SUMMARY

The dissertation presents an application of a viscous brake filled with an electrorheological (ER) fluid, with controlled rheological properties, using an electric field to exert a constant pressing force on an object. While analyzing the literature, preceding the design of a viscous brake, typical devices using the properties of ER fluids, with particular emphasis on the methods of controlling viscous clutches and brakes, were taken into consideration.

For experimental tests, a viscous brake was used, as a result of an adaptation of an already existing clutch consisting of viscous and hydrokinetic parts. The clutch adaptation involved disconnecting the hydrokinetic part and stopping the output shaft with an arm exerting the pressing force on an object. The tests were carried out on a test stand, especially prepared for this purpose, suitable for the examination of an impact of the rotational speed of the input shaft and the value of the electric voltage supplied to the viscous brake on pressing forces, taking into account ER fluid temperature and brake fluid filling level.

On the basis of the experimental research results a viscous brake control system to exert constant pressing forces with feedback from an adjustable value, based on PLC, was designed and implemented. This system, using its own control algorithm, ensured obtaining a control pressing force within the assumed range, both during the constant and follow–up control. The measurement results obtained during the tests of the viscous brake designed to exert a force were presented in the form of time courses, showing the changes of the pressing force, the electric voltage applied to the brake and the rotational speed of the brake input shaft. The developed ER fluid brake control system with feedback was tested for constant and follow-up control, taking into account the impact of the working fluid temperature. The correct operation of both the brake and the control system as well as the compatibility of the pressing force value and time adjustment, according to the earlier assumptions, were determined.

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