Laminar Flow and Mixing at a Pipeline Junction

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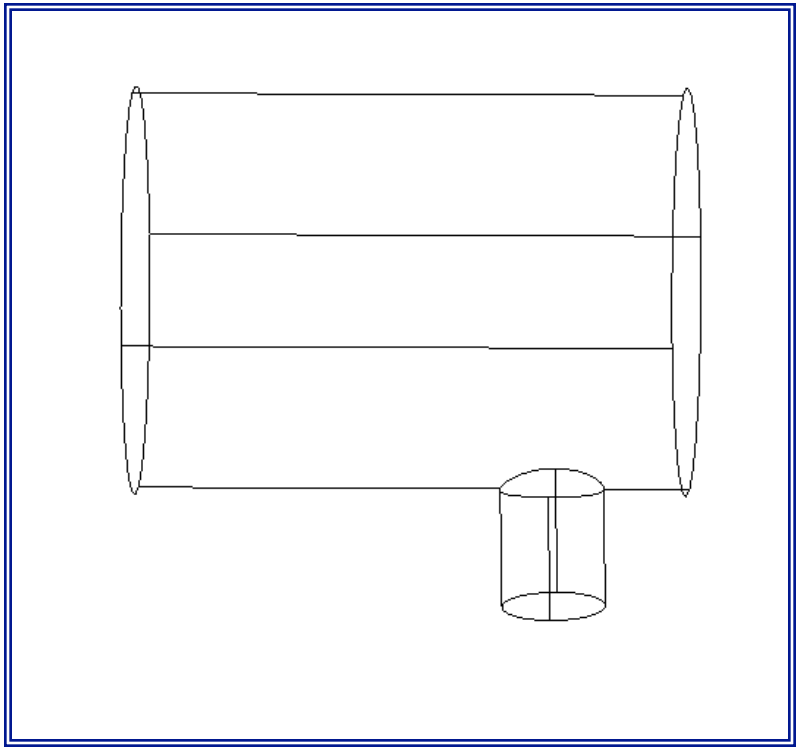
Objective

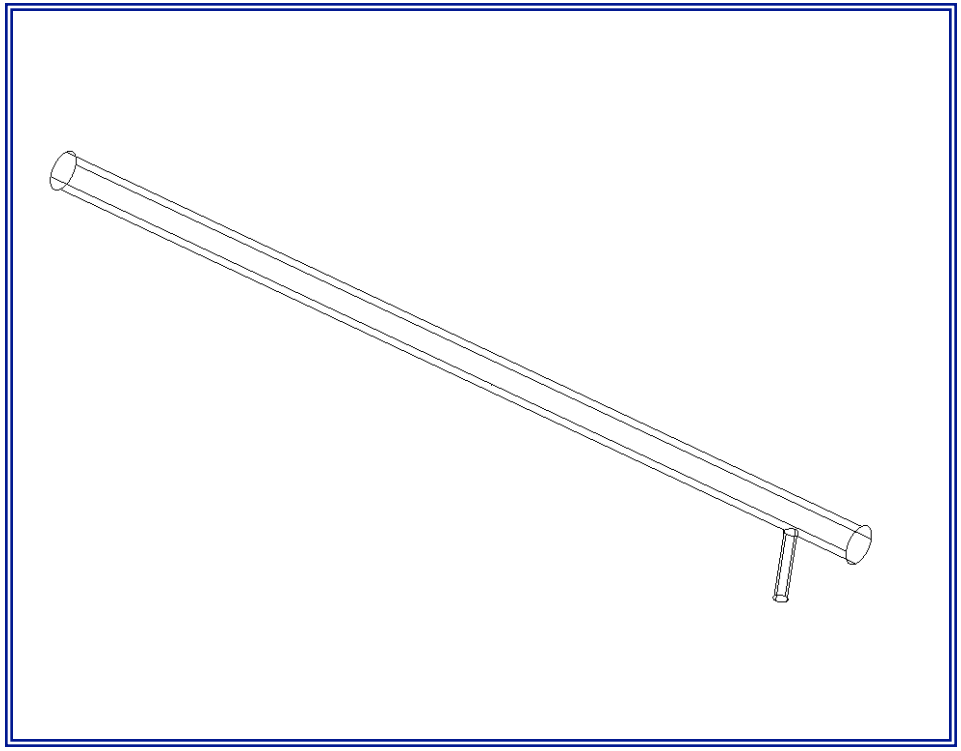
- Model the flow and mixing of power law fluids (polymer and sludge) at a T-junction in a pipeline
  - Model flow in 2 different lengths of pipes
  - Compare mixing in 2 different lengths of pipes

