Computational Fluid Dynamics: Manufacturing Processes

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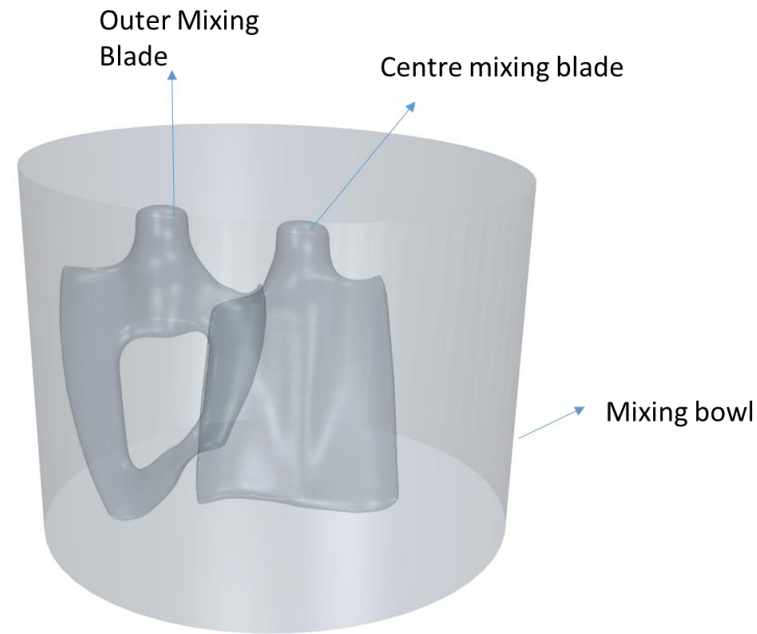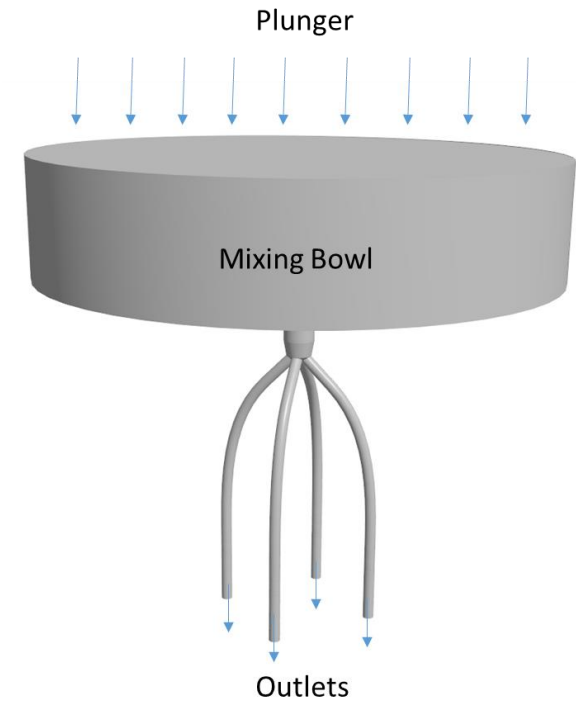April 2023

