

On time-periodic solutions to an interaction problem between compressible viscous fluids and viscoelastic beams

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Abstract

We study a nonlinear fluid-structure interaction problem between a "square-root" viscoelastic beam and a compressible viscous fluid. The beam is immersed in the fluid which fills a two-dimensional rectangular domain with periodic boundary conditions in both directions, while both the beam and the fluid are under the effect of time-periodic forces. By using a decoupling approach, at least one time-periodic weak solution to this problem is constructed which has a bounded energy and a fixed prescribed mass. The lack of a priori energy bounds is overcome by a series of estimates based on a careful choice of parameters. The most challenging one is the pressure estimate, which is obtained by utilizing the specific periodic geometry and the Bogovskii operator on a fixed domain that has a uniform constant.