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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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Currently, three issues are planned for 2005, but the journal is moving towards quarterly publication.

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MONITORING OF FLUIDIC MUSCLES BY INFRARED THERMOGRAPHY

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Abstract

The paper discusses an approach to monitoring fluidic muscles, applying a non invasive thermal analysis based on infrared thermography. Different working dynamic conditions strongly modify the internal distribution of temperature of muscles, and the thermal gradients can be used as monitoring variables in order to check the correct behaviour of this type of component. A wide research activity, oriented to investigate on correlations between muscle performances and temperature distribution, is under development. This paper collects the result of the first phase of this activity, concerning experimental evaluations of thermal distribution and their relation to specific physical variables.

Keywords: pneumatics, muscles, monitoring, thermography

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WEAR AND FRICTION OF ZRC_G-COATED PISTONS OF AXIAL PISTON PUMPS

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Abstract

Within the Collaborative Research Center 442 "Environmental friendly tribological systems" components of different tribological systems are applied with PVD-coatings to realize the performance of these systems with biologically fast degradable fluids without increased friction and wear. With the usage of biologically fast degradable fluids without environmentally toxic additives some essential functions, that had been given by the former fluid, have to be substituted, what is realized by the provision of sliding parts with coatings. By that way wear and friction are decreased significantly. In this paper it is shown, that coated pistons of an axial piston machine reveal limited wear within the first hours of operation and very low friction between piston and bushing. The experiments are made on an one piston test bench.

Keywords: carbon, coatings, PVD, hydrostatic displacement unit, wear, friction

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DESIGN AND PERFORMANCE OF A MR TORQUE TRANSFER DEVICE

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Abstract

Magnetorheological (MR) fluids possess the unique ability to undergo dramatic and nearly completely reversible changes in their rheological properties under the application of a magnetic field. These controllable fluids can serve as quiet, rapid interfaces between electronic controls and mechanical systems. One area of application is to use these fluids in torque transfer devices, such as clutches and brakes. After determining MR fluid properties and behavior using a rheometer, a parallel disk type MR clutch was successfully developed, which utilized a stationary electromagnetic coil. Finite element analysis was used to design the coil and clutch assembly in order to maximize the magnetic field generated within the MR fluid. The resulting magnetic field was uniform over the active portion of the clutch, easily controllable by adjusting the current passing through the coil, and provided a large range of field strength values. The experimentally measured output torque was generally in good agreement with predicted values. This work details the design considerations and methodology used to develop this clutch, which can be extended to the design of other MR devices.

Keywords: Magnetorheological (MR) fluid, clutch, torque prediction.

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A REVIEW ANALYSIS OF UNSTEADY FORCES IN HYDRAULIC VALVES

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Abstract

In the fluid power applications where the typical operating conditions are dynamic the knowledge of the unsteady flow forces that act on the spools of the hydraulic valves represents an important issue to be addressed in order to make a correct design of the valve geometry and its driving system.

This paper deals with a rigorous unsteady numerical study of the fluid dynamic behavior of a hydraulic directional control valve.

A theoretical approach based upon the application of the momentum equation in the transient fluid dynamic conditions is presented, while a successive numerical analysis is performed by using the commercial Fluent™ code that provided, in the past, a correct evaluation of the stationary flow forces.

Unsteady simulations have been carried out considering three different conditions: constant pressure boundary conditions during the spool movement, inlet pressure ripple at a constant spool position, damped pressure oscillations during the spool opening phase.

The main objective is to estimate the critical magnitude orders of the pressure ripple frequency and of the axial spool velocity above which the pseudo-steadiness assumption fails; in order to reach this aim, in some cases, the effects of the fluid dynamic phenomena connected with the unsteady flow conditions have been amplified.

Keywords: CFD simulation, unsteady flows, directional control valves

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This mark denotes that the values for the axes of the figures need to have the comma replaced by a decimal point. Also note the legends in Fig. 17-19
ex. Fig. 2 x-axis change from:
1 2,5 4 5,5 7 8,5 10 (German style numbering)
to: 1 2.5 4 5.5 7 8.5 10 (standard)

NUMERICAL INVESTIGATIONS ON THE WORKING CYCLE OF A HYDRAULIC BREAKER: OFF-DESIGN PERFORMANCE AND INFLUENCE OF DESIGN PARAMETERS

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Abstract

This paper deals with theoretical considerations and numerical simulations concerning the working behaviour of a hydraulic breaker. At first, some formulations coming from sufficiently reasonable considerations on the working principle of the breaker, based on the hypothesis of the motion of the striking mass as uniformly accelerated, are proposed. Later, a previously realized parameterised model is used in order to investigate the influence of the inlet flow rate and of the most important design parameters on the behaviour of the machine. This analysis allows the characterization of these parameters affecting breaker performance, suggesting possible design improvements which may lead to better performance in terms of both impact energy and efficiency.

Keywords: hydraulic breaker, working cycle, simulation, design parameters