document, and oversee every task carried out to maintain a plant's appropriate maintenance levels. This covers both long-term and daily maintenance work planning. When it is used, accurate time and cost estimates are produced, and by strengthening the control mechanism, time and money are saved [13]. Both scheduled and unscheduled forms of planned maintenance are possible.

1.3. Problem Statement

Inadequate maintenance and safety protocols within the mechanical engineering sector can undoubtedly result in workplace dangers and incidents, potentially leading to fatalities, diseases, property damage, and substantial financial losses for the company. However, safe and efficient maintenance procedures pay for themselves and enhance an organization's standing with clients, authorities, and staff. Therefore, every industrial disaster that occurs assumes that either certain safety precautions have not been closely maintained or that some important maintenance operations have been neglected because they are past due.

After all, news of industrial disaster incidences abound and they continue to happen frequently on a daily basis [25] [26]. It makes sense that industries would lack sufficient, efficient procedures for safety and maintenance. The question therefore becomes, if there is any value in an industry implementing efficient maintenance and safety regulations, why is this tendency so widespread? The issue that needs to be addressed by this research is how following safe-maintenance procedures affects an industry's performance as a whole.

1.4. Aim and Objectives

The aim of the study is to assess the impact safety-maintenance practices has on the overall performance of Ghanaian mechanical engineering industry. The specific objectives are to:

1) Determine the maintenance systems and strategies employed by mechanical engineering workshops in Ghana.

2) Highlight practices and challenges of mechanical engineering workshops in regard to maintenance.

2. Research Methodology

The methodology followed in this work is outlined as follows.

2.1. Research Design and Procedure

A questionnaire and in-person interviews at particular firms were used to collect quantitative information. In addition, first-hand observations and field trips

were used in the study to gather data. Generalising from a sample to the population is the aim of survey research, allowing conclusions to be drawn about the subject matter. Due to its guarantee of economical design, quick data collection turnaround, and capacity to discern population characteristics from a small sample of samples, this approach is favoured. Other industries that also run maintenance systems, such as mining, were left out of the research's purview because the focus of the study was Ghanaian industry's mechanical engineering workshops.

2.2. Questionnaire Design and Administration

The study used a descriptive survey design technique to ascertain the type of maintenance engineering that was practiced in Ghanaian mechanical engineering workshops at the time of the study. It aimed to highlight existing demands and identify the sector's current situation. The ability to analyse, summarise, and integrate data in order to investigate its implications and relationships is the aim. In the mechanical engineering workshops, respondents provided both qualitative and quantitative data using a variety of data collecting instruments, with the quantitative approach being more common. In addition to informal conversations and direct observation, these methods of gathering primary data also included the use of structured and semi-structured questionnaires and the contributions of engineers, technicians, and artisans from both the formal and informal sectors.

A variety of questions that are typical when it comes to problems with maintenance engineering in Ghana were included in the questionnaire. The questionnaire contained both closed- and open-ended questions. The primary purpose of the open-ended questions was to help the researchers pinpoint the biggest obstacles that respondents faced when carrying out the maintenance task. Respondents could select an answer from a list of potential answers provided by the closed questions. While some of the questionnaires were mailed to the respondents, the majority were given out in the form of in-person interviews.

2.3. Population, Sampling Procedure and Sample Size

The entire population (164) for the study consisted of mechanical engineering workshops located in Accra, Tamale, and Kumasi, as listed in the Association of Ghana Industries membership registry of the year 2023 (AGI, 2021). This is broken down by city, with 14 firms located in Accra, 61 firms in Tema, and 44 firms in Kumasi. The number of mechanical engineering workshop enterprises that made up the sample size for the questionnaire administration was sixty (60), chosen at random from the AGI membership registry.

Nonetheless, the study was based on the fifty (50) surveys that respondents returned in total. The study is based on the National Board for Small Scale Industries (NBSSI) classification scheme, which classifies companies into four categories: micro, small, medium, and large enterprises. Firms with staff strengths

of 0 - 5 are classified as micro, those with staff strengths of 5 - 9 as small, and those with staff strengths of 10 - 90 as medium.

2.4. Field Observation and Interviews

When appropriate, interviews were held to elucidate any of the data that respondents had submitted on the questionnaire. This procedure allowed for the collection of crucial extra information that was not included in the questionnaire.

2.5. Method of Data Analysis

In data analysis, descriptive statistics using MS Excel and Stata10 were used to calculate means ($\bar{x} = \sum x/n$) and frequency counts ($f = n/N$). Graphs were also plotted for aesthetic effect.

