

# CFD MODELLING OF RESIN FLOW IN LIQUID COMPOSITE MOULDING (LCM) PROCESSES

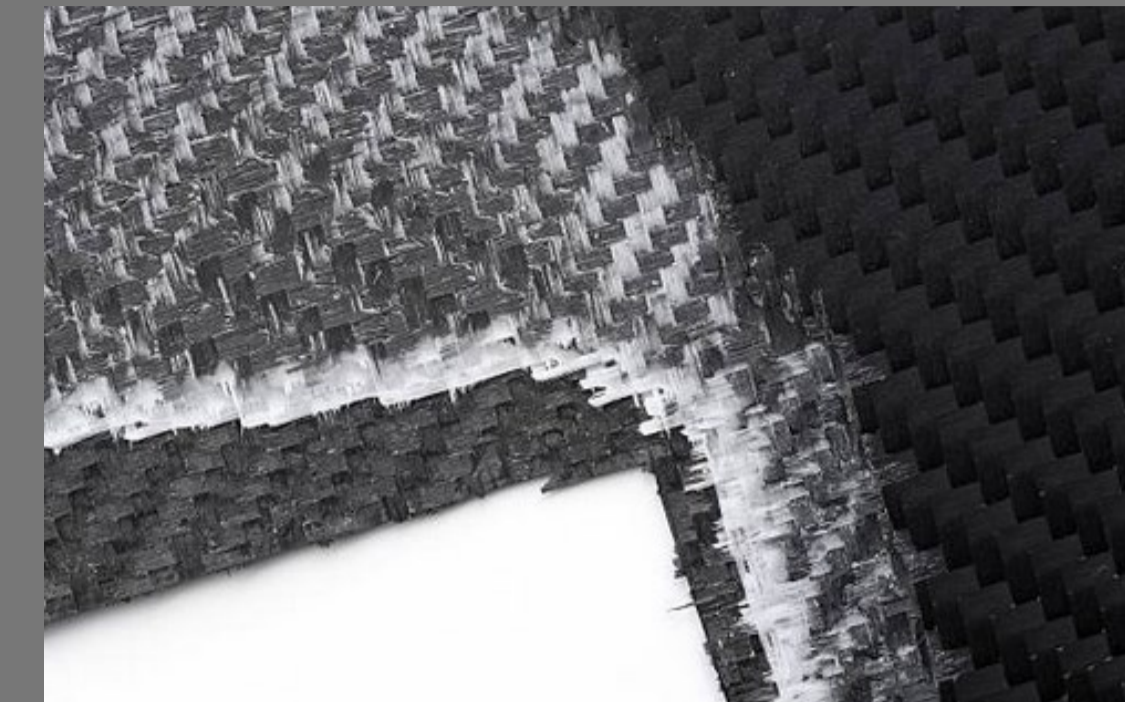
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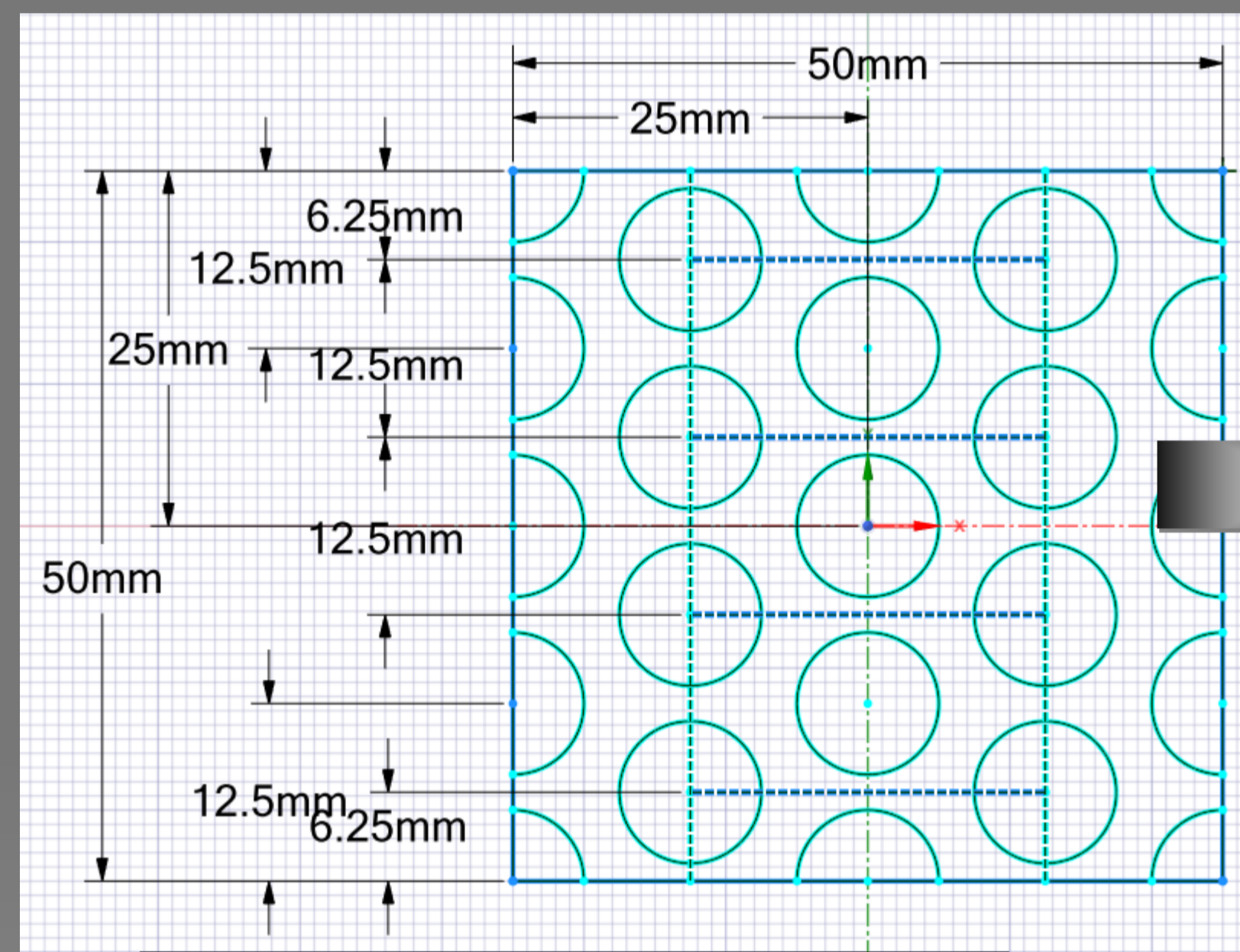
This report set out to create a CFD model that would simulate some aspects of realistic resin flow inside an LCM process. This is being done to help understand what the resin experiences when in that environment. Using the CFD software ANSYS, several models were created which simulated various potential fibre configurations of an LCM process.