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Overview

Melt Cast Model

Outer Mixing Blade

Centre mixing blade

Mixing bowl

Planetary Mixer Model

Plunger

Mixing Bowl

Outlets

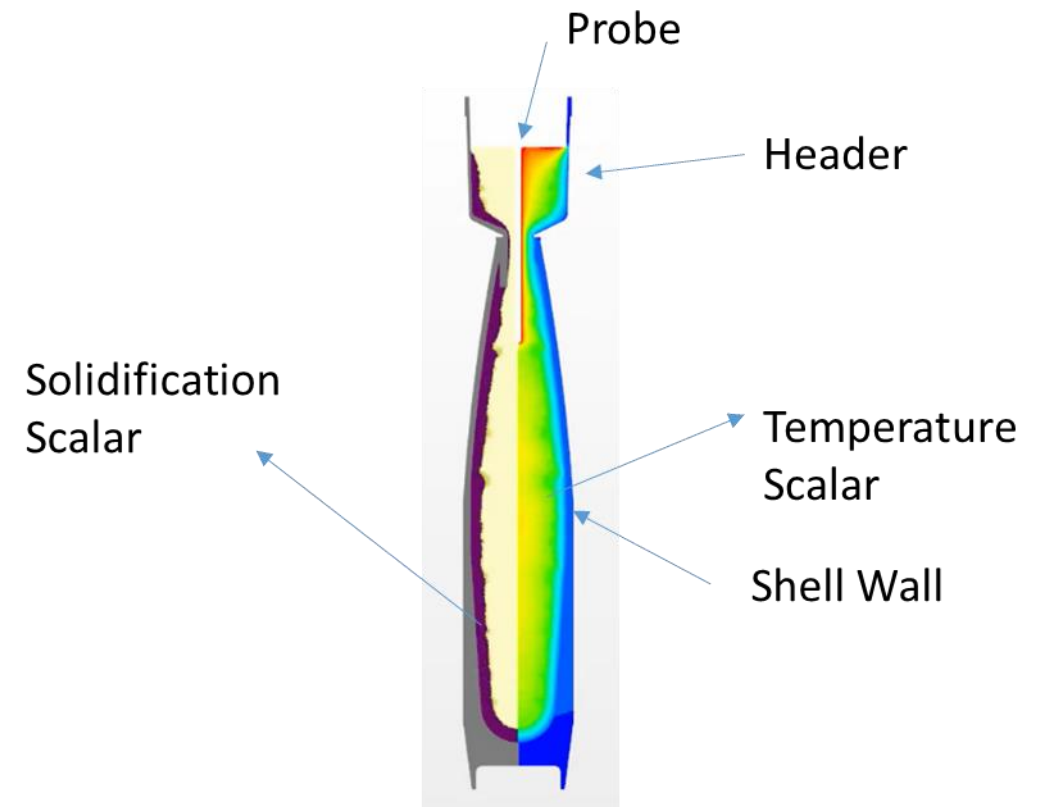Mixer Decanting Model

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Why Model Manufacturing Process?

