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Proposal for Corrective Maintenance Actions on the STEMAC DS8528 Generator Set (GMG) at the Soyo/Zaire Polytechnic Institute

Proposal for Corrective Maintenance Actions on the STEMAC DS8528 Generator Set (GMG) at the Instituto Médio Politécnico do Soyo, Zaire

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Summary

The article **"Proposal for Corrective Maintenance Actions on the STEMAC DS8528 Generator Set (GMG) at the Soyo/Zaire Polytechnic Institute"** addresses the need to implement corrective maintenance practices to ensure the reliability and efficiency of the generator set used by the institution. The study begins with the observation of recurring equipment failures that compromise the continuity of electricity supply in educational and laboratory environments. The research describes the operational history of the STEMAC DS8528 GMG, identifying the main technical problems, such as component wear, lubrication system failures, overheating, and irregularities in the control system. The methodology used includes technical inspections, document analysis, and interviews with operators, allowing for mapping the causes of the failures and proposing practical solutions. Among the suggested actions are: periodic replacement of critical parts, reinforcement of lubrication procedures, and calibration of...

Monitoring systems, training of responsible technicians, and the creation of a systematized corrective maintenance plan are key. The article emphasizes that such measures not only extend the generator's lifespan but also reduce operational costs and prevent power outages. It concludes that adopting a structured corrective maintenance plan is essential to ensure the reliability of the generator set, contributing to the smooth operation of the pedagogical and laboratory activities of the Soyo Polytechnic Institute. This study serves as a reference for other institutions that depend on generator sets in regions with energy instability.

Keywords: Corrective maintenance, Generator set, STEMAC DS8528, Operational reliability, Soyo Polytechnic Institute

Abstract

The article **"Proposal of Corrective Maintenance Actions for the Generator Set (GMG) STEMAC DS8528 at the Soyo/Zaire Polytechnic Institute"** addresses the need to implement corrective maintenance practices to ensure the reliability and efficiency of the generator set used by

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the institution. The study begins with the observation of recurring equipment failures, which compromise the continuity of electricity supply in educational and laboratory environments.
The research describes the operational history of the STEMAC DS8528 GMG, identifying the main technical problems such as component wear, lubrication system failures, overheating, and irregularities in the control system. The methodology applied includes technical inspections, document analysis, and interviews with operators, allowing the mapping of failure causes and the proposal of practical solutions. Among the suggested actions are: periodic replacement of critical parts, reinforcement of lubrication procedures, calibration of monitoring systems, training of responsible technicians, and the creation of a systematic corrective maintenance plan. The article emphasizes that such measures not only extend the generator's operational lifespan but also reduce costs and prevent interruptions in energy supply. It is concluded that the adoption of a structured corrective maintenance plan is essential to ensure the reliability of the GMG, contributing to the proper functioning of pedagogical and laboratory activities at the Soyo Polytechnic Institute. The study serves as a reference for other institutions that rely on generator sets in regions with unstable energy supply.

Keywords: Corrective maintenance, Generator set, STEMAC DS8528, Operational reliability, Soyo Polytechnic Institute

Introduction

1. Contextualization and Justification

Electrical energy is one of the fundamental pillars for development. socioeconomic and technological development of any nation. In the educational context, especially in For technical and polytechnic educational institutions, a continuous supply of energy is indispensable. to ensure the operation of laboratories, workshops, computer equipment and other Educational resources that support the training of future professionals. In regions where the network The public supply system experiences instability or frequent interruptions; generator sets They play a strategic role as alternative sources of energy.

The Soyo Polytechnic Institute, located in the Zaire province of Angola, faces challenges related to energy reliability. To mitigate the impacts of power grid failures, The institution uses the STEMAC DS8528 generator set, a robust piece of equipment designed to supply critical energy demands. However, like any electromechanical system, the generator is subject to... wear and tear, failures, and malfunctions compromise its efficiency and availability. In this scenario, it becomes... It is imperative to adopt corrective maintenance practices that ensure continuity of supply. energy efficiency and preserving the lifespan of the equipment.

2. Research Problem

Despite the relevance of the STEMAC DS8528 generator set, recurring failures have been observed that result in unexpected interruptions. Among the most frequent problems are: wear and tear. premature component failure, lubrication system failures, overheating, and irregularities in control system. These occurrences not only increase operating costs, but also

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They directly affect pedagogical and laboratory activities, causing delays, data loss, and... Compromising the quality of education.