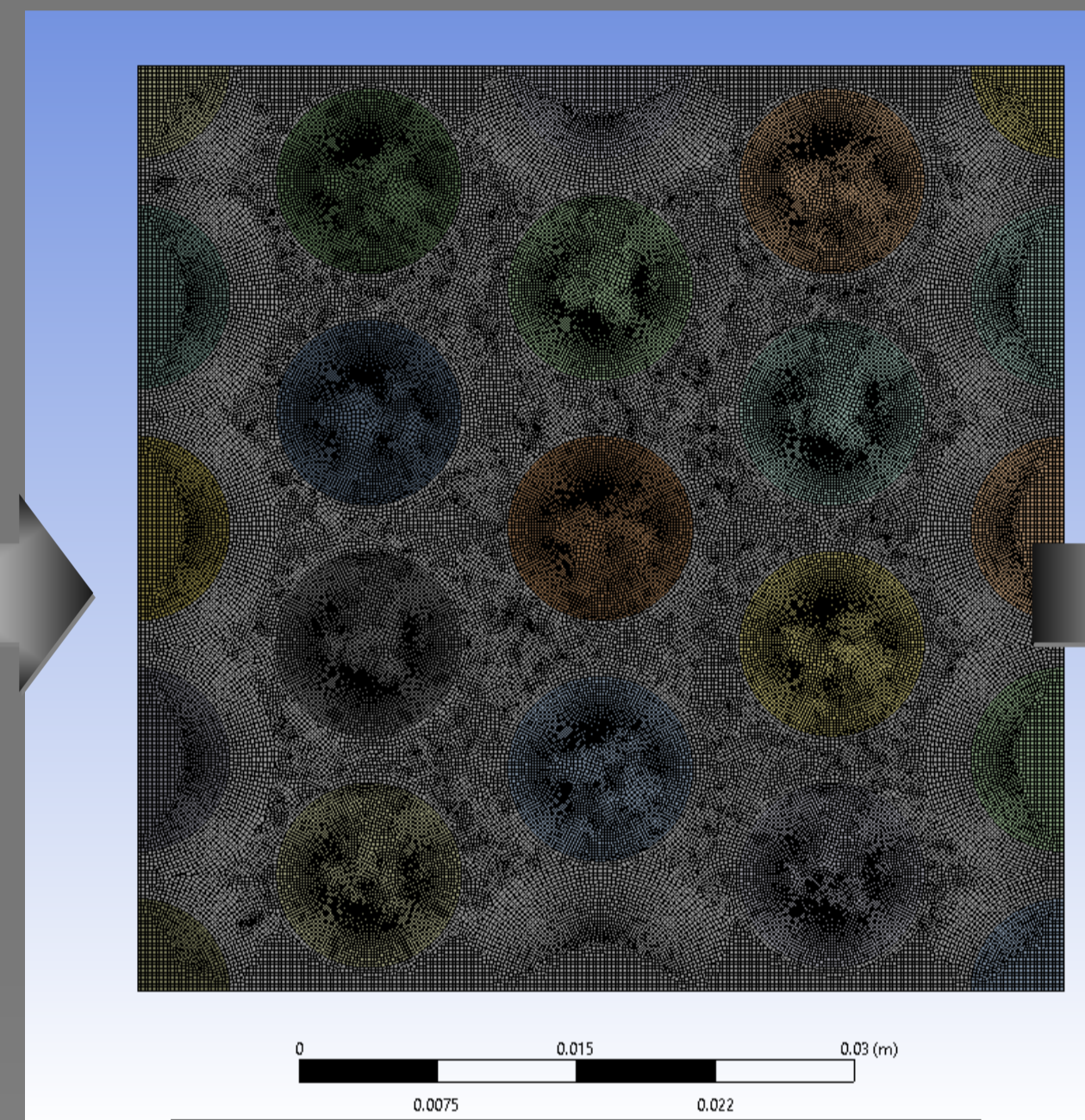
## WHAT IS LCM AND CFD?