Actual Set up

Two different lengths of pipes modeled



8 inch long Pipe

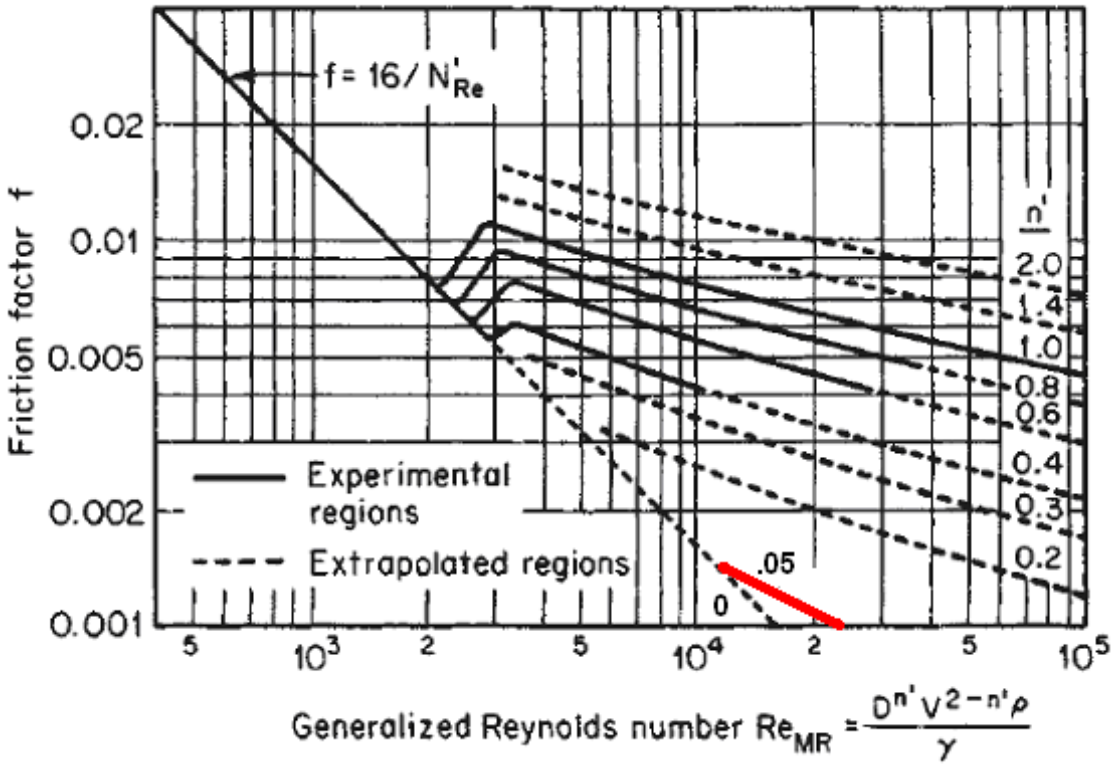


8 foot long pipe

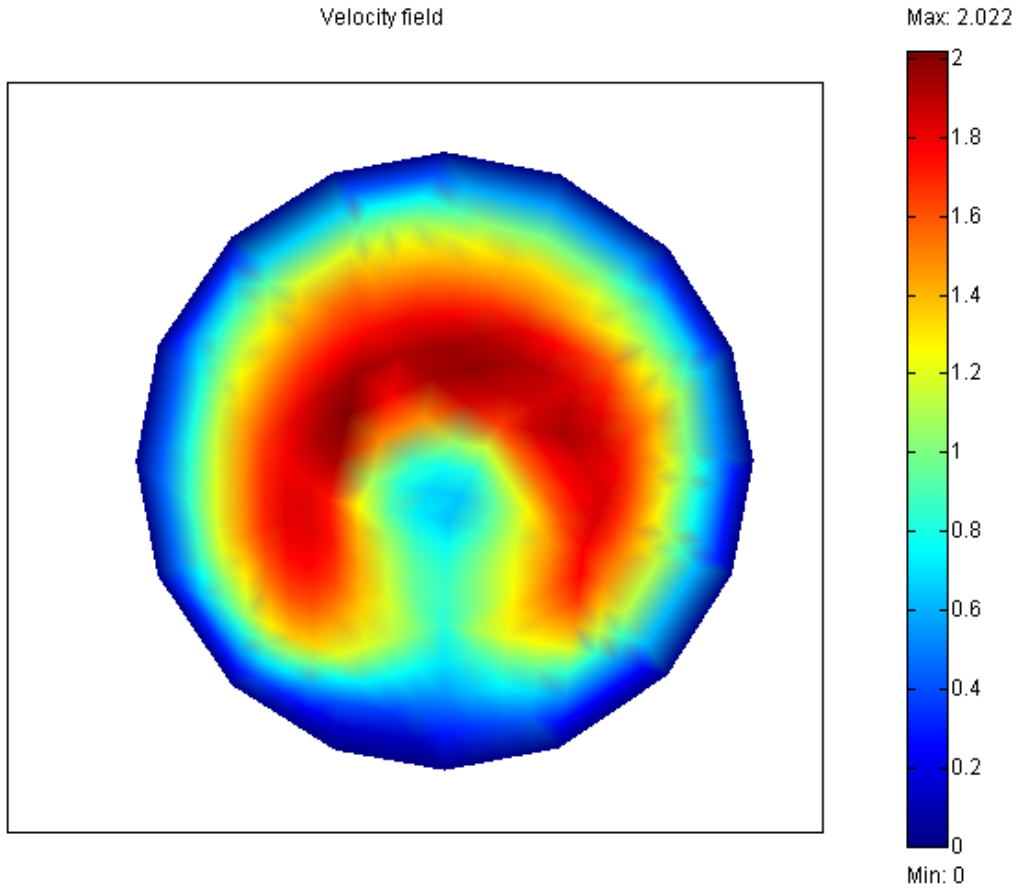
Procedures in FEMLAB and Limitations

- Incompressible Navier Stokes Equation (both Newtonian and Non-Newtonian)
