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ON THE APPLICATION OF POWDER SHEAR DAMPING TO A STRUCTURAL ELEMENT

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ABSTRACT

With the increasing demands placed on modern gas turbine components, improvements in high temperature compatible damping technology are required. The areas of application include turbine airfoils, struts, guide vanes, exhaust ducts, and similar components. The need for improved damping elements is especially acute for integrally bladed disks ("blisks"). Constrained powder shear dampers, using thin pockets of high temperature compatible powders meets these needs. With damping performance comparable to current visco-elastic elements, shear powder damping elements add the capability of high temperature operation, compatibility with blade heat treatments, good high frequency damping characteristics, and minimal degradation predicted for high centrifugal loads. Building on previous fundamental work, this paper discusses a proof of concept application of powder shear damping to a thin beam. Both cantilever and free-free configurations are examined. Comparisons between experimental measurements of undamped, constrained layer visco-elastic damping, and powder shear damped beams are presented. FEA results for the cantilever configuration are also shown to correlate well with the experimental data..