The absence of a structured corrective maintenance plan exacerbates the situation, since The interventions carried out tend to be sporadic and reactive, without considering a systematic analysis of the... causes of failures. Thus, the central problem guiding this study is: **how to propose actions to Corrective maintenance that ensures greater reliability and efficiency for the STEMAC generator set. DS8528 from the Soyo Polytechnic Institute?**

3. Objectives

The overall objective of this article is to propose a set of corrective maintenance actions. applicable to the STEMAC DS8528 generator set, in order to ensure its operational reliability. and to reduce the impact of failures on the institution's activities.

Specific objectives include:

- Identify and analyze the main technical problems affecting the GMG's performance.
- Evaluate the maintenance procedures currently adopted by the institution.
- Propose corrective measures that include replacing critical parts and calibrating systems. and reinforcement of lubrication protocols.
- Recommend training strategies for technicians responsible for operation and maintenance. of the equipment.
- Develop a systematized corrective maintenance plan that can serve as a reference for other institutions in similar contexts.

4. Relevance of the Study

The relevance of this research lies in multiple dimensions:

- **Academic:** contributes to the field of maintenance engineering by offering a case study. applied to an educational institution in Angola.
- Soyo Polytechnic Institute, with the potential to reduce costs and increase operational efficiency. Practice: provides concrete solutions to real problems faced by the institution. • **Social:** by ensuring the continuity of energy supply, it promotes better teaching and learning conditions, positively impacting the training of technicians and engineers.
- **Economical:** adopting systematic corrective practices can extend the generator's lifespan, preventing excessive expenses on equipment replacement and prolonged downtime.

5. Conceptual Review

Corrective maintenance is defined as the set of actions aimed at restoring a equipment returns to its operational state after a failure occurs. Unlike Preventive maintenance, which seeks to anticipate problems through inspections and replacements. Scheduled corrective maintenance acts reactively, but it can be systematized to reduce... negative impacts.

In the case of generator sets, corrective maintenance involves activities such as: replacement.

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of damaged components, adjustments to control systems, repairs to lubrication systems and refrigeration, in addition to post-intervention performance tests. The technical literature highlights that, when With proper planning, corrective maintenance can be as effective as preventive maintenance, especially in environments where financial and logistical resources are limited.

6. Article Structure

This article is organized as follows:

- **Introduction:** presents the context, problem, objectives, and relevance of the study.
- **Methodology:** describes the procedures adopted for data collection and analysis.
- **Results and Discussion:** outlines the main problems identified and the corrective actions. proposals.
- **Conclusion:** summarizes the findings and recommendations, highlighting the importance of maintenance. Corrective action to improve generator reliability.

Theoretical Framework

1. Fundamentals of Industrial Maintenance

Industrial maintenance is a strategic field of engineering that seeks to ensure availability, reliability and safety of productive assets. According to Santana et al. (2019), the Maintenance can be classified as preventive, predictive, and corrective, each with its own objectives. Specific characteristics and distinct applicability. Corrective maintenance, the focus of this study, is defined as... A set of actions performed after a failure occurs, aimed at restoring the equipment to its original state. operational status.

Oliveira (2024) highlights that, although often seen as a reactive practice, the Corrective maintenance can be systematized and optimized, becoming an effective tool for... To reduce costs and increase operational efficiency. In the context of generator sets, this... This approach is particularly relevant, since unexpected failures can compromise the Power supply in critical environments, such as hospitals, industries, and educational institutions.

2. Corrective Maintenance on Generator Sets

Generator sets play an essential role in locations where the electrical grid is unstable. or insufficient. According to Lial (2023), corrective maintenance on generators is indispensable. to ensure that equipment is available in emergency situations. Among the main Problems requiring corrective action include: wear and tear of mechanical components, system failures. lubrication, overheating, and irregularities in electronic control systems.

Studies conducted by Ghirardelli (2019) demonstrate that the costs associated with maintenance Corrective maintenance on large generators can be significant, but still less than that of... losses resulting from the interruption of the energy supply. This reinforces the

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The need for a structured plan that allows for quick and effective interventions.

3. Operational Reliability and Asset Management

Operational reliability is a central concept in maintenance engineering. According to According to Alghamdi (2024), the reliability of a generator is directly related to the quality of its... Maintenance practices adopted. The absence of a systematized corrective maintenance plan. This compromises not only the efficiency of the equipment, but also the safety of the operations. They depend on him.

GE Vernova (2025) emphasizes that robust maintenance strategies are fundamental for To extend the lifespan of generators and reduce the risk of unexpected failures. In this sense, the Corrective maintenance should be integrated into a broader asset management strategy that considers various aspects. technical, economic and organizational.

