AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
Automotive Engineering Department

DEVELOPMENT OF AN AUXILIARY HYDROMECHANICAL TRANSMISSION CONTROL SYSTEM

A thesis Submitted in partial fulfillment of the requirements of the Master of Science degree in Mechanical Engineering

By

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B.Sc. in Mechanical Engineering
Applied Mechanics Engineering
2007

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STATEMENT

This thesis is submitted as partial fulfillment of Master of Science degree in Mechanical Engineering (automotive), Faculty of Engineering, Ain Shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or qualification at any other scientific entity.

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Abstract

The scope of this thesis is to study the failures in the control system of a hydro-mechanical transmission used in earth moving equipment and introduce an auxiliary system to overcome some types of these failures. The auxiliary system is used to re-engage the transmission to make the machine mobile to get it to the workshop or to drive it towards a truck to be transported to the workshop. The proposed solution will avoid long down times and will also reduce the cost of transportation of the malfunctioning machine.

A 936F Caterpillar wheel loader is selected as a case study and a lab setup is implemented where the speed selector with one set of gears is used to demonstrate the proposed solution. An experimental test is designed to validate the proposed solution to assure the properties of the system. A mathematical model is developed to simulate the dynamics of the proposed system. The experimental results are used to validate the simulation results and both showed good agreement.

The proposed solution showed reliable results where it managed to overcome some of the possible control valve failures using the developed electro hydraulic system with external hydraulic power supply through a separate directional control valve. The developed mathematical model of the proposed system can be utilized to simulate other types of failures along with a full machine model.

The proposed auxiliary system will have a good economic impact on the cost of moving malfunctioning machines as well as its effect of the machine down type which directly affects the machine productivity.

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