



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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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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Contents

Contents	v
List of Figures	x
List of Tables	xiv
Nomenclature	xv
List of symbols	xvi
Chapter 1 Introduction	1
1.1 Introduction	1
1.2 Hydraulic drive transmission	2
1.2.1 Hydrostatic transmission	2
1.2.2 Hydrodynamic transmission	4
1.2.2.1 Fluid coupling and torque converter	4
1.2.2.2 Multiple disk clutch	6
1.3 Construction and operation of hydro mechanical transmission with spur gear	7
1.3.1 Types of failures in the hydro mechanical transmission	8
1.3.2 Case study of machine down time	10
1.4 The aim of the present work	10
1.5 Thesis outline	11
Chapter 2 literature survey	13
2.1 Introduction	13
2.2 Hydrodynamic transmission	13
2.3 Torque converter	16

2.4 Hydraulic control valve	17
2.5 Multiple disk clutch	20
2.6 Task definition	22
Chapter 3 Experimental work	23
3.1 Introduction.....	23
3.2 System operation of 936 wheel loaders power train	24
3.2.1 Torque converter of 936 wheel loaders	25
3.2.2 Power flow through torque converter	26
3.2.3 Planetary transmission	28
3.2.4 Power flow through transmission in first speed forward	29
3.2.5 Transmission hydraulic control	31
3.2.5.1 Transmission hydraulic control at starting the engine (transmission in neutral)	32
3.2.5.2 Transmission hydraulic controls at first speed forward	35
3.3 Test rig construction	38
3.4 Experimental Measurements	48
3.4.1 Test rig experimental results	48
Chapter 4 Mathematical model	52
4.1 Introduction.....	52
4.2 Mathematical model for auxiliary control module	52
4.2.1 Forces acting on the solenoid	53
4.2.2 Flow equations	54
4.2.3 Continuity equations	55
4.2.4 Actuator equation of motion	56
4.2.5 Mathematical model simulation and results	57

4.3 Comparison between experimental and simulation results	63
Chapter 5 Conclusions and recommendations for future work	65
5.1 Conclusions	65
5.2 Recommendations for future work	65
References	66
Appendix A. Existing Transmission Types	69
A.1 Introduction to transmission systems	69
A.1.1 Manual Transmission	69
A.1.2 Automatic Transmission	70
A.1.3 Continuously Variable Transmission	71
A.1.4 AMT Transmission	72
A.1.4.1 Single-Sided Clutch Transmission	72
A.1.4.2 Double-Sided Clutch Transmission	73
A.1.4.3 Dual Clutch Transmission forward	73
A.2 Internal Combustion Engine Characteristics	75
Appendix B. Transmission Operation And Its Components	77
B.1 Torque Converter	77
B.1.1 Torque Converter And Pump Drive Housing	78
B.1.2 Torque Converter Hydraulic System	79
B.1.2.1 Torque Converter Ratio Valve	80
B.1.2.2 Converter Outlet Relief Valve	81
B.2 Transmission Hydraulic System	82

B.2.1 Power Train Oil Cooler	84
B.3 Planetary Transmission	85
B.3.1 Second Speed Forward	86
B.3.2 Third Speed Forward	87
B.3.3 Fourth Speed Forward	87
B.3.4 First Speed Reverse	88
B.3.5 Second Speed Reverse	90
B.3.6 Third Speed Reverse	90
B.3.7 Fourth Speed Reverse	91
B.4 Planetary Lubrication	92
B.5 Transmission Neutralizer Group	93
B.6 Output Transfer Gears	94
B.6.1 Output Transfer Gear Lubrication	97
B.7 Front and Rear Axle Groups	97
 Appendix C. Type Of Failures In The Hydro Mechanical Transmission And Troubleshooting	99
C.1 Introduction	99
C.1.1 Visual Checks	99
C.1.2 Checks During Operation	100
C.1.3 Check List During Operation	101
C.1.3.1 Transmission Troubleshooting Problem List	101
C.1.3.2 Transmission Troubleshooting	103
C.1.3.3 Nospin Differential Test... ..	108
 Appendix D. Simulation Parameters	111
D.1 Simulation Parameters	111

