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An Experimental and numerical Study for squeezing flow[1] RUNGUN NATHAN, Penn State Berks, JI LANG, QIANHONG WU, Villanova University, VUCBMSS TEAM — We report an experimental and numerical study to examine the transient squeezing flow driven by sudden external impacts. The phenomenon is widely observed in industrial applications, e.g. squeeze dampers, or in biological systems, i.e. joints lubrication. However, there is a lack of investigation that captures the transient flow feature during the process. An experimental setup was developed that contains a piston instrumented with a laser displacement sensor and a pressure transducer. The heavy piston was released from rest, creating a fast compaction on the thin fluid gap underneath. The motion of the piston and the fluid pressure build-up was recorded. For this dynamic process, a CFD simulation was performed which shows excellent agreement with the experimental data. Both the numerical and experimental results show that, the squeezing flow starts with the inviscid limit when the viscous fluid effect has no time to appear, and thereafter becomes a developing flow, in which the inviscid core flow region decreases and the viscous wall region increases until the entire fluid gap is filled with viscous fluid flow. The study presented herein, filling the gap in the literature, will have broad impacts in industrial and biomedical applications.

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