3. Results and Discussion

3.1. Type of Ownership of Respondent Firms

The majority Individual Ghanaian private-ownership (PO) accounts for 60% of the firms, while Ghanaian-foreign joint ventures (Gh-F) account for 10%, Ghanaian joint ventures (JVs) for 3%, public limited liability companies for 17%, private limited liability companies for 6%, and state-owned enterprises for 3% of the surveyed companies. In conclusion, the majority of the businesses are privately or internationally owned. (Figure 2)

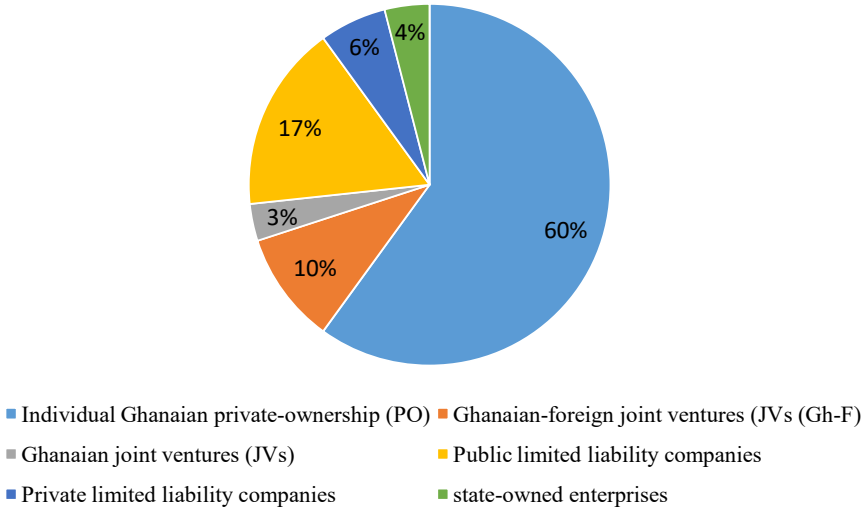

Figure 2. Type of ownership of respondent firms.

3.2. Maintenance Systems and Strategies

3.2.1. In-House Versus Contract Maintenance/Repair

Reference [5] talked about how mechanical companies all around the world have been using contract maintenance more and more in recent years; more studies support this finding. Larger companies, however, are more likely to use this

strategy. Ghana-based contractors are preferred by the majority of respondents. According to 60% of respondents, 70% of maintenance and repair work is done internally by large firms (33.3%) and medium-sized enterprises (45%). 50% of work is done in-house by 3% of businesses. The businesses in the latter category are all medium-sized. The majority of large-scale businesses never employ contract maintenance.

3.2.2. Maintenance Systems and Strategies Employed

The workstations' operating schedules are directly impacted by the maintenance schedule and production plan. Establishing a suitable preventive maintenance plan that maximises specific goal functions, such as lowering maintenance costs or maintaining workstation quality, is the most crucial duty when it comes to maintenance scheduling. The relative importance index of various maintenance systems and strategies employed by respondent firms is presented in **Table 1**. Preventive shut-down maintenance systems, with a mean score of 4.78 and RII = 0.98, represent first (1st) in the Likert ranking order, and are used by the majority of enterprises in the preventive (routine), predictive (condition-based), and contract maintenance modes despite these challenges.

Table 1. Maintenance systems and strategies employed.

Maintenance Strategies	$\sum_{i=1}^{n} w_i / N$	RII	Ranking
Preventive Maintenance	4.78	0.98	1st
Run-to-failure Maintenance	4.26	0.96	2nd
Contract Maintenance	3.97	0.92	3rd
Total Productive Maintenance (TPM)	3.86	0.87	4th
Predictive Maintenance	3.85	0.85	5th

RII—Relative Importance Index.

Run-to-failure Maintenance ranked 2nd with a mean score of 4.26 and RII 0.96. Planned preventive maintenance schemes are mainly employed because they are the best suited to the equipment types employed by respondent firms. Large firms form the majority of respondents who employ this maintenance scheme. The relationship between production and maintenance has been literally considered as a conflict in optimal decisions.

With a mean score of 3.97 and RII of 0.92, Contract Maintenance (CM) came in third place. The present rising trend is towards outsourcing for maintenance services due to the necessity for increased technical specialisation or as a means of allocating sufficient attention to focus on important business challenges [24].

Due to workstation malfunctions or interruptions from preventive maintenance procedures, these conflicts could lead to an unmet demand in output. Total Productive Maintenance (TPM) came in fourth place with a RII of 0.87 and a mean score of 3.86. Afterwards, TPM will be referred to as TPM. Medium and

large-scale businesses make up an equal portion of the tiny number of responders who practise TPM. Respondents who disagree with the TPM philosophy listed the implementation cost as one of their reasons.