- Quick parametric studies

- Inform manufacturing process decisions

- Outputs that are difficult to obtain in trials
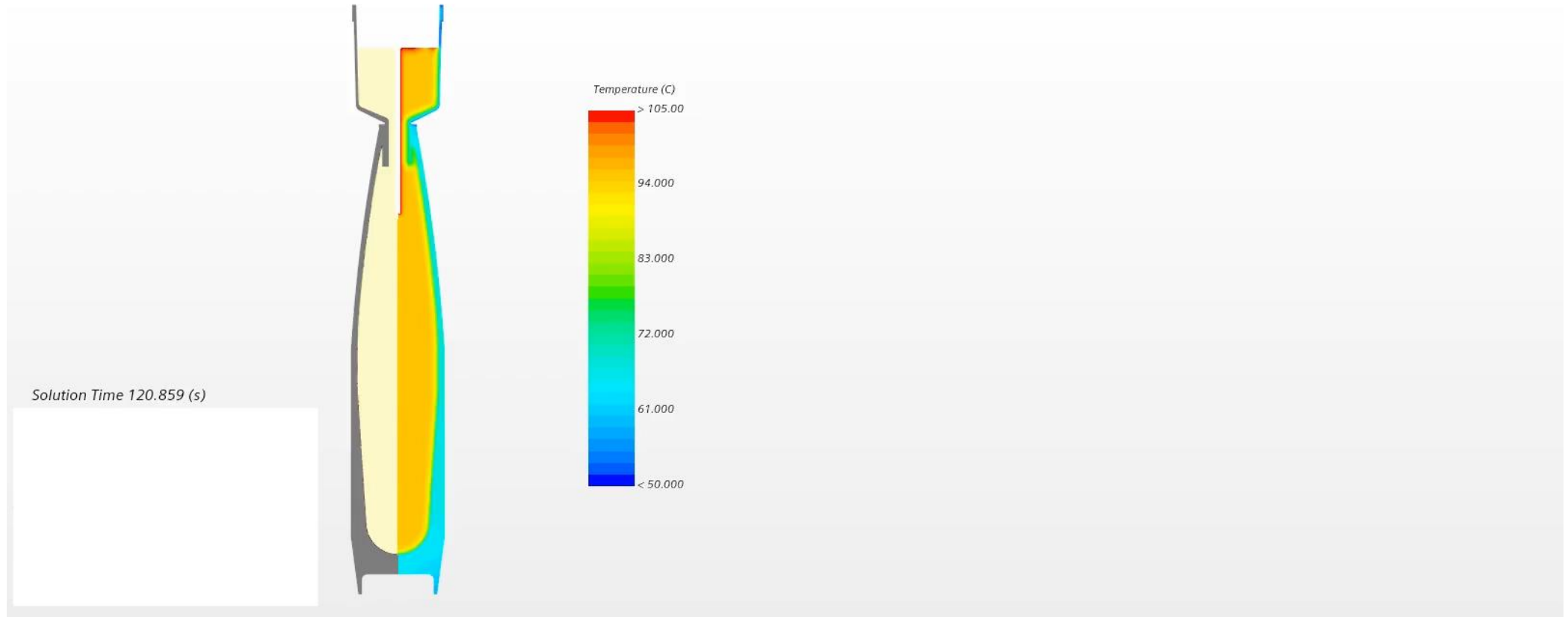
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Melt Cast Modelling

- Solidification of explosive during probe cooling

- Require bottom up solidification to prevent defects
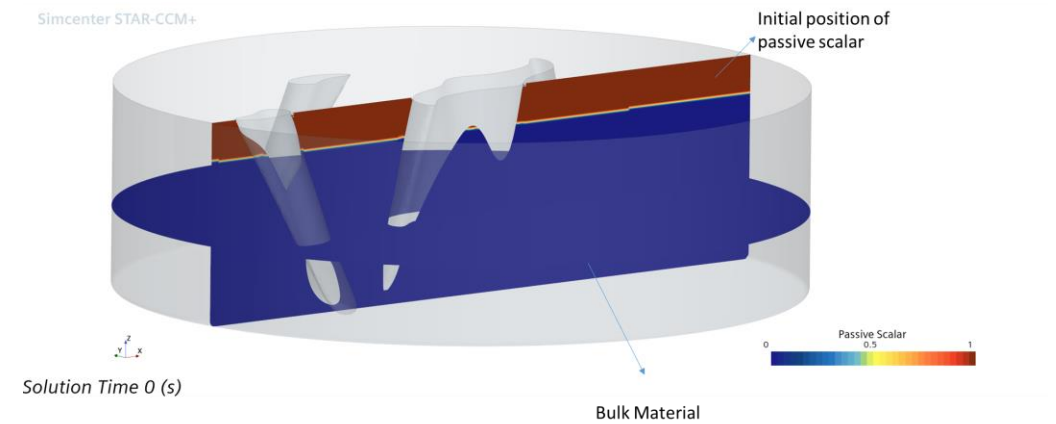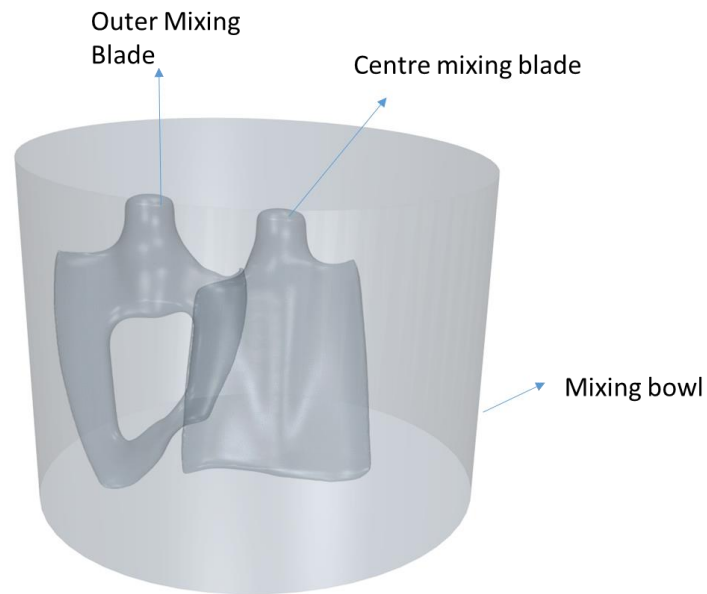
- Simplified 2D axisymmetric model