4. The Case of STEMAC Generator Sets

STEMAC is one of the leading manufacturers of generator sets in Brazil and Angola. offering specialized service infrastructure and original replacement parts. The model The DS8528, used by the Soyo Polytechnic Institute, is designed to meet demands. Critical power consumption, but like any electromechanical equipment, it is subject to failures arising from... from continuous use.

The STEMAC operation and maintenance manual (2019) recommends periodic inspections and Immediate corrective interventions in cases of failure. However, it is observed that many institutions They do not strictly follow these guidelines, resulting in more frequent breakdowns and higher costs. additional.

5. Theoretical Perspectives on Corrective Maintenance

The literature points to different perspectives on corrective maintenance:

- **Santana et al. (2019):** argue that scheduled corrective maintenance can be as effective as preventive maintenance, provided it is well structured.
- **Oliveira (2024):** argues that corrective maintenance should be seen as part of a A process optimization strategy, not just an emergency response.
- **Lial (2023):** emphasizes that, in generator sets, corrective maintenance is vital to avoid failures at critical times.
- **Alghamdi (2024):** directly links generator reliability to maintenance practices. adopted.
- **Ghirardelli (2019):** demonstrates that, despite the costs, corrective maintenance is economically viable when compared to losses due to interruption.

These theoretical contributions underpin the proposal of this article, which seeks to apply these concepts to the specific case of the GMG STEMAC DS8528 at the Soyo Polytechnic Institute.

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6. Synthesis and Relevance to the Study

The theoretical framework highlights that corrective maintenance, when systematized, is a practice. essential to ensure the reliability of generator sets. In the case of the Polytechnic Institute From Soyo's perspective, adopting a structured plan will not only reduce recurring failures, but also... also to optimize resources and ensure the continuity of pedagogical and laboratory activities.

Thus, this study relies on a solid theoretical foundation that combines classic concepts of Maintenance engineering with practical evidence of application in generator sets. The proposal of Corrective actions for the STEMAC DS8528 generator set aim to align theory and practice, offering solutions. applicable and replicable in similar contexts.

Materials and Methods

1. Characterization of the Object of Study

The central object of this study is the **STEMAC DS8528 Generator Set,** installed at the Institute. Soyo Polytechnic Institute, Zaire province, Angola. This is a medium-sized facility. Designed to meet critical electrical power demands in educational and laboratory environments. The generator consists of a diesel engine, alternator, lubrication system, and a system for... cooling system, electronic control panel and auxiliary safety devices.

The choice of this equipment as the object of analysis is justified by its relevance. strategic for the institution, since it guarantees the continuity of pedagogical activities in situations of failure or instability in the public electricity grid.

2. Materials Used

The following materials and resources were used to carry out the research:

- **Technical documentation:** operation and maintenance manuals provided by STEMAC, reports Internal procedures within the institution and records of previous failures.
- **Inspection tools:** digital multimeters, infrared thermometers, pressure gauges, vibration analyzers, and lubrication kits.
- **Supporting software:** spreadsheets for data entry, statistical analysis software (SPSS and Excel) and generator performance monitoring programs.
- **Auxiliary equipment:** basic mechanical tools (wrenches, pliers, torque wrenches), as well as safety devices such as gloves, safety glasses and ear protectors.
- **Human resources:** institution maintenance technicians, generator operators, and consultants External specialists in corrective maintenance.

3. Research Methodology

The methodology adopted was **applied and descriptive** in nature , with a **qualitative approach and**

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quantitative. The study followed these steps:

3.1 Document Survey

An analysis was conducted of the institution's internal reports, containing records of failures. incidents that occurred on the GMG STEMAC DS8528 over the past three years. This survey allowed us to identify Failure patterns and frequency of occurrences.

3.2 Technical Inspections

Visual and instrumental inspections were conducted on the generator set, focusing on the following: systems:

- **Lubrication system:** checking oil levels, pressure, and for leaks.
- **Cooling system:** analysis of operating temperature, radiator condition, and airflow. refrigerant liquid.
- **Electrical system:** voltage, current and insulation resistance tests.
- **Control system:** evaluation of the electronic panel, sensors, and safety alarms.

3.3 Interviews with Operators

Semi-structured interviews were conducted with the technicians responsible for the operation and Generator maintenance. The interviews sought to understand current practices and difficulties. challenges and suggestions for improvement.

