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Interaction of a Vortex Ring with a Thin Porous Surface JOHN HRYNUK, DOUG BOHL, Clarkson University — The interaction of vortex rings with thin porous screens was investigated using Molecular Tagging Velocimetry (MTV). The surface porosity, defined as the ratio of the open area to total area of the screen, was held constant at $\varphi = 65\%$ while the diameter of screen wires was varied. The three screens of varying wire diameter tested were: a fine wire ($D_{wire} = 0.0178$ cm), a medium wire ($D_{wire} = 0.104$ cm) and coarse wire ($D_{wire} = 0.204$ cm). When the vortex interacted with the fine wire screen a secondary vortex formed on the upstream face of the screen that orbited the primary vortex and then convected back up stream. The primary vortex reformed immediately downstream of the screen with significantly lower strength. For medium and large wire screens additional vorticity was generated and shed from individual wires, changing the downstream vortex behavior. Secondary vortices were observed for these larger screens but they were weaker and remained in proximity to the screen. Vortex shedding from the screen wires was observed for the medium screen which delayed the reformation of the vortex ring downstream of the screen. Shed vortex pairs, from individual wires, were observed to dominate the downstream flow for the large wire screen and no vortex ring reformation was observed. Vorticity and circulation will be used to further understand the interaction process for each of these screens.

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