- Convective Diffusion Equation
- Too low of a density used for Non-Newtonian model
- Diffusivity used was too big

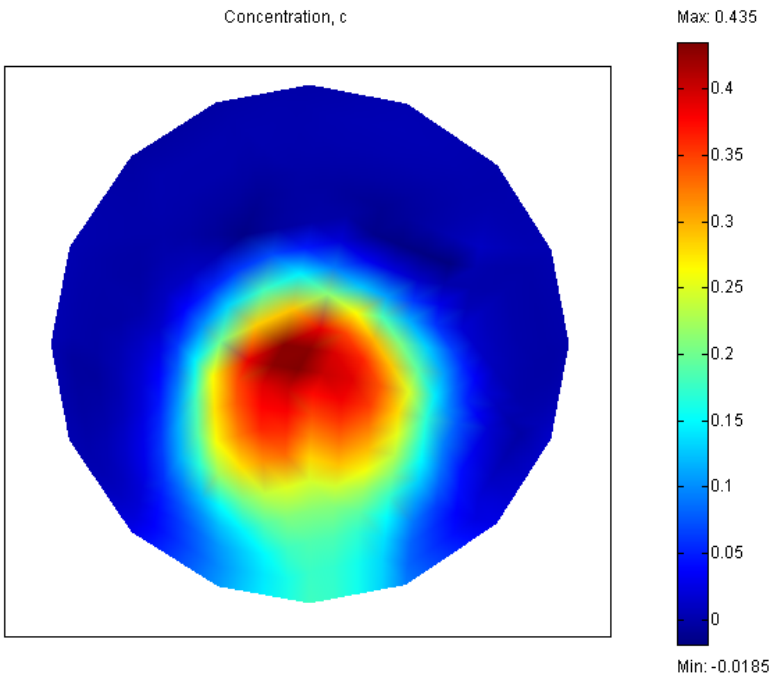
Verification of laminar flow



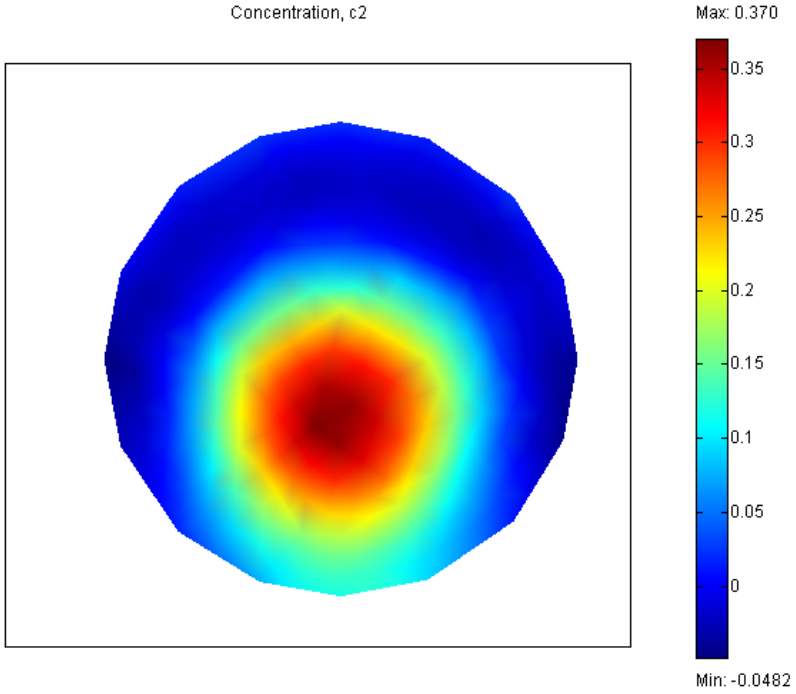
Outlet Velocity Profile for 8 inch long Pipe