Computational fluid dynamics or CFD is a science that produces quantitative predictions of fluid-flow phenomena based on the conservation laws governing fluid motion. It allows engineers to simulate how fluid would flow in specific environments with given assumptions.

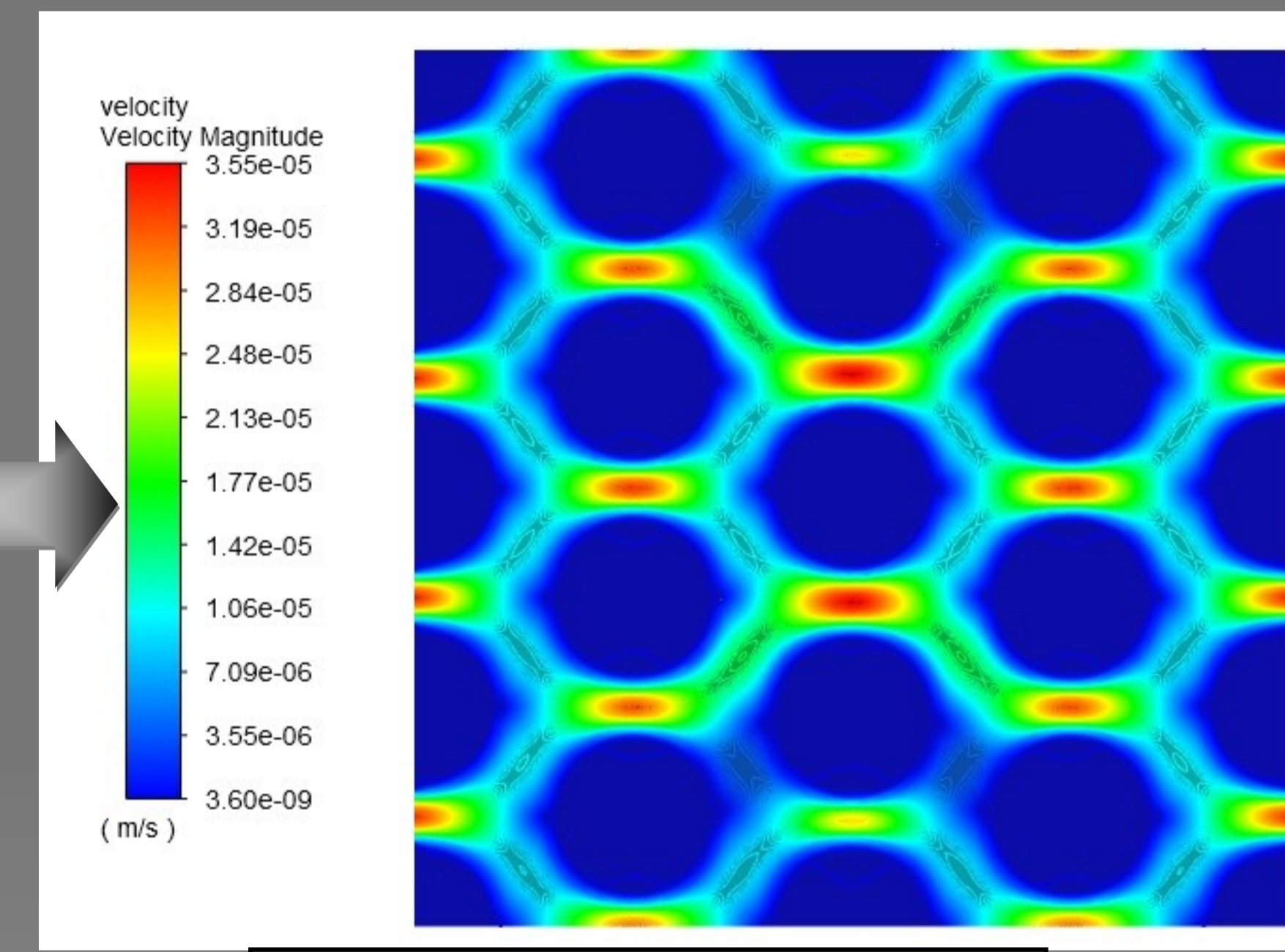
While LCM is the process of a liquid matrix material being forced into a dry pre-formed reinforcing material.



