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**A CASE STUDY OF PORTSUDAN (A)**

**POWER PLANT**

تحسين برنامج الصيانة لمحرك ديزل

دراسة حالة لمحطة توليد بورتسودان (أ)

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## الآية

بسم الله الرحمن الرحيم

وَالرَّاسِخُونَ فِي الْعِلْمِ يَقُولُونَ إِنَّمَا نَكَلُّ مِنَ عُنُودٍ بَنَوْا مِثْلَ بَنَائِنَا وَاللَّهُ  
الْأَعْلَمُ بِالظَّالِمِينَ (٧)

## *Dedication*

*To my parents, my source of inspiration, wisdom, knowledge and  
understanding*

*To my brothers and sister, my strong pillar*

*To all my family members for their love and care*

*To all of my friends, for their great support*

*To the one who has been a constant source of encouragement*

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## ABSTRACT

Diesel engines draw larger interest today mainly because of higher efficiency and cost effectiveness. The thermal electric power unit is a complex system with several components. In case of diesel engine, the respective subsystems are the diesel engine, the electric equipments, and systems of oil, fuel, water cooling etc. this work is aimed to carry out a reliability study for individual sub-systems, so as the most frequently malfunctioning parts of the system be identified and proactive measures be taken. Nowadays, maintenance has become a strategic function in its own right since it must ensure maximum uptime at lower cost. Thus, and to ensure the availability of equipment, knowledge and rigorous and optimal management of maintenance is needed, and also a continuous improvement of the reliability and maintainability. In this research, our work takes stock of the FMECA study as a tool to improve the maintenance and the availability of equipment. Therefore, it is necessary to know the failure mode to which the system is subjected, and also of their criticality in order to the development of an adequate maintenance schedule while following the specifications of the equipment. The information gathered in the FMECA enabled tailoring the maintenance to handle each evaluated failure mode, resulting in a program of both corrective and preventive actions. Further, the results were structured to provide a framework for continuous improvement and update of the maintenance program. Cylinder liner, pistons, fuel injectors, exhaust valves and oil pump were identified as the top critical items.

## خلاصه

تشكل محركات الديزل اليوم اهمية كبيرة وذلك لارتفاع كفاءتها وجدوتها لاقتصادية. وحدات الطاقه الكهروحرارية تعتبر نظام معقد مكون من عدة مكونات. في حالة ماكينات الديزل ، الانظمه الفرعية هي جسم الماكينه والاجزاء الكهربائيه ودورات الزيت و الوقود ومياه التبريد... الخ. هذا العمل طبق لدراسة الموثوقيه للانظمة الفرعيه، وبذلك يتم تقييم وتحديد جميع الاجزاء التي يحدث فيها خلل بصفه دوريه و اتخاذ التدابير المسبقيه في الوقت الحاضر تعتبر الصيانة وظيفه استراتيجيه حيث انها يجب أن تضمن أعلى جاهزية بأقل تكلفه. وبالتالي المعرفة والصرامه والادارة المثلى للصيانه تعتبر متطلبات لضمان توفر المعدة. في هذا السياق يتم استخدام طريقة FMECA كاداة لتحسين صيانه وتوفر المعده. وبالتالي من الضروري معرفة شكل الفشل الذي يخضع له النظام ، ومدى خطورته وذلك لتطوير نظام صيانه ملائم لمواصفات المعده. المعلومات التي تم جمعها في طريقة FMECA سمحت بتكليف الصيانه لمعالجة كل الاشكال الفشل التي تم تقييمها، مما أدى لعمل برنامج يحتوي علي صيانات وقائية وصيانات تصحيحية. تمحورت النتائج لتمد بنظام يعمل على التطوير والتحسين المستمر لنظام الصيانه.

وجد ان قميص الاسطوانة، المكابس، حاقنات الوقود، صمامات العادم و مضخة الزيت هي اكثر المكونات خطورة على النظام.

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## **Abbreviations:**

MESA	Maintenance engineering society of Australia
TPM	Total productive maintenance
RCM	Reliability centered maintenance
PM	Preventive maintenance
CM	Corrective maintenance
LOLP	Loss of load power
LOLE	Loss of load energy
FOR	Forced outage rate
FMEA	Failure mode and effect analysis
FMECA	Failure mode and effect critically analysis
IEEE	Institute of electrical and electronics engineers
FMETA	Failure mode and effect task analysis
S	Severity
O	Occurrence
D	Detection
RPN	Risk priority number

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