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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:

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- computer software and hardware interfacing and
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EXPERIMENTAL AND THEORETICAL METHODS TO EVALUATE THE PRESSURE LOSSES IN AIR DISTRIBUTION LINES

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Abstract

Modern pipes for compressed air distribution lines are made of aluminium alloy and built by means of manufacturing extrusion processes. This kind of pipes needs of suitable mathematical formulation providing performances, in terms of pressure drop and flow-rate.

To this aim in this work a methodology based both on experimental tests and on theoretical approach was carried out. Analytical formulations were performed providing best experimental data fitting and range of applicability. Performances of most common line components (straight pipes, elbows, straight fittings and tees) made of different commercial sizes were evaluated carrying out experimental tests by means of a properly instrumented test bench.

Experimental and theoretical results were in good agreement, thus validating the proposed formulation.

Keywords: pressure losses, pipe, pneumatic component.

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STABILITY AND PERFORMANCE ANALYSIS OF A METERING POPPET VALVE

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Abstract

Poppet type metering valves have many benefits including low leakage and an economical design. These benefits make the poppet valve an appealing alternative to spool valves in a valve stack. The fact that the metering element is not hydrostatically balanced as in a spool valve leads to control design challenges. In this work, a model of an electro hydraulic metering poppet valve is considered. Due to design compromises, the response of production metering poppet valves tends to be too slow to maintain a desired flow rate when there are fast upstream pressure variations. Re-designing to speed up the response of the valve may lead to stability issues which can be traced to plant uncertainty. Frequency response analysis of the valve model shows that the model varies greatly depending on the operating point chosen for the linearization. The analysis presented will help define the problem of designing hardware and control systems for higher performance but still reliable metering poppet valves.

Keywords: poppet valve, uncertainty analysis

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APPROACH TO THE SIMULATION OF AGEING OF ENVIRONMENTALLY COMPATIBLE FLUIDS IN HYDRAULIC SYSTEMS

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Abstract

This article describes a concept for the lifetime prediction of fluids used in hydraulic networks that has emerged from sub-project A3 concerned with "ageing behaviour of ecologically compatible precursor materials" within collaborative research centre (SFB) 442 at the RWTH Aachen University, Germany. This concept is focused around a neural network that implicitly contains the ageing properties of the fluid. The complex of loads imposed on the fluid by the hydraulic circuit is processed in such a way that it can be used as the input for the neural network when described by
appropriate characteristic values.

Keywords: oil ageing, lifetime prediction, environmentally compatible fluids, neural networks

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ANALYSIS OF THE BEHAVIOUR OF A WATER HYDRAULIC CRANE

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Abstract

In this work a hydraulic crane was equipped with water hydraulic components. A control system using two PID controllers plus a Feed Forward block (F-PID) was implemented and in order to study the dynamic behaviour of this kind of system a series of tests were performed. At first, a characterisation of the system (mechanical and hydraulic) was performed and then the different steps of the controllers design were analysed, by means of various end-effector trajectories. The results show a very good behaviour of this kind of system with a low positioning error.

Keywords: hydraulic crane, water hydraulic, PID, proportional valve

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FEATURE EXTRACTION, OPTIMIZATION AND CLASSIFICATION BY SECOND GENERATION WAVELET AND SUPPORT VECTOR MACHINE FOR FAULT DIAGNOSIS OF WATER HYDRAULIC POWER SYSTEM

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Abstract

The work described in this paper investigates the fault diagnosis of water hydraulic motor by the optimization and automatic classification of the feature values. The second generation wavelet for the vibration signals analysis of the water hydraulic motor was proposed to extract the feature values. The new optimization method by bi-classification support vector machine (SVM) was proposed to select the optimal feature values based on a rank criterion and the algorithm was developed here. In order to classify the conditions of the pistons used in the hydraulic motor, a two-level structure based on the multi-classification was developed in this work. The multi-classification method of SVM for the fault diagnosis of a piston crack was investigated. The winner-takes-all scheme was studied. The results of the classification were found to be successful.

Keywords: Fault diagnosis, Support vector machine, Water hydraulic system, Feature extraction, Wavelet transform, Neural network