

Abstract Submitted
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Reconfiguration parameters for drag of flexible cylindrical elements CHAPMAN JOHN, BRUCE WILSON, JOHN GULLIVER, University of Minnesota — This presentation compares parameters that characterize reconfiguration effects on flow resistance and drag. The drag forces occurring on flexible bluff bodies are different from the drag occurring on rigid bluff bodies due to reconfiguration. Drag force data, collected using a torque sensor in a flume, for simple cylindrical obstructions of the same shape and size but with different flexibility is used to fit drag parameters. The key parameter evaluated is a reference velocity factor u to account for drag reduction due to reconfiguration, similar to a Vogel exponent. Our equations preserves the traditional exponent of the drag relationship, but places a factor onto the drag coefficient for flexible elements, rather than a Vogel exponent arrangement applied to the flow velocity. Additionally we relate the reference velocity factor u to the modulus of elasticity of the material through the Cauchy Number. The use of a reference velocity factor u in place of a Vogel exponent appears viable to account for how the drag forces are altered by reconfiguration. The proposed formulation for drag reduction is more consistently estimated for the range of flexibilities in this study. Unfortunately, the mechanical properties of vegetation are not often readily available for reconfiguration relationships to the elastic modulus of vegetation to be of immediate practical use.

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