ANALYSIS AND EVALUATION OF PREDICTIVE PREVENTIVE MAINTENANCE PARAMETERS OF SOME PARTS AND OPERATIONAL SUPPLEMENTS OF AGRICULTURAL TRACTOR ENGINE

By

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B.Sc. Agric. Sci. (Agricultural Engineering), Fac. Agric., Cairo Univ., 2010

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Name of Candidate: Nehad AbdElRahman Ahmad **Degree:** M.Sc.
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ABSTRACT

Agricultural machinery maintenance has a critical role for successful agricultural production. It aims at ensuring the safety of operations and reliability of machines and related equipment for farming operations . Moreover, it is one main cost for agriculture operations . Thus, the increased competition in agricultural production demands maintenance improvement, aiming at the reduction of maintenance expenditures while keeping the safety of operations. This issue is addressed by the methodology presented in this study . It is the follow up all means of obtaining information and data, either from restricted records or personal interviews or experiments and tests. This was done in coordination with three sectors: Governmental sector (North Giza District – Giza Governorate), Private sector (mandate Landini® tractors in the governorates of Egypt) and Research oriented sector (The Agricultural Experiment Station, Fac. Of Agric., Cairo University). So, the aim of this study was to give a brief introduction to various preventive, predictive maintenance systems (specific condition-based maintenance (CBM) techniques), selection of condition monitoring techniques which can be applied. The most important cause of damage to agricultural equipment is wear. Wear, the damage to a hard surface, mostly including progressive loss of material, due to relative motion among that surface and a contacting element or substances. Recent research work investigated a case study on wear in some basic parts concentrated on the piston with oil-sealing rings, suction and exhaust valves and its guides and some of the operating requirements of tractor engines mainly, fresh and used engine oil samples. Some parts of the engine have been taken; piston engine and its rings (pressure and oil rings) Which was changed after 10 years at a rate of 3 hours of daily operation. A test (setting wear rate and friction coefficient) was performed for both the metal of the anti-slip rings oil as well as the inner part of the engine cylinder. The results proved that the rate of ring wear is greater than the rate of wear of the cylinder as well as the experiments showed the importance of lubrication in the engine since the results in the case of the sample after lubrication showed less wear rate than the dry sample without lubrication. The axial adjustment test was performed on a suction valve as well as an exhaust valve in the guide of each valve to determine the effect of deterioration after 10 years. The results showed that the exhaust valve was bent with 1º 40' and the suction valve at 2° 20'. (S A E) allows one degree in the case of rotary columns and three degrees of inclination in fixed columns as in the case of the sample. The analysis of the findings of the performed tests may recommend to follow predictive preventive maintenance system to keep an acceptable level of engine reliability and to reduce the replace costs of the basic parts of the engine.

Keywords: Preventive maintenance, predictive maintenance, piston–cylinder tribosystem, wear rate, coefficient of friction, wear particles, oil analysis .

DEDICATION

I dedicate this work to whom my heartfelt thanks; to ***my mother, my sister, my husband*** *for their patience, help and for all the support they lovely offered along the period of my post-graduation.*

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LIST OF ABBREVIATION

CM	Corrective Maintenance
PM	Preventive Maintenance.
PdM	Predictive Maintenance.
PPM	Preventive- Predictive maintenance
CBM	Condition-Based Maintenance.
RCM	Reliability-Centered Maintenance.
TBM	Time Based Maintenance
MMI	Measuring, Monitoring and Inspecting
ICEs	Internal Combustion Engines.
WPS	Welding Procedure Specification.
PQR	Personal Qualification Require.
AWS	American Welding Society.
ASTM	American Society for Testing and Materials.

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