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A comparison of three SPH methods for the solution of the Fluid-Solid Interaction problem MILAD RAKHSHA, LIJING YANG, DAN NEGRUT, University of Wisconsin - Madison — We report results and lessons learned from a study in which three Smoothed Particle Hydrodynamics (SPH)-methods were used for the solution of several fluid-solid Interaction problems. The first SPH approach considered is widely used in the community and it relies on an equation of state to weakly enforce compressibility (called WCSPH, from Weakly Compressible SPH). The second SPH approach uses an implicit solution in which the incompressibility is enforced by a pressure distribution computed via a Poisson equation (called ISPH, from Implicit SPH). Lastly, a constraint-based method is considered that enforces incompressibility by imposing the constant density condition via a kinematic holonomic constraint on the motion of the SPH markers (called KCSPH, from Kinematically Constrained SPH). WCSPH, ISPH and KCSPH are compared in conjunction with five tests: an incompressibility benchmark test, Poiseuille flow, flow around cylinder, dam break, and fluid sloshing. The interest is in comparing solution attributes such as accuracy, robustness, efficiency, and ease of use and implementation. Ultimately, this effort provided a mechanism to probe the agency of the SPH method.

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