

REVIEWER's REPORT

on the article

'Spectrum of a Problem about the Flow of a Polymeric Viscoelastic Fluid in a Cylindrical Channel (Vinogradov-Pokrovski Model)'

(authors: D. L. Tkachev and E. A. Biberdorf)

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The article by D. L. Tkachev and E. A. Biberdorf proposes a novel result regarding qualitative properties of solutions to the famous Vinogradov-Pokrovski model describing flows of an incompressible viscoelastic polymeric fluid. The study of linear stability of the natural rest state of the polymeric fluid with respect to axisymmetric perturbations is fulfilled. After implementing the linearization procedure and accepting the axisymmetry condition, the highly sophisticated original Vinogradov-Pokrovski model reduces to the set of two mutually independent subsystems that allow for a fruitful analysis, these are systems (37) and (38) in the article. Thorough analysis of these systems, lead to derivation of the spectral equations for the eigenvalues, see Theorem 1. Theorem 1 is the main theoretical result of the article. With the help of this result and the associated formulas (58) and (60), a series of numerical experiments is worked out. It is shown that, with amplification of perturbations frequency along the channel axis, there appear eigenvalues with positive real part for the radial velocity component. This fact guarantees linear Lyapunov instability of the rest state.

Generally speaking, the study of polymers and polymeric fluids is no doubt an extremely important topic in view of the numerous practical applications. Accordingly, the results obtained by the authors in the proposed article definitely will get attention of specialists in mechanics of fluids with complex rheology and, more particularly, in the mathematical modeling of polymeric flows. The text of the article is both lucid and clear. The main results are novel; they are supplemented by correct and detailed proofs.

Some quite minor imperfections have been found while reading the text. They are as follows.

1. Abstract: should be 'axisymmetric', not 'axisymetric'.
2. Page 145, line 2 after title 'Introduction': should be 'Vinogradov', not 'Vinogradvo'.
3. Page 149, line 4 from above: $\|\cdot\|^2$ is not defined explicitly; on my opinion, it would be good to define directly that $\|\cdot\|^2$ is the sum of squares of the components of a vector.
4. Page 157, line 5 after formula (66): the references to the formulas are confused: there should be (58) and (60) instead of (3.2) and (3.4), respectively.

Furthermore, in order to make the presentation of the article more consistent (more 'step by step'), I would recommend to move the correlation formula (64) right into the formulation of Theorem 1.

Overall opinion on the article *'Spectrum of a Problem about the Flow of a Polymeric Viscoelastic Fluid in a Cylindrical Channel (Vinogradov-Pokrovski Model)'*, written and submitted by D. L. Tkachev and E. A. Biberdorf, is quite positive. After the above mentioned minor corrections, it can be published in *Siberian Electronic Mathematical Reports*.