基于机液联合仿真的跨式油茶果收获机液压系统研究

宁晨[1] 杜小强[1,2,3] 锃宏[1,2,3] 贺磊盈[1,2,3] 姚小华[2,4] 鑫涛[1] 刘吉 [1]

（1. 浙江理工大学机械工程学院，杭州 310018；2. 浙江省种植装备技术重点实验室，杭州 310018；3. 农业农村部东南丘陵山地农业装备重点实验室（部省共建），杭州 310018；4. 中国林业科学研究院亚热带林业研究所，杭州 311400）

摘 要: 为了提高跨式油茶果收获机的工作性能和可靠性，需要设计一套适用于跨式油茶果收获机，且稳定性较好的液压系统。本文基于 RecurDyn 与 AMESim 软件分别建立跨式油茶果收获机的机械系统模型与液压系统模型，并创建信息传递接口，实现整机机液联合仿真。通过机液联合仿真分析底盘直线行走、越障、爬坡及转向工况下，执行元件内液压油压力及流量变化情况，并对采打机构空载及负载工况下执行元件内液压油压力及流量变化情况进行仿真。仿真结果表明本文设计的跨式油茶果收获机液压系统具有良好的稳定性：底盘直线行走工况下，4 个行走马达内流量稳定在 30L/min，压力稳定在 15bar；越障工况下，马达内压力发生波动，压力波动范围为 15~25bar，随后压力恢复稳定；爬坡工况下，当底盘完全位于坡面时，行走马达内压力最大，稳定在 90bar；单边制动转向与双边差速转向工况下，马达内压力波动范围分别为 60~100bar 和 20~100bar。采打机构空载工况与负载工况下，采打马达内流量及压力均呈正弦曲线周期性变化，负载工况下压力变化范围为 10~40bar，影响采打液压系统流量及压力变化的主要原因是采打机构自身的运动特性。

关键词： 跨式油茶果收获机；液压系统；机液联合仿真；RecurDyn；AMESim

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Research on Hydraulic System of Straddle *Camellia Oleifera* Fruit Harvester Based on Mechanical-Hydraulic Co-Simulation

NING Chen[1] DU Xiaoqiang[1,2,3] MA Zenghong[1,2,3] HE Leiying[1,2,3] YAO Xiaohua[2,4] HAN Xintao[1] LIU Jishun[1]

(1. School of Mechanical Engineering, Zhejiang Sci-Tech University, Hangzhou 310018, China

2. Key Laboratory of Transplanting Equipment and Technology of Zhejiang Province, Hangzhou 310018, China

3. Key Laboratory of Agricultural Equipment for Hilly and Mountainous Areas in Southeastern China (Co-construction by Ministry and Province), Ministry of Agriculture and Rural Affairs, Hangzhou 310018, China

4. Research Institute of Subtropical Forestry, Chinese Academy of Forestry, Hangzhou 311400, China)

Abstract: In order to improve the working performance and reliability of the straddle *Camellia oleifera* harvester, it is great significance to design an appropriate and stable hydraulic system. Based on RecurDyn and AMESim software the mechanical and hydraulic system models of the straddle *Camellia oleifera* fruit harvester is established, and the information interface is created to achieve mechanical-hydraulic co-simulation of the entire machine. The hydraulic oil pressure and flow changes in the execution components of the chassis under straight walking, obstacle crossing, climbing, and turning conditions are analyzed by simulation. The hydraulic oil pressure and flow changes in the actuating components of the shaking mechanism under no-load and load conditions are analyzed are verified. The simulation results show that the hydraulic system of the straddle *Camellia oleifera* fruit harvester is valid and has good stability. Under the straight walking condition of the chassis, the flow rate in the four walking motors is stable at 30L/min and the pressure is stable at 15bar. Under obstacle crossing conditions, the pressure fluctuates inside the motor with the fluctuation range of 15-25 bar, and the pressure stabilizes subsequently. Under climbing conditions, when the chassis fully climbs up the slope, the pressure reaches the maximum value and the stable pressure value is 90bar. Under the working conditions of unilateral braking steering and bilateral differential steering, the fluctuation range of the internal pressure of the motor is 60~100bar and 20~100bar, respectively. Under the no-load working condition and load working condition of the shaking mechanism, the flow and pressure in the shaking motor change periodically in a sinusoidal wave, and the pressure varying range under load working condition is 10~40bar. The main reason that affects the flow and pressure change of the hydraulic system for shaking mechanism is the movement characteristics of the shaking mechanism itself.

Key words: Straddle *Camellia oleifera* fruit harvester; Hydraulic system; Mechanical-hydraulic co-simulation; RecurDyn; AMESim