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Output video

Temperature (C)

> 105.00

94.000

83.000

72.000

61.000

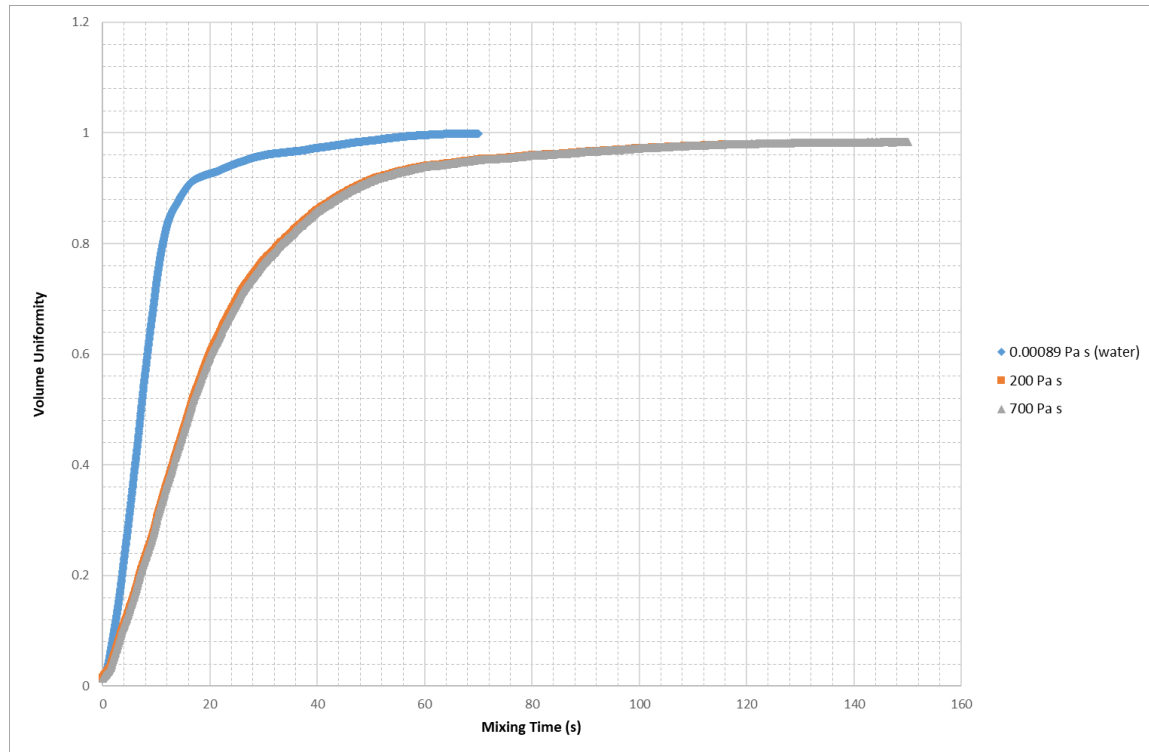< 50.000

Solution Time 120.859 (s)

