Abstracts

Group 4: Fluid Power in Automotive Applications

4-0 On the Competition between Fluid and Electric Automotive Drives

W. Hirschberg

The present general lecture gives a view over the relevance and potential of fluid power systems for automotive applications in the present and future, compared to electric drives as their major challengers. In order to address their respective relevance, the classification of automotive vehicles according to ISO/DIN 70010 is shown in the introduction. There are different reasons which stimulate innovations in drive engineering, where the need for saving energy during production and operation of automobiles can be considered as the first order demand for the future.
For assigning the appropriate drive technology, a distinction between traction ("main") drives and additional drives ("auxiliaries") is determined. In order to utilise their specific advantages, more and more different energy sources and/or energy converters (drives) have been combined in one vehicle, known as hybrid traction drives having certain topologies. To understand the relationships, the influence of different drive characteristics and efficiencies on the driving and braking performance of the vehicle is discussed. Selected types of drives are compared, where particularly the aspect of energy storage has to be taken into account.
From the engineering point of view, an automobile's auxiliary drives are of same level of interest as its traction drive(s). In this area a tendency to electric actuation can clearly be identified, which allow a "power on demand" strategy in an appropriate manner. At present, the low voltage board net may considered as the major handicap, however, once having high voltage aboard, a remarkable breakthrough of electric auxiliary drives can be expected. Anyway, due to their specific advantages, fluid power solutions may retain their importance in automotive engineering, e.g. pneumatic springs and servo brakes and hydrodynamic torque converters. In conclusion, the necessity of significant reduction of energy during the whole automotive life cycle should remain in the focus, particularly during the phases of production and utilisation.

4-1 A Study on the Sealing Gaps of Internal Gear Ring Pumps for Automotive Drivetrain Applications

W. Schweiger, W. Schoefmann, A. Vacca

This paper presents the latest effort made by the authors in the development of a comprehensive modeling approach useful for the design and analysis of internal gear ring pumps. In particular, the present work focuses on the radial and lateral sealing gap modeling. A CFD model for the accurate evaluation of lateral leakages and shear stresses has been coupled with a lumped parameter fluid dynamic model, which is used to simulate the main flow through the unit. Radial leakages at tooth tips are modeled through a lumped parameter orifice model based on a deep evaluation of variable gap geometry. The results presented in this work demonstrate how the developed tool can be used to gain knowledge about the operation of internal gear pumps with high level of details as concerns the features of internal flow.

4-2 Electro-Hydraulic Power Pack for Truck Cab Tilting Systems

B. Müller, S. Glöckle

The cab of a typical European truck can be tilted hydraulically. After introducing to the hydraulic system, its components, the requirements and the development of customer requests, the paper presents a new miniaturized electrically driven radial piston pump and the tilting module based on this pump. Further development of this pump, resulting in a new concept of binary displacement control, is illustrated.

4-3 Theoretical Research and Laboratory Experimental Tests Regarding the Dynamic Behavior of Hydraulic System for Energy Recovery at the Braking of Motor Vehicle

C. Cristescu, P. Drumea, D. D. I. Guta, C. Dumitrescu

The paper presents some results from the theoretical research and from the laboratory experimental tests regarding the dynamic behavior of one Romanian hydraulic system for the energy recovery, presented in the last edition of the conference. Laboratory tests of the hydraulic system for recovering energy were made on a testing stand, special designed and built, also, presented in the previous edition of conference. The theoretical and experimental results demonstrate the possible performances of the hybrid vehicle and that the energy recovery hydraulic systems are good means to increase energy efficiency of the road motor vehicles.

4-4 Piston Accumulator with Detent Function for Automatic Gearboxes

W. Döhla, F. Lauterbach

This paper presents a new developed spring tensioned piston accumulator with detent function. A relatively light, small and cost-saving solution for storing hydraulic energy and activating it by means of a holding magnet, the component is applied particularly for the assistance of start-stop-systems in automatic gearboxes. Following an introduction to the principle of operation, the variety of simulation methods used during development are presented. Design and fabrication of key functional parts under the conditions of mass production are described. The article gives an overview on newly developed assembly processes, laboratory testing and experiences since the start of production.