

The Turek and Hron Benchmark problem

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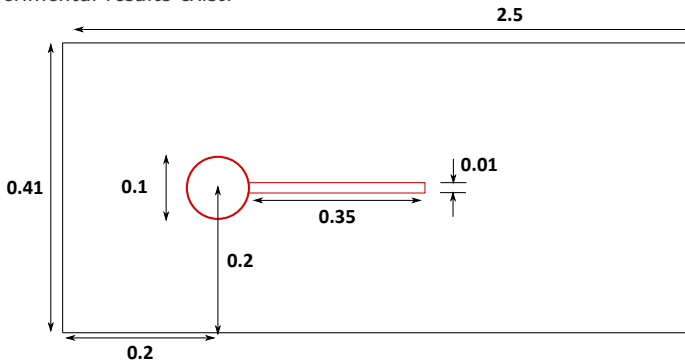
LSDYNA ICFD solver

Dev version SVN 110295

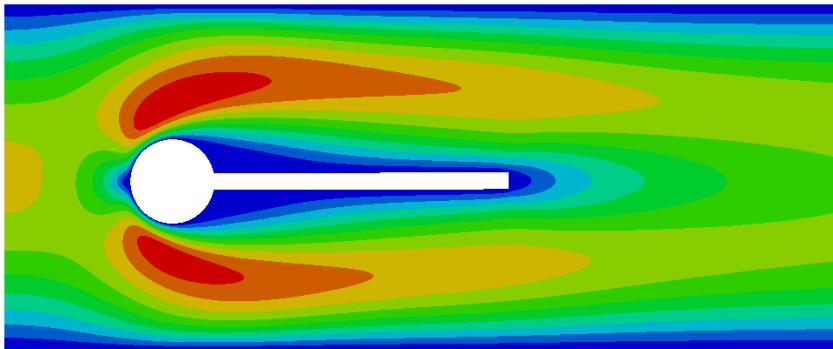


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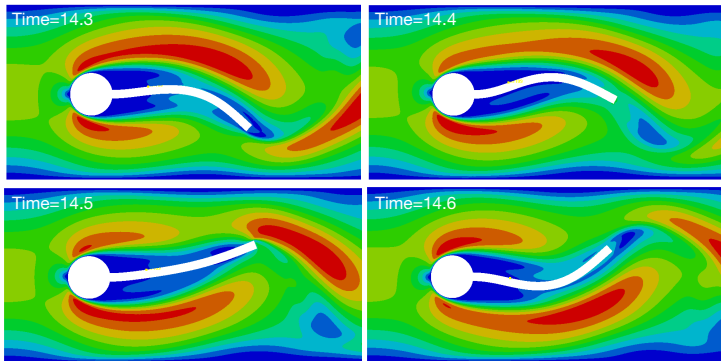
An elastic cantilever plate is clamped behind a rigid cylinder under laminar flow circumstances. Three different test cases named FSI1, FSI2 and FSI3 are provided. This is a purely numerical benchmark problem where codes can be compared to one another but no experimental results exist.



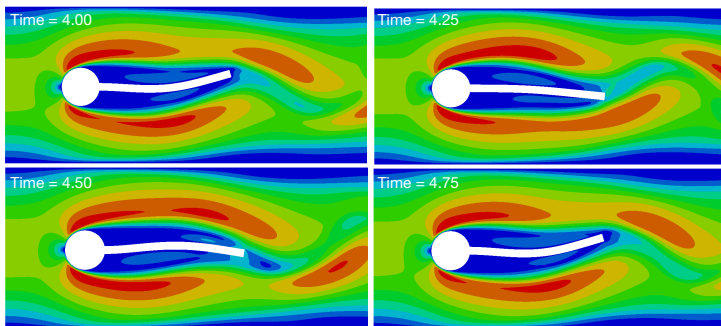
Quantity	FSI1	FSI2	FSI3
V_{inflow}	0.2	1.0	2
ρ_f	1000	1000	1000
μ_f	1	1	1
E	$1.4e6$	$1.4e6$	$5.6e6$
ρ_s	1000	10000	1000
ν	0.4	0.4	0.4
dt	0.025	0.005	0.0025
Beam surface mesh size	0.00125	0.00125	0.00125
Nodes	157572	157572	157572



$u_x [10^{-5}]$	$u_y [10^{-4}]$	Drag	Lift
1.7	8.6	14.26	0.73 ± 0.3



$u_x [10^{-2}]$	$u_y [10^{-3}]$	Drag	Lift
1.8 ± 1.6	0.3 ± 88.3	227 ± 109	0.35 ± 277.35



$u_x [10^{-3}]$	$u_y [10^{-3}]$	Drag	Lift
-2.35 ± 2.45	1.5 ± 33.5	452 ± 31	3.3 ± 83.1

- [1] S. Turek and J. Hron, *Proposal for Numerical Benchmarking of Fluid-Structure Interaction between an Elastic Object and Laminar Incompressible Flow*, pp. 371–385.
Berlin, Heidelberg: Springer Berlin Heidelberg, 2006.
- [2] S. Turek, J. Hron, M. Razzaq, H. Wobker, and M. Schäfer, *Numerical Benchmarking of Fluid-Structure Interaction: A Comparison of Different Discretization and Solution Approaches*, pp. 413–424.
Berlin, Heidelberg: Springer Berlin Heidelberg, 2010.
- [3] S. Turek, J. Hron, M. Mádlík, M. Razzaq, H. Wobker, and J. F. Acker, *Numerical Simulation and Benchmarking of a Monolithic Multigrid Solver for Fluid-Structure Interaction Problems with Application to Hemodynamics*, pp. 193–220.
Berlin, Heidelberg: Springer Berlin Heidelberg, 2010.

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