According to some academics, TPM can help organisations acquire a competitive advantage by positioning them to become world-class manufacturers [27] [28]. According to McCone *et al.* (2001), it is believed to encourage cost savings while enhancing the overall quality and delivery of the maintenance function.

PM, came in fifth place with a RII of 0.85 and a mean score of 3.85. According to Mobley (2008), predictive maintenance is a maintenance technique that optimises plant performance overall by applying regular evaluation of real operating conditions of equipment, production systems, and plant management activities.

Thus, the majority of Ghanaian mechanical engineering companies are not benefiting from TPM. One additional noteworthy finding is that the responding companies don't use a single maintenance plan for every piece of machinery. When necessary, they blend several tactics to accommodate their equipment and production schedules.

3.3. Challenges Facing Implementation of Maintenance Strategies

The cost of shut-downs, the cost of replacement parts, the inability of maintenance personnel to retain knowledge and skills following training, the lack of funding allotted for the maintenance function, and the unwillingness of contractors to replace faulty parts are some of the general issues that respondents faced when implementing maintenance strategies. Let's take a quick look at each of these individually.

3.4. Effect of Shut-Downs

Production and maintenance have historically been viewed as incompatible when making the best choices. Due to workstation malfunctions or interruptions from preventive maintenance procedures, these conflicts could lead to an unmet demand in output. Another frequent grievance is that equipment typically performs less well when production picks back up following a shut-down, which results in a sizable percentage of initial production being faulty. However, by properly and meticulously adjusting the parameters following each repair operation, this issue can be resolved.

3.5. Cost of Spare Parts

The cost-effectiveness of the maintenance function is found to be challenged by rising spare component costs and delivery delays. Although this could be the result of Ghana's uncontrollably high inflation rate, there are ways to benefit from the existence of economic dependencies that affect maintenance costs. For example, economies of scale or positive economic dependence suggest that combining maintenance activities can save money rather than keeping individual components in need of repair. A number of maintenance models have taken this

positive reliance into consideration. Note that combining maintenance, however, might also result in increased costs, for example, because of labour constraints.

3.6. Failure of Maintenance Staff to Retain Knowledge and Skills Acquired

One of the biggest issues facing businesses is the low knowledge and skill retention of maintenance personnel following training. Sometimes maintenance personnel who have received training on a machine fail to fix it. According to the study's findings, businesses' employment of inefficient techniques for talent transfer and training is what's causing a growing need for contract maintenance, which might occasionally result in higher expenses.

3.7. Lack of Adequate Funds Committed to Maintenance

The findings of this study generally represent management's ignorance of the significance of the maintenance function and its critical influence on business profitability because this is a global occurrence. This emphasises the necessity of having the best maintenance practices to counteract the effects of this issue by delivering the highest level of system safety performance, dependability, and availability at the lowest feasible maintenance costs.

3.8. Reluctance of Contractors to Replace Defective Parts

Businesses who use maintenance contractors disclose that most contractors in Ghana are agents of international corporations, and one of the biggest problems they encounter is the agents' "disregard for replacing supplied defective parts." The time it takes to acquire supplies, even when they agree to provide replacements, drives up manufacturing expenses overall.

4. Conclusion and Recommendations

The study evaluated the effect that safety-maintenance procedures have on the mechanical engineering sector's overall performance in Ghana. The complexity of maintenance facilities is such that a single person's abilities are frequently insufficient to finish work to the highest standard. Through increased production equipment availability, a sound maintenance approach should boost business profitability [29] [30]. One can infer the following conclusions.

The maintenance procedures employed by mechanical engineering organisations were tailored to their equipment and organisational culture. Preventive shut-down, with a mean score of 4.78 and RII = 0.98, placing first (1st) in the Likert rating order, is the most frequently used maintenance system by respondents. Run-to-failure is closely behind. With a mean score of 4.26 and RII 0.96, maintenance came in second, while contract maintenance (CM) came in third with a mean score of 3.97 and RII 0.92. Compared to medium-sized businesses, large corporations are far more likely to adhere to regular maintenance processes.

Ghanaian mechanical engineering firms are missing out on the efficiencies associated with current systems since maintenance and repair activities in the engineering sector of the country's industry are not characterised by the usage of these systems.

5. Recommendations

Implementation of Total Preventive Maintenance (TPM) principles should be intensified in order to take advantage of its benefits in the Ghanaian Mechanical engineering workshops. Secondly, Mechanical engineering workshops should develop and implement performance standards as well as ongoing maintenance training modules to train their staff regularly to enhance their effectiveness.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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