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Influence of strip thickness and roughness on flow induced motion of circular cylinders KAI HE, ASHWIN VINOD, ARINDAM BANERJEE, Lehigh Univ — Experiments were conducted to develop a thorough understanding of the mechanisms involved in enhancing flow induced motion (FIM) of circular cylinders with surface protrusions. Two types of strips – smooth and rough were attached to the surface of a circular cylinder in order to decouple the effects of thickness from roughness in FIM response and the energy transfer process. Vibration amplitudes and frequencies were analyzed as a function of strip roughness ratio (height of roughness element/strip thickness, varied from 0% to 100%) and strip thickness ratio (strip thickness/ cylinder diameter, varied from 0.8% to 8.2%). An increase in strip thickness increased FIM vibration amplitudes. In comparison to smooth strips, the rough strips were found to result in an identifiable suppression of FIM amplitudes over the strip thickness ratio range of 2.4% to 4.9%. Both strip types were ineffective in inciting galloping oscillations at a strip thickness of 0.8% and displayed negligible differences in FIM response beyond a strip thickness ratio of 8.2%. System characteristics such as mechanical power and energy transfer efficiencies were also evaluated and will be discussed.

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