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Planetary Mixer Modelling

- Single phase passive scalar model
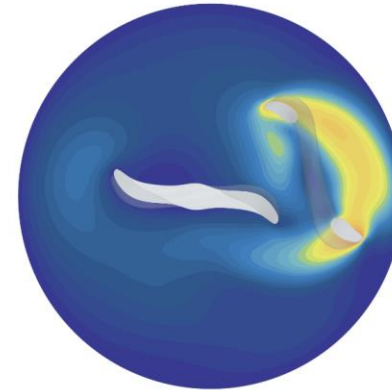
- Measure of volume uniformity of passive scalar

Initial condition passive scalar

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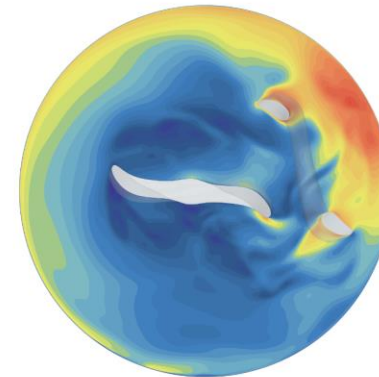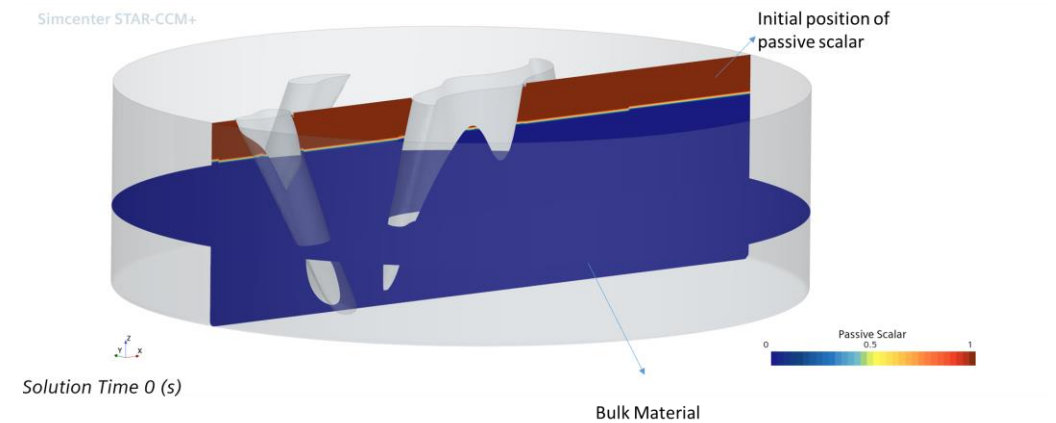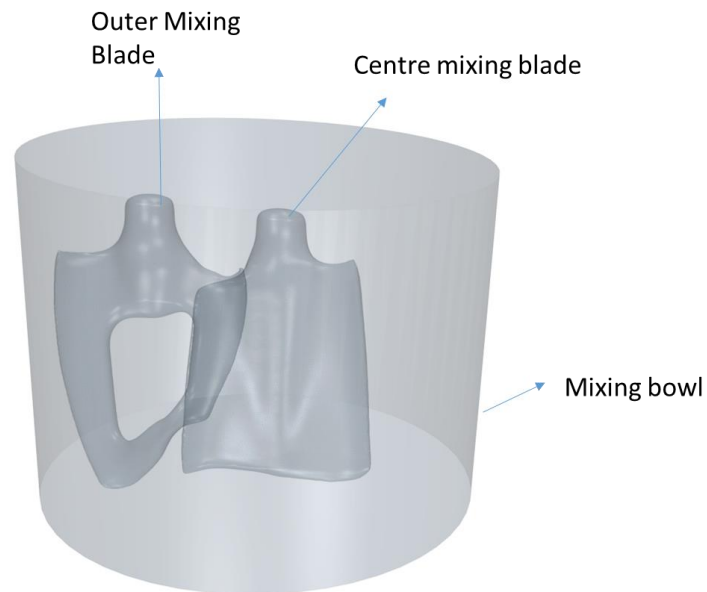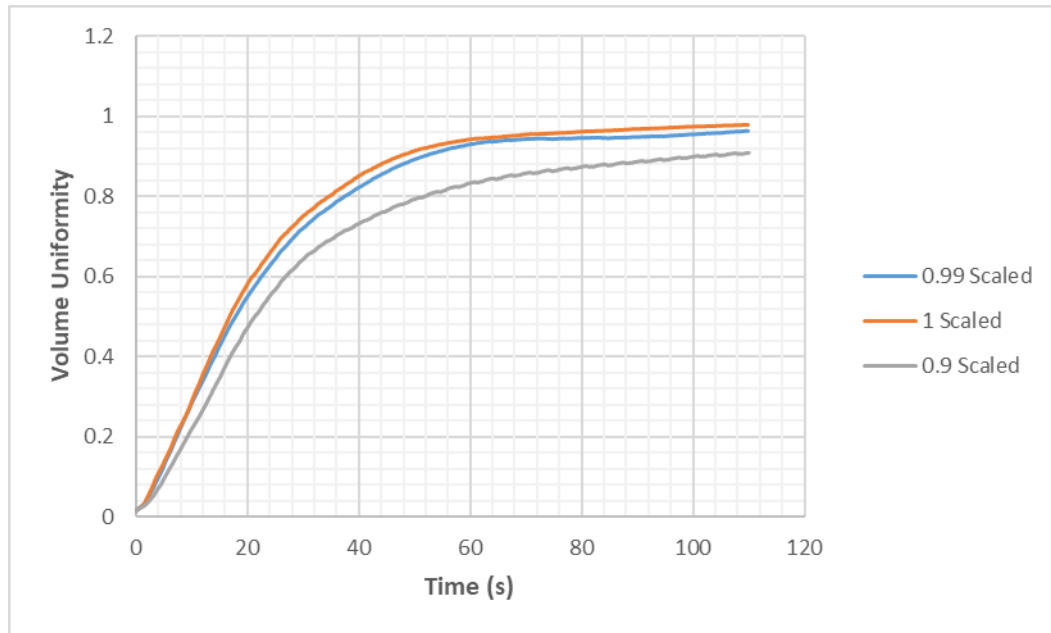# Planetary Mixer Modelling

