Temat rozprawy: Wpływ wybranych warunków eksploatacji na skuteczność układu hamulcowego pojazdów samochodowych

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Summary

When a vehicle is parked outdoors for a prolonged time period, due to water and water vapour contained in air, the working surfaces of the brake disc may become covered by a layer of oxides from corrosion processes. While braking, this layer often causes high torque variations (BTV) which may affect brake efficiency and braking force imbalance between wheels on the same axle. The aim of this thesis is to evaluate the impact of environmental exposure time on coefficient of friction and wear rate of disc brake friction components. First part of this study was based on field testing methods to explore the influence of different working conditions on disc brake system issues at the component level. The second part involve pin-on-disc tribometer tests on metal matrix composite material F3S.20S, hypereutectic aluminium-silicon alloy AlSi18NiMgCu and modified gray cast iron EN-GJL-250 cooperating with the phenolic friction material (FO 701). Time of exposition on atmospheric factors - 0h, 48 h and 240h has been determined on the base of parking time of the vehicle submitted for repair. Sliding velocities, unit pressures of brake pad on the disc rotor and the sliding distance are equivalent for braking distance of a vehicle with mass up to 1350kg running through urban area with a velocity of 30 or 50 km/h. Research results were compared with the ones received in the same experimental conditions for the brake discs made of traditional grey cast iron EN-GJL-250. Composites were characterised with considerably lower susceptibility to corrosion inducted coefficient of friction fluctuations (0,25÷0,32) in comparison to flake graphite cast iron (0,3÷0,5). Its wear was also several times lower than of the traditional material. Modification of cast iron improved tribological behaviour significantly. It was noticed that pressure of 0,5 MPa (which corresponds to brake lining pressure of 1 MPa - most common when driving in build-up area) is sufficient to easily remove oxide layer from composite surface after 240 h of exposure. Full scale dynamometer tests confirmed greater (compared to cast iron) braking efficiency and self-cleaning ability of corroded aluminium matrix composite disc brakes.