3.4 Statistical Analysis

The collected data were organized into spreadsheets and subjected to statistical analysis. descriptive. Frequency, mean time between failures (MTBF), and time measurements were calculated. Mean Time To Repair (MTTR). These indicators allowed for the evaluation of equipment reliability and the effectiveness of the interventions carried out.

3.5 Proposal for Corrective Actions

Based on the results of inspections, interviews, and statistical analysis, the following were prepared: Proposals for corrective actions, including:

- Periodic replacement of critical components.
- Enhancement of lubrication and cooling protocols.
- Calibration of monitoring systems.
- Ongoing training for the responsible technicians.
- Creation of a systematized corrective maintenance plan.

4. Ethical Procedures

The study respected ethical principles related to applied research in environmental settings. institutional objectives. All technicians and operators interviewed were informed about the objectives of The participants in the research and consented to participate. The data collected was treated confidentially. guaranteeing the privacy of participants and the institution.

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5. Methodological Limitations

Among the study's limitations, the following stand out:

- The absence of complete records of previous failures, which made historical analysis difficult.
- The limited financial resources for acquiring genuine STEMAC parts, which impacts the Immediate implementation of some corrective actions.
- The reliance on interviews, which may contain subjective biases from the operators.

6. Structuring the Analysis

The analysis was structured in three levels:

1. **Technical diagnosis:** identification of the most frequent faults.
2. **Operational evaluation:** analysis of the generator's reliability and availability.
3. **Proposing solutions:** developing applicable and replicable corrective actions.

Results and discussion

1. Overview of Identified Failures

During the analysis period, recurring failures were recorded in the STEMAC DS8528 generator set, which fell into four main categories:

- **Lubrication system:** low oil pressure and presence of leaks.
- **Cooling system:** overheating due to blockages in the radiator and pump failures. of water.
- **Electrical system:** voltage variations and faults in power cables.
- **Control system:** false alarms and sensor failures.

Statistical analysis revealed that the **mean time between failures (MTBF)** was approximately 120 hours of operation, while the **mean time to repair (MTTR)** ranged from 3 to 6 hours, depending on the complexity of the failure. These indicators demonstrate that the generator has moderate reliability, but is still insufficient to meet the institution's critical demands.

2. Impacts of Failures on Academic Activities

The identified shortcomings had a direct impact on the pedagogical and laboratory activities of the Soyo Polytechnic Institute. Among the main effects observed are:

- Interruptions in practical classes in electricity and mechanics.
- Data loss on computers due to abrupt shutdowns.
- Delays in laboratory experiments that depend on a continuous power supply.
- Increased operational costs due to emergency repairs and parts acquisition.

These results confirm the need for a structured corrective maintenance plan.

capable of reducing the frequency of failures and ensuring greater reliability for the generator set.

3. Proposed Corrective Actions

Based on the results obtained, the following corrective actions were developed:

- **Periodic replacement of critical components:** oil filters, belts, hoses, and sensors.
- **Enhanced lubrication protocols:** weekly inspections and oil changes every 250 hours. operation.
- **Calibration of monitoring systems:** adjustment of temperature and pressure sensors to

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Avoid false alarms.

- **Ongoing training for technicians:** training in fault diagnosis and tool usage.
inspection.
- **Creation of a systematized corrective maintenance plan:** detailed record of interventions performed and monitoring of performance indicators.

4. Discussion in Light of the Literature

The results obtained are consistent with previous studies on corrective maintenance in generator sets:

- Santana et al. (2019) argue that scheduled corrective maintenance can be as effective as Preventive measures, provided they are well-structured.
- Oliveira (2024) argues that corrective maintenance should be seen as part of a strategy. process optimization, and not just as an emergency response.
- Lial (2023) emphasizes that, in generator sets, corrective maintenance is vital to avoid failures in critical moments.
- Ghirardelli (2019) demonstrates that, despite the costs, corrective maintenance is economically viable when compared to losses due to interruption.

A comparison between the results obtained and the literature shows that the adoption of practices

Systematic corrective actions can significantly increase the reliability of the STEMAC generator set.

DS8528, reducing negative impacts on the institution's activities.

5. Expected Benefits of Implementation

The implementation of the proposed corrective actions should generate the following benefits:

- **Increased operational reliability:** reduced failure frequency and greater Generator availability.
- **Cost reduction:** decreased expenses on emergency repairs and extended equipment lifespan.

- **Improvement of teaching conditions:** continuity of pedagogical and laboratory activities without interruptions.
- **Technical training:** greater autonomy for the technicians responsible for maintenance.

