

## Hybrid Quasi-Steady Thermal Lattice Boltzmann Model for Studying the Behavior of Oil in Water Emulsions Used in Machining Tool Cooling and Lubrication

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**Abstract :** Oil in water (O/W) emulsions are utilized extensively for cooling and lubricating cutting tools during parts machining. A robust Lattice Boltzmann (LBM) thermal-surfactants model, which provides a useful platform for exploring complex emulsions' characteristics under variety of flow conditions, is used here for the study of the fluid behavior during conventional tools cooling. The transient thermal capabilities of the model are employed for simulating the effects of the flow conditions of O/W emulsions on the cooling of cutting tools. The model results show that the temperature outcome is slightly affected by reversing the direction of upper plate (workpiece). On the other hand, an important increase in effective viscosity is seen which supports better lubrication during the work.

**Keywords :** hybrid lattice Boltzmann method, Gunstensen model, thermal, surfactant-covered droplet, Marangoni stress

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