Velocity scalar of water (bottom) compared to high viscosity (top)

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Planetary Mixer Modelling

- Single phase passive scalar model
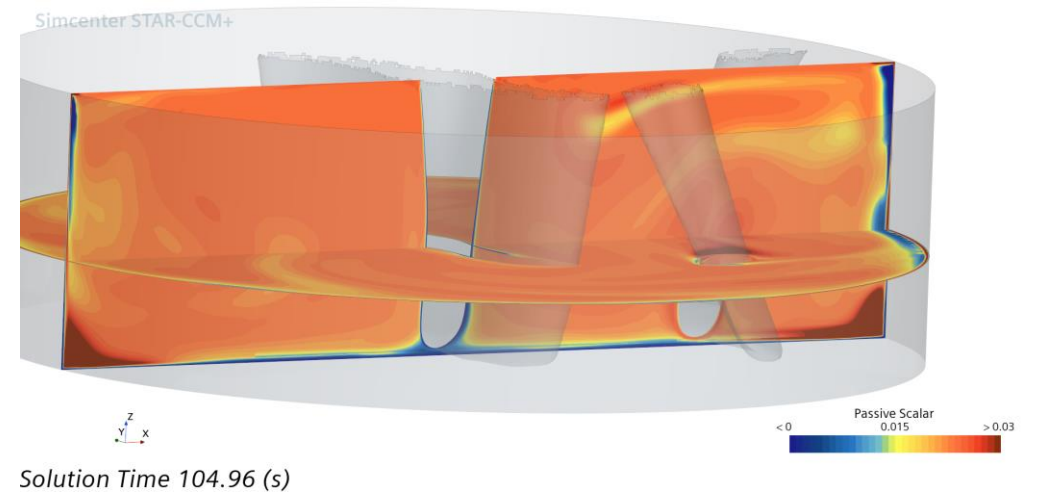
- Measure of volume uniformity of passive scalar