6. Limitations and Future Perspectives

Despite the progress made, the study has some limitations:

- The lack of complete records of previous failures made historical analysis difficult.
- Limited financial resources impact the immediate implementation of some actions. corrective.
- Reliance on interviews may contain subjective biases from the operators.

Conclusion

- This study, entitled *"Proposal for Corrective Maintenance Actions on the STEMAC DS8528 Generator Set (GMG) at the Soyo/Zaire Polytechnic Institute",* allowed us to identify and analyze the main failures that compromise the reliability and efficiency of the equipment, as well as propose practical solutions for their mitigation.
- The results demonstrated that the generator set presents recurring failures in the lubrication, cooling, control, and electrical systems, directly impacting the institution's pedagogical and laboratory activities. Statistical analysis of performance indicators

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(MTBF and MTTR) showed that current reliability is moderate, but insufficient to meet critical energy demands.

- The proposed corrective actions — including periodic replacement of critical components, reinforcement of lubrication protocols, calibration of monitoring systems, continuous training of technicians, and creation of a systematized maintenance plan — constitute a viable strategy to increase the availability of the generator set and reduce operating costs.
- From an academic and practical standpoint, this work reinforces the importance of corrective maintenance as an asset management tool, especially in contexts where financial and logistical resources are limited. Adopting a structured plan will not only extend the generator's lifespan but also ensure the continuity of educational activities, contributing to the training of qualified professionals and strengthening the infrastructure of the Soyo Polytechnic Institute.

Finally , it is recommended that future research integrate preventive and predictive maintenance practices into the corrective plan, as well as explore the use of real-time digital monitoring technologies. In this way, it will be possible to achieve even higher levels of reliability and efficiency, consolidating the strategic role of generator sets in educational and institutional environments.

Practical Recommendations

1. Structuring a Corrective Maintenance Plan

- **Develop a systematic schedule** of inspections and corrective interventions, with records. Detailed descriptions of each activity performed.
- **Define clear responsibilities** between managers and technicians, ensuring that each step of the process is properly defined. be monitored and evaluated.
- **Establish performance indicators** (MTBF and MTTR) to monitor the evolution of the reliability of the STEMAC DS8528 generator set.

2. Resource Management and Spare Parts

- **Create a minimum inventory of critical parts,** such as filters, belts, sensors, and hoses, to reduce response time in case of failure.
- **Prioritize the use of genuine STEMAC parts,** ensuring greater compatibility and durability.
- **Negotiate supply contracts** with local distributors, ensuring rapid replenishment. and cost reduction.

3. Technical Training

- **Promote regular training** for the responsible technicians, focusing on diagnosis of faults, use of inspection tools and good corrective maintenance practices.
- **Encourage continuous professional development** through online courses and workshops offered by manufacturers and educational institutions.
- **Create simplified internal manuals,** adapted to the institution's reality, to guide quick and safe interventions.

4. Operational Monitoring and Control

- **Install digital sensors** for real-time monitoring of critical parameters (temperature, pressure, vibration).
- **Integrate the collected data** into spreadsheets or management software, allowing for continuous analysis and evidence-based decision-making.

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• **Establish monthly** generator performance reports, with analysis of failures that occurred and corrective measures applied.

5. Organizational Culture of Maintenance

• **To raise awareness among managers and technicians** about the importance of corrective maintenance as an investment. strategic, and not just as an operational cost.
• **Promote regular meetings** between technical and administrative teams to align priorities. and evaluate results.
• **Encourage safety practices** during all interventions, ensuring the physical integrity of operators and the preservation of equipment.

6. Integration Perspectives

• **Complement the corrective plan with preventive and predictive actions,** creating a hybrid maintenance system that maximizes the reliability of the generator set.
• **Explore digital technologies** such as assisted maintenance software and alert systems. remote systems, which can anticipate failures and reduce costs.
• **Replicate the proposed practices** in other facilities within the institution, expanding the benefits. for all energy infrastructure.

Final Summary

The practical recommendations presented here offer a clear and immediate roadmap for managers and technicians at the Soyo Polytechnic Institute. Implementing these measures will allow for:

• Reduce the frequency of failures of the STEMAC DS8528 generator set.
• To ensure greater reliability and energy availability.
• Optimize financial and human resources.
• To ensure the continuity of the institution's pedagogical and laboratory activities.

In short, the adoption of a structured corrective maintenance plan, combined with training...

Technical expertise and continuous monitoring constitute an essential strategy for consolidating efficiency.

operational efficiency of the generator set and to strengthen the educational infrastructure of the Institute.

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