Hand Effects on Free Surface of a Flow past Glove-Shaped Formers in Latex Dipping: A CFD Investigation

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Abstract. Latex dipping process in a medical-gloves production line is one of the most critical components that affect the final product quality. In this process, glove-shaped formers are moved through an open-channel latex-dipping tank. Since the gloves have long arms and the latex compound is opaque, it is difficult or impossible to directly observe the flow beneath the free surface. On the other hand, surface wave and vortex shedding patterns are easy enough to observe or measure on-site. Therefore, it will be beneficial to identify and establish a relationship between the observable surface quantities and the flow underneath. In this work, Computational Fluid Dynamics (CFD) is used to simulate a free-surface flow past a glove-shaped former in comparison to that over a vertical cylinder of the same diameter. The computational results showed that the vortex generation in the near wake is inhibited by the effect of the free surface, and reducing the vortex shedding and vorticity. The shedding from the fingertips has little to no effect on the surface. Most surprisingly, the free surface flow past a glove-shaped former in this setting does not exhibit a transient vortex-shedding pattern unlike the case with a vertical cylinder. This disparity among others makes a vertical cylinder a poor simplified surrogate model for the glove-shaped former.

Keywords: Latex Dipping, Free Surface Flow, Computational Fluid Dynamics