Outer Mixing Blade

Centre mixing blade

Mixing bowl

Simcenter STAR-CCM+

Initial position of passive scalar

Solution Time 0 (s)

Passive Scalar

Bulk Material

Initial condition passive scalar

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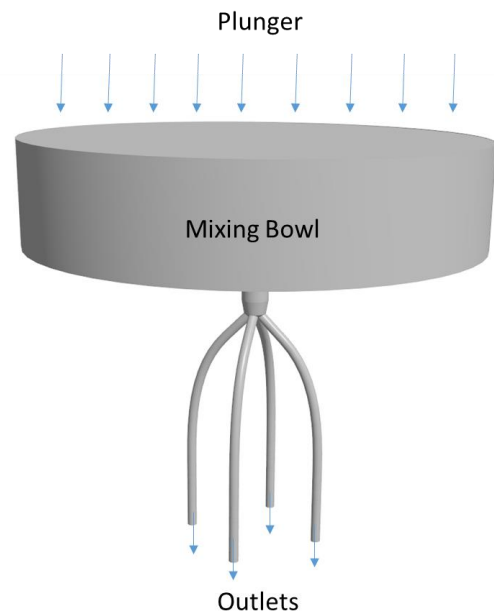
Clearances

Graph comparing larger blade clearances

Passive scalar plot

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Mixing Bowl Decanting
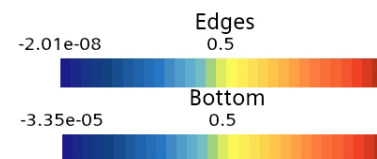
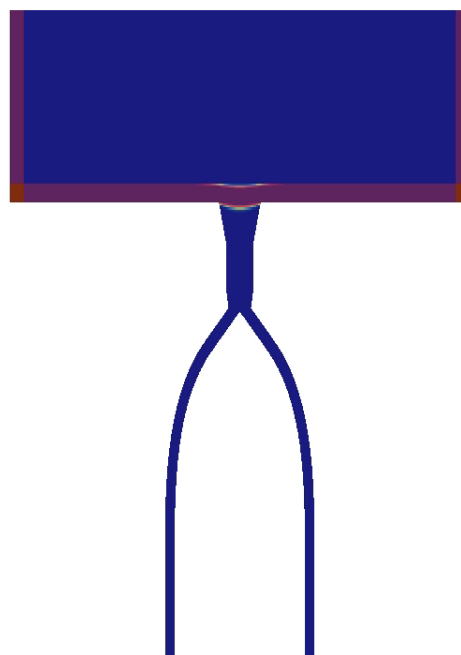- Track material as the bowl empties
- Uses passive scalars to track flow

Plunger

Mixing Bowl

Outlets

Simcenter STAR-CCM+
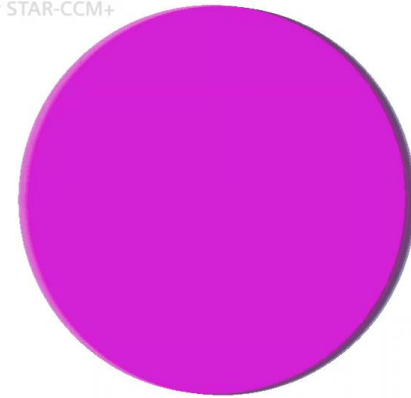
Solution Time 0.5 (s)

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Decanting output video

Simcenter STAR-CCM+

Edges
-2.01e-08   0.5   1

Bottom
-3.35e-05   0.5   1

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Thank you. Any questions?

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