VIETNAM NATIONAL UNIVERSITY- HCMC
HCMC UNIVERSITY OF TECHNOLOGY

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INFORMATION of THE Ph.D DISSERTATION

Title: **IMPROVEMENT of DYNAMICS CHARACTERISTIC FOR PILOT-STAGE of JET PIPE ELECTRO-HYDRAULIC SERVO VALVE**

School / Department: MECHANICAL ENGINEERING
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Summary of Dissertation

Electro-hydraulic servo valves are key units in servo control system and highly combined components with mechanical, hydraulic and electronic technology. With advantages such as rapid dynamics response, high controlling accuracy and long working life, electro-hydraulic servo valve have been widely used in aerospace, metallurgy, chemical industry and so on.

Through recommendation of servo valve structure, it has made a detailed introduction of the structure of jet pipe servo valve with force feedback and analysis of force balances of torque motor, jet pipe feedback armature assembly and slide valve spool, it provides a theoretical base for setting up the mathematical model of jet pipe servo valve. In torque motor, the feedback spring pole is identified as more critical spring elements in servo valve operation. If this element is properly designed with respect to stiffness, automatically dynamics performance of the servo valve is improved. An attempt has been made to predict stiffness of this element by finite element method.
Besides, dynamics characteristics of the armature assembly in jet pipe electro-hydraulic torque motor are involved by the stiffness of armature assembly and moment of mass inertia of armature assembly. Therefore, mathematical models for prediction and estimate of optimal stiffness of the armature assembly and of moment of inertia of armature assembly are established.

While jet pipe servo valves work frequently in aerospace hydraulic system and their structures are complicated and sizes are limited, high requirements should be put on reliability of components in working of servo valve. Hence, the improvement of the operating characteristics of torque motor and drive part is necessary for guarantee of normal work and to improve its performance stability in electro-hydraulic servo valve.

Main contribution

- Through recommendation of jet pipe electro-hydraulic servo valve structure, it is set up the mathematical model for dynamics problem of jet pipe servo valve.
- Find out effect of stiffness of the feedback spring pole on dynamics response of the pilot-stage in jet pipe servo valve hence giving how to have optimal stiffness.
- To propose design method for optimal stiffness of armature assembly and moment of mass inertia in order to improve dynamics characteristics of the pilot-stage in jet pipe electro-hydraulic servo valve.
- Experiment is carried out to check the rightness of optimal calculation which is given in theoretical base.

Applications from the dissertation

- Criteria of dynamics response are improved in pilot-stage of jet pipe servo valve to ensure its operation which is more stable.
- Proposing theoretical base for design or manufacture jet pipe electro-hydraulic servo valve in industry which makes servo valves in VietNam.
- This dissertation can be used as reference for related research.

Further works

- It is necessary to research field of injection which is happening at the amplifier of jet pipe electro-hydraulic servo valve or phenomena of noise emission or phenomena of self-excited oscillation in the amplifier. Effect of these problems on dynamics characteristics in jet pipe servo valve is done, too.
- It is necessary to give an accurate calculation theory which is suitable to experiment about flow characteristics or pressure characteristics in jet pipe servo valve.

Supervisor	**Candidate**
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