Appendix E. Mapping	113
E.1 Mapping Of Speed Sensor	113
E.2 Pressure Transducer Sensor Mapping	114
 Appendix F. Datasheets	 117
F.1 Hydraulic Pump Datasheet	117
F.2 Direction Control Valve Datasheet	118
F.3 Pressure Transducer Sensor Datasheet	119
F.4 Proximity RPM Sensor Datasheet	120

List of Figures

Fig.1.1. Hydrostatic drive with four wheel motors.....	3
Fig.1.2. Hydrostatic drive circuit.....	3
Fig.1.3. Fluid coupling.....	5
Fig.1.4. Torque Converter.....	6
Fig.1.5. Multiple-disk clutch.....	7
Fig.1.6. Transmission circuit.....	8
Fig.3.1. Presents the power train of loader 936.....	25
Fig.3.2.Torque converter components.....	27
Fig.3.3. Planetary transmission.....	28
Fig.3.4.Power flow through first speed forward.....	30
Fig.3.5.Transmission hydraulic controls (Neutral, Engine Off).....	31
Fig.3.6.Transmission hydraulic controls (Neutral, Engine Running).....	34
Fig.3.7.Transmission hydraulic controls (first speed forward).....	37
Fig.3.8. Operating system in test rig.....	38
Fig.3.9. Hydraulic pump.....	39
Fig.3.10 phase AC electric motor.....	40

Fig.3.11. Relief valve.....	41
Fig.3.12. One set hydraulic transmission clutch.....	42
Fig.3.13. One set hydraulic transmission clutch.....	42
Fig.3.14. One set hydraulic transmission clutch.....	43
Fig.3.15. 3 Phase AC motor.....	44
Fig.3.16.4/3 Direction control valve.....	44
Fig.3.17.Measuring devices.....	45
Fig.3.18. Pressure transducers sensor.....	46
Fig.3.19. RPM sensor.....	46
Fig.3.20. Arduino mega.....	47
Fig.3.21.Experimental test rig.....	47
Fig.3.22.Dynamic response of the engaged pressure of the first speed by electro hydraulic control valve.....	49
Fig.3.23.Dynamic response of the speed of the first gear train engaged by electro hydraulic control valve.....	50
Fig.3.24. Experimentally Dynamic response of the first speed by auxiliary electro hydraulic control valve.....	51
Fig.4.1. Electro hydraulic system used to control the first gear train.....	52
Fig.4.2. Flow through directional control valve ports.....	54

Fig.4.3. The hydraulic system simulink diagram	57
Fig.4.4. The simulation of equation of motion of valve spool.....	58
Fig.4.5. The simulation of flow rates through the valve restriction areas.	58
Fig.4.6. The simulation of continuity equation to the cylinder chambers.	59
Fig. 4.7.The simulation of actuator equation of motion	60
Fig.4.8.Dynamic response of the electrohydraulic control valve solenoid and actuator displacement of the first gear train engaged.....	61
Fig.4.9.Dynamic response of the electrohydraulic control valve solenoid and actuator velocity of the first gear train engaged.....	62
Fig.4.10.Dynamic response of the engaged pressure of the first speed....	62
Fig.4.11. Experimental and simulation pressure with time.....	63
Fig.4.12. Experimental and simulation RPM with time.....	64
Fig.A.1. Comparison between different types of transmissions.....	72
Fig.A.2. Ideal performance characteristics for vehicular power plants.....	76
Fig.A.3. Performance characteristics of a gasoline engine.....	76
Fig.B.1. Torque converter.....	77
Fig.B.2. Torque converter and pump drive housing.....	79
Fig.B.3. Torque converter hydraulic system.....	80

Fig.B.4. Location of the torque converter ratio valve.....	81
Fig.B.5. Converter outlet relief valve.....	82
Fig.B.6. Hydraulic system schematic.....	83
Fig.B.7. Transmission oil cooler schematic.....	84
Fig.B.8. Planetary transmission components.....	86
Fig.B.9. Power flow in first speed reverse.....	90
Fig.B.10. Planetary lubrication.....	93
Fig.B.11. Transmission neutralizer group.....	94
Fig.B.12. Output transfer gears.....	96
Fig.B.13. Typical illustration of the front and rear axle groups.....	98
Fig.C.1. Test procedure for nospin differential.....	109
Fig.E.1 Speed sensor mapping curve.....	114
Fig.E.2 Pressure transducer sensor mapping curve.....	115