Final Sketch of Staggered Model



Mesh of Staggered Model



Fluid Velocities of Staggered Model

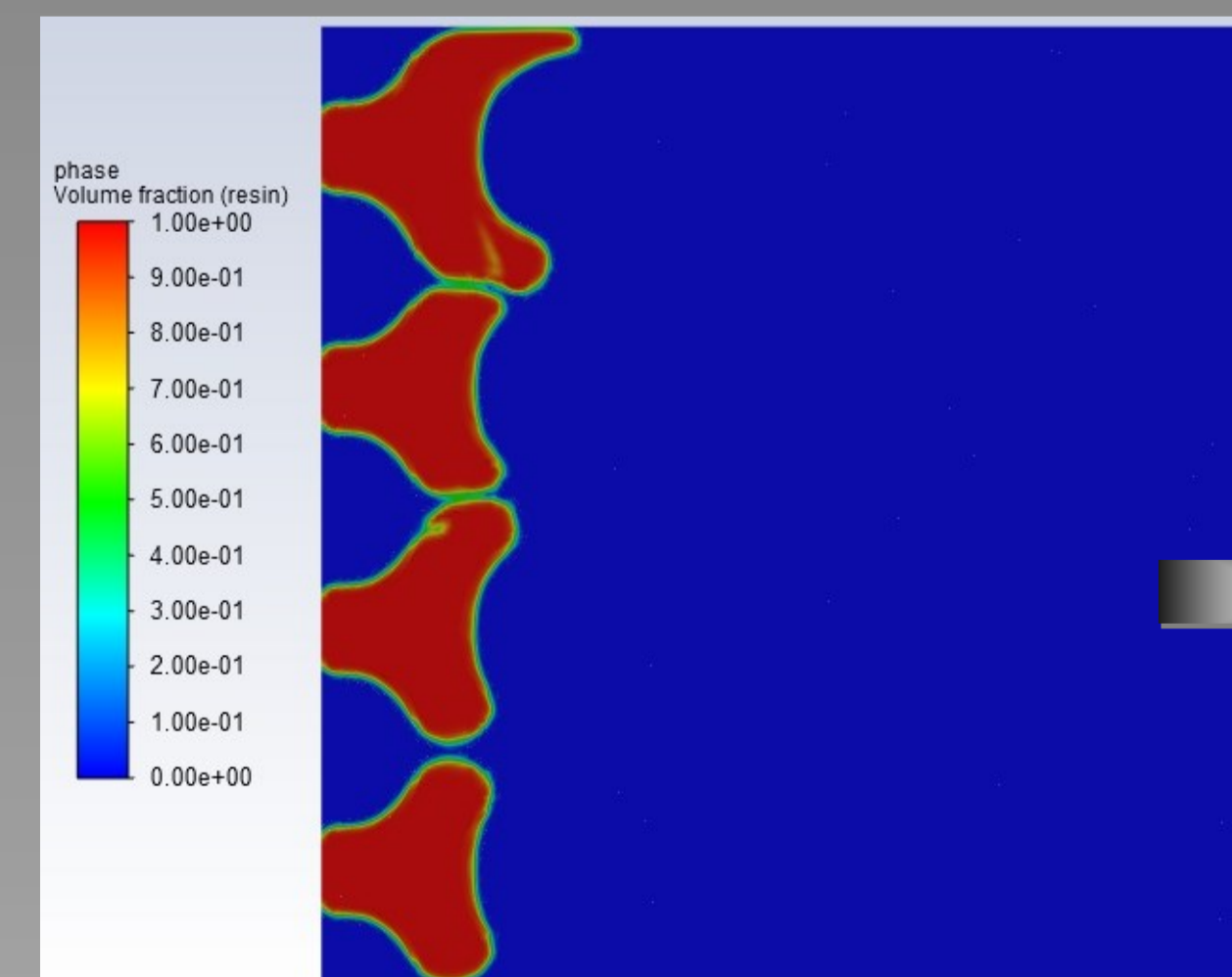
## ASSUMPTIONS

- $50\mu\text{m}^2$  plate scaled up to  $50\text{mm}^2$
- Constant injection pressure
- A pressure difference of 0.15Pa
- Resin/Hardener mixture was assumed to be IN2 epoxy fusion from Easy Composites
- Porosity of fibres as 40%
- Some models as single-phase and others as multiphase
- Single-phase models simulated as saturated and multiphase as unsaturated

