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[\[PDF \(1367K\)\]](#) [\[References\]](#)**Numerical Analysis of Penetration Flow through Viscoelastic Fluids**[Takehiro YAMAMOTO<sup>1\)</sup>](#) and [Ryusuke KIMOTO<sup>1\)</sup>](#)*1) Department of Mechanical Engineering, Graduate School of Engineering, Osaka University*

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**Abstract:** Penetration flows of a Newtonian fluid through a viscoelastic fluid in an abrupt contraction channel were numerically analyzed. In the numerical simulation, the Phan-Thien Tanner model was employed as a constitutive equation. The level set method was used to numerically represent the interface between two fluids and effects of interfacial tension were introduced into the numerical simulation using the continuum surface force model. The numerical computation predicted the occurrence of fluctuation of interface between a Newtonian penetrating fluid and a viscoelastic fluid in a downstream conduit of the contraction channel. This fluctuation was a typical phenomenon for penetration flows through a viscoelastic fluid and was not observed in a penetrate flow through a Newtonian fluid. Furthermore, it was confirmed that the normal stress effect drove the fluctuation and the amplitude of fluctuation when elastic properties were strong.

**Key Words:** [Penetration flow](#), [Viscoelastic fluid](#), [Interface](#), [Numerical simulation](#), [Phan-Thien Tanner model](#)

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