Comparison of concentration at outlets

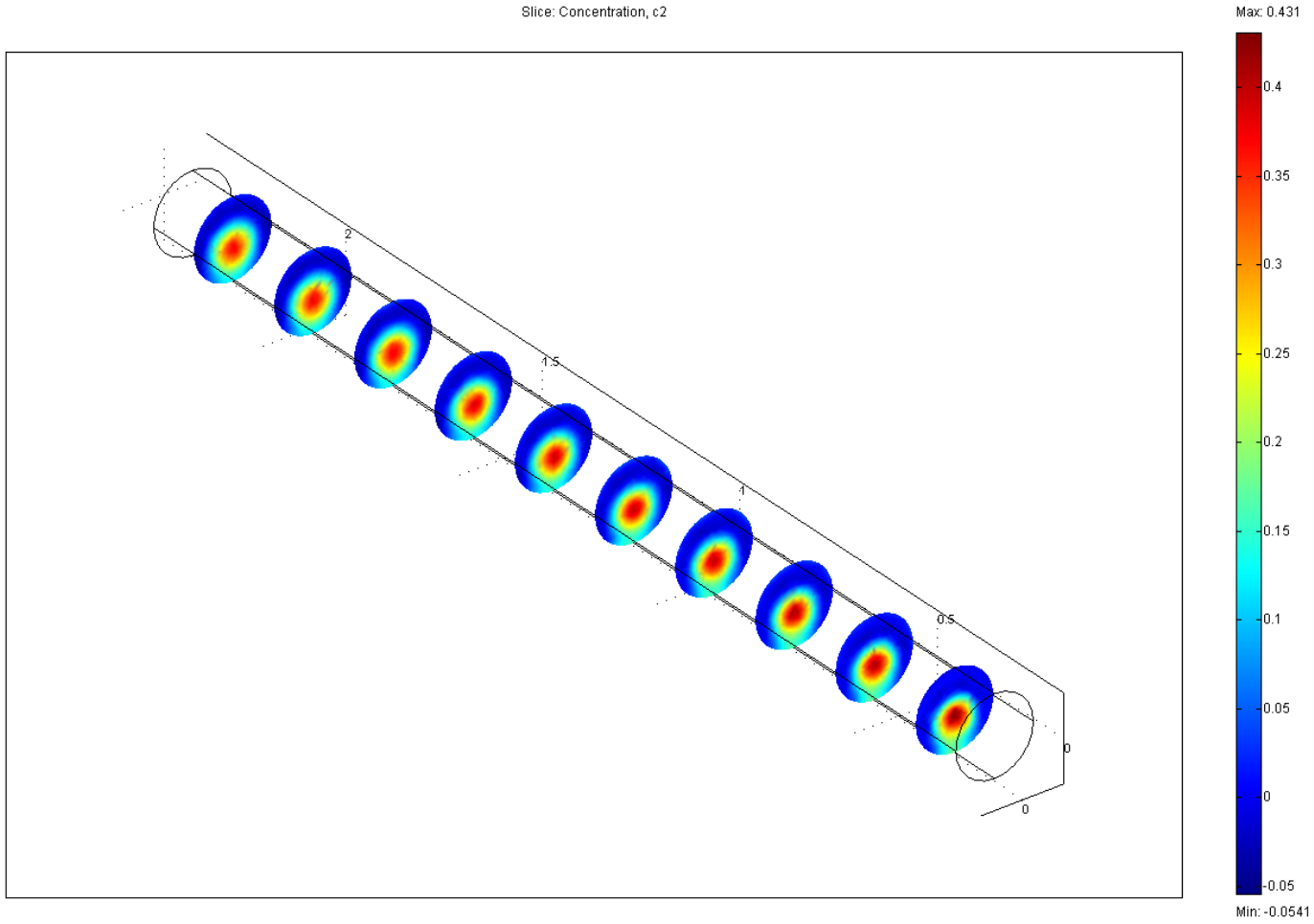


8 inch pipe

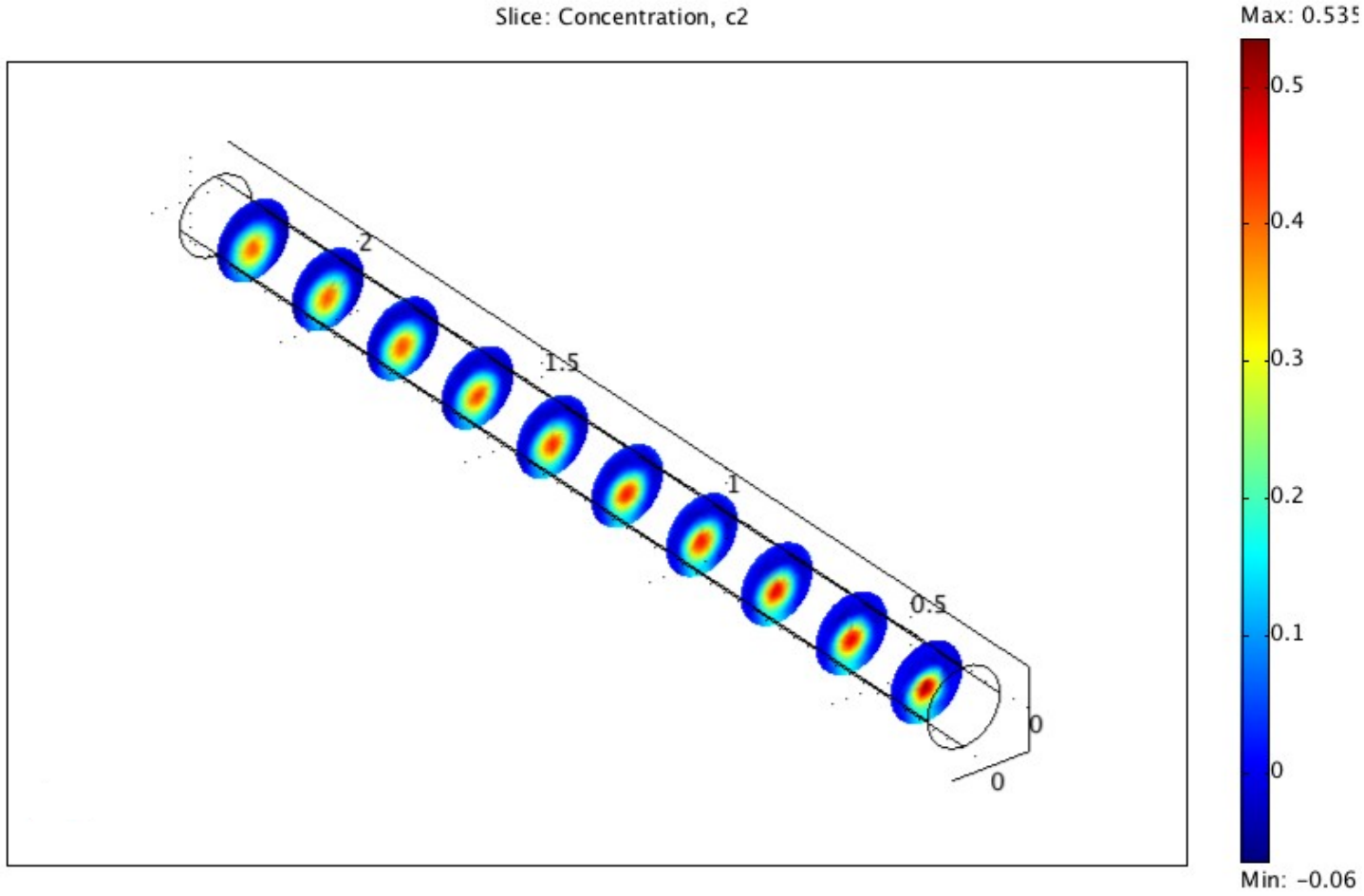


8 foot pipe

Concentration profile for Newtonian model



Concentration profile for Non-Newtonian model



Conclusion

- Flow is laminar
- Not much mixing
- More modeling can be done