

# Optimal control of quasi-Newtonian fluids

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## Abstract

Our aim is to establish necessary optimality conditions for optimal control problems governed by steady, incompressible Navier-Stokes equations with shear-dependent viscosity. The lack of regularity of the state variable induces some difficulties related with the differentiability of the control-to-state mapping. In the case of shear-thickening flows, the corresponding analysis cannot be achieved in Sobolev spaces and the natural setting for the linearized equation and the adjoint state equation involves weighted Sobolev spaces. The case of shear-thinning flows is more difficult to handle because of the combined effect of the extra stress tensor and the convective term. These issues can be overcome by introducing a family of smooth approximate control problems and by passing to the limit in the corresponding optimality conditions.

## References

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