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AIMS AND SCOPE

The *International Journal of Fluid Power* is dedicated to the latest advances in the science and technologies associated with hydraulics and pneumatics. The aim of the journal is to provide the engineering community with high quality information concerning developments in research, design and application of fluid power technology. Special emphasis is placed on papers concerned with components and system integration by embracing key aspects of:

- analysis, modelling and control,
- monitoring and fault diagnosis,
- artificial intelligence applications,
- component and systems design,
- computer software and hardware interfacing and
- computer aided engineering for both static and dynamic analysis of fluid power systems.

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INFLUENCE OF NOTCH SHAPE AND NUMBER OF NOTCHES ON THE METERINGCHARACTERISTICS OF HYDRAULIC SPOOL VALVES

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Abstract

The paper presents theoretical and experimental results of studies on the influence of shape and number of spool notches on the discharge characteristics (discharge coefficient, velocity coefficient and flow angle) of a hydraulic distributor metering edge.

The flow-rate vs. pressure drop and the steady state axial flow-force vs. pressure drop diagrams are determined for spools with different configurations of multiple notched metering edges. Various combinations of the shape and number of the notches modulating the metering area of the passage between supply and drain ports were investigated and correlated with flow-rate, axial flow-force and pressure drop, in order to get estimates of discharge coefficient and flow angle. The procedure is applied to all the data collected during the experimental activity, and shows the behavior of the flow characteristics in both the fully turbulent and transitional region of motion. The influence of notch shape and number on the metering edge flow characteristics is evaluated as well.

Keywords: Hydraulic components, spool valves, metering edge, metering notches, experimental characterization, discharge coefficient, axial flow-forces

AN INVESTIGATION OF SWASH PLATE CONTROL CONCEPTS FOR DISPLACEMENT CONTROLLED ACTUATORS

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Abstract

Displacement controlled actuators offer a very promising alternative and energy saving solution for many applications in mobile machines, mobile robots and other applications. Here, the achievable system dynamics and thus the dynamics of the control element, the variable displacement pump, is often of great concern. It will be shown in this paper that electro-hydraulic pump control allows sufficiently high dynamics for this class of heavy duty actuators, which can in fact compete with conventional valve controlled systems.

Keywords: displacement controlled actuator, swash plate control, Ackermann parameter space method, rotary actuator

AN INVESTIGATION OF THE EFFECT OF FEEDBACK CONTROL ON THEBIFURCATION STABILITY OF A NONLINEAR SERVOHYDRAULIC SYSTEM

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Abstract

The Servo-hydraulic systems are commonly used for motion and force control and exhibit nonlinear dynamic phenomena. One such nonlinear phenomenon is the loss of stability via bifurcations. In this work, a computational and experimental investigation is performed to characterize with a higher degree of accuracy the effect of linear feedback control on the bifurcation stability of a nonlinear servo-hydraulic system. A low-order model of the experimental test stand is first developed, validated and analyzed. It is then shown that the use of an appropriate linear feedback control structure can improve the bifurcation stability of a nonlinear servo-hydraulic system. Parametric space investigation is conducted to study the bifurcation stability behavior of the system and stability boundaries are developed to demonstrate the effect of linear feedback on the nonlinear systems.

Keywords: Servo-hydraulic, bifurcation, feedback control, nonlinear system

MODELLING AND SIMULATION OF A HYDRAULIC BREAKER

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Abstract

This paper deals with the simulation of the working behaviour of a hydraulic breaker. A detailed parameterised model was realized in order to simulate physical phenomena occurring during the functioning of the machine. An appreciable agreement between experimental and theoretical pressure and frequency encouraged about the quality of the model. The dynamic behaviour of the moving masses was presented and thoroughly discussed. As a special remark, it is to be highlighted that the theoretical results suggested by the model came out not to vary if the real waveform concerning input flow rate is replaced with its average.

Keywords: hydraulic breaker, working cycle, mathematical model, simulation

ANALYSIS AND AUTOMATED TESTING OF A MINIATURE PNEUMATIC VALVE FOR HOSPITAL PATIENT SUPPORT EQUIPMENT

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Abstract

The steady state and dynamic performance of a miniature pneumatic valve is studied and an automated, computer-controlled test procedure is developed to determine unwanted leakage. A novel testing approach is developed using the valve dynamic leakage characteristic, and a substantially reduced test time has been achieved. A National Instruments LabVIEW hardware approach is utilised for both data acquisition and real time control and the test procedure has been put into commercial use.

Keywords: miniature pneumatic valve, automated testsystem, valve characteristics