INVESTIGATIONS ON HYBRID CEMENTITIOUS COMPOSITES FOR AEROSTATIC POROUS BEARINGS

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Abstract: Lubrification bearings are essential components for the proper operation of a machine. Conventional lubricants have limited efficiency, causing inadequate conditions for machinery operating at high speeds. Bearings that rely on air as a lubricant, called aerostatic bearings, use a thin layer of pressurized air, leading to zero friction interface between the parts which prevents future problems related to friction, wear and lubrification. Air restrictors in porous medium possess a more uniform pressure distribution, increasing load capacity and improving movement stability. Porous restrictors also require high mechanical strength and adequate permeability. A full factorial design of experiments was conducted to identify the effects of particle type (silica, silicon carbide, carbon powder), carbon fibre length (6 and 10mm in length), uniaxial pressure (10 and 30MPa) and water/cement ratio (25, 30, 33 and 40wt%) on the mechanical properties of cementitious composites for use as aerostatic porous bearings. The incorporation of particles and carbon fibres led to improved compressive and flexural properties, especially for silica and silicon carbide which provide similar behaviour. The low compaction level (10MPa) achieved increased compressive strength. Higher mechanical performance was achieved when the composites were compacted at 10MPa with silica or silicon carbide and 6mm carbon fibres.

Keywords: porous aerostatic bearings. cementitious composites; carbon fibre.