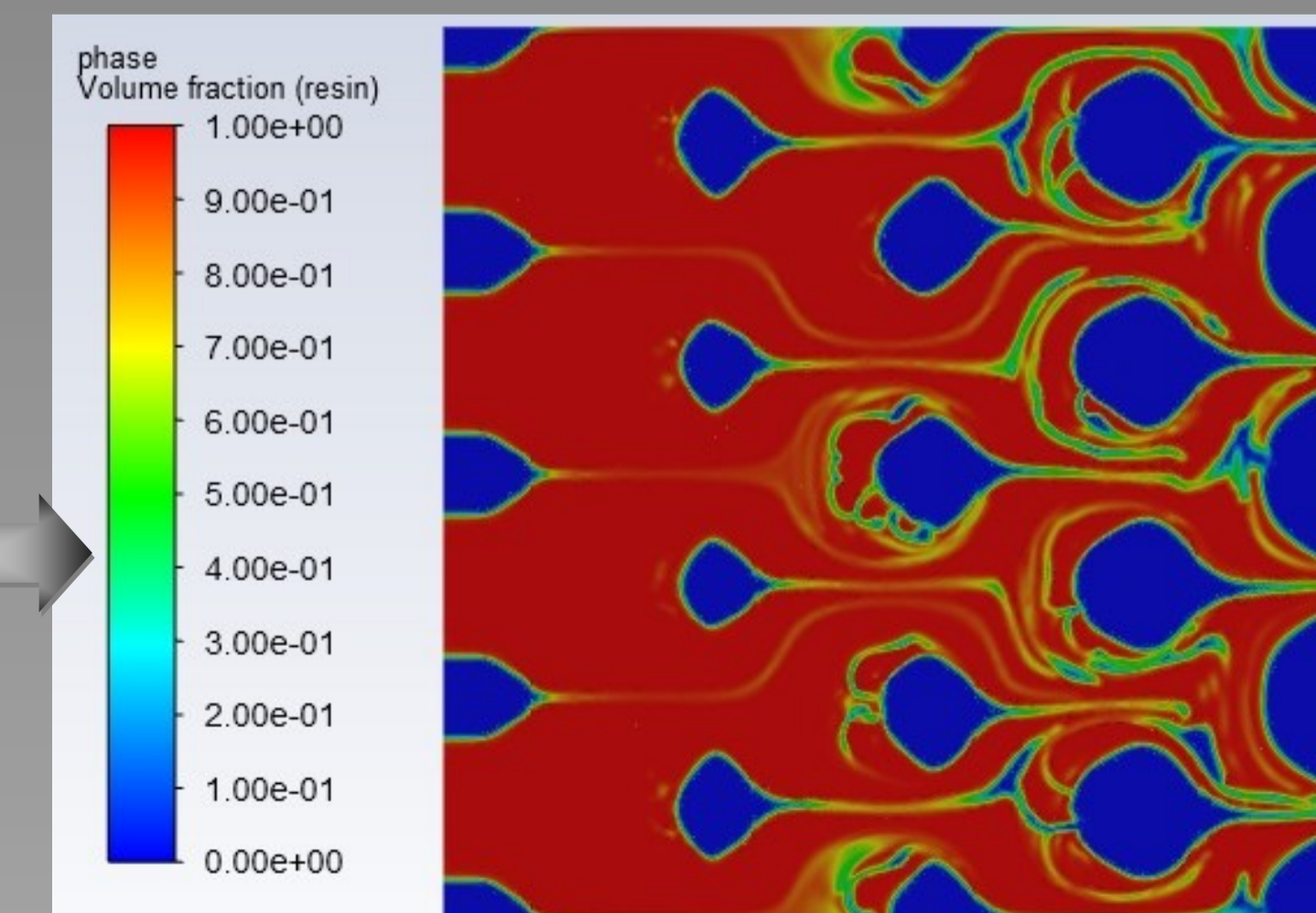
## RESULTS OF SINGLE-PHASE AND MULTIPHASE MODELS

After a significant amount of research, many assumptions, and lots of simulations, various models of different fibre configurations were created and simulated. With all the models showing realistic velocities for their size, all of them being in the range of roughly  $50\pm 25\mu\text{m/s}$ . The multiphase also shows promising fluid flow around fibre bundles.

## RESULTS OF MULTIPHASE



Volume Fraction at 5,500 Iterations



Volume Fraction at 100,000 Iterations