
BIONIC
SURFACE
TECHNOLOGIES
World
Leading
Riblet Expert

bionic surface technologies

We are a globally active company, based in Austria. Our focus lies in developing engineering solutions. A company-owned HPC system with 1026 cores including a comprehensive license pool is supporting our customers.

2009
Founded

20+
Employees

Biggest CFD
Office in Austria

600+
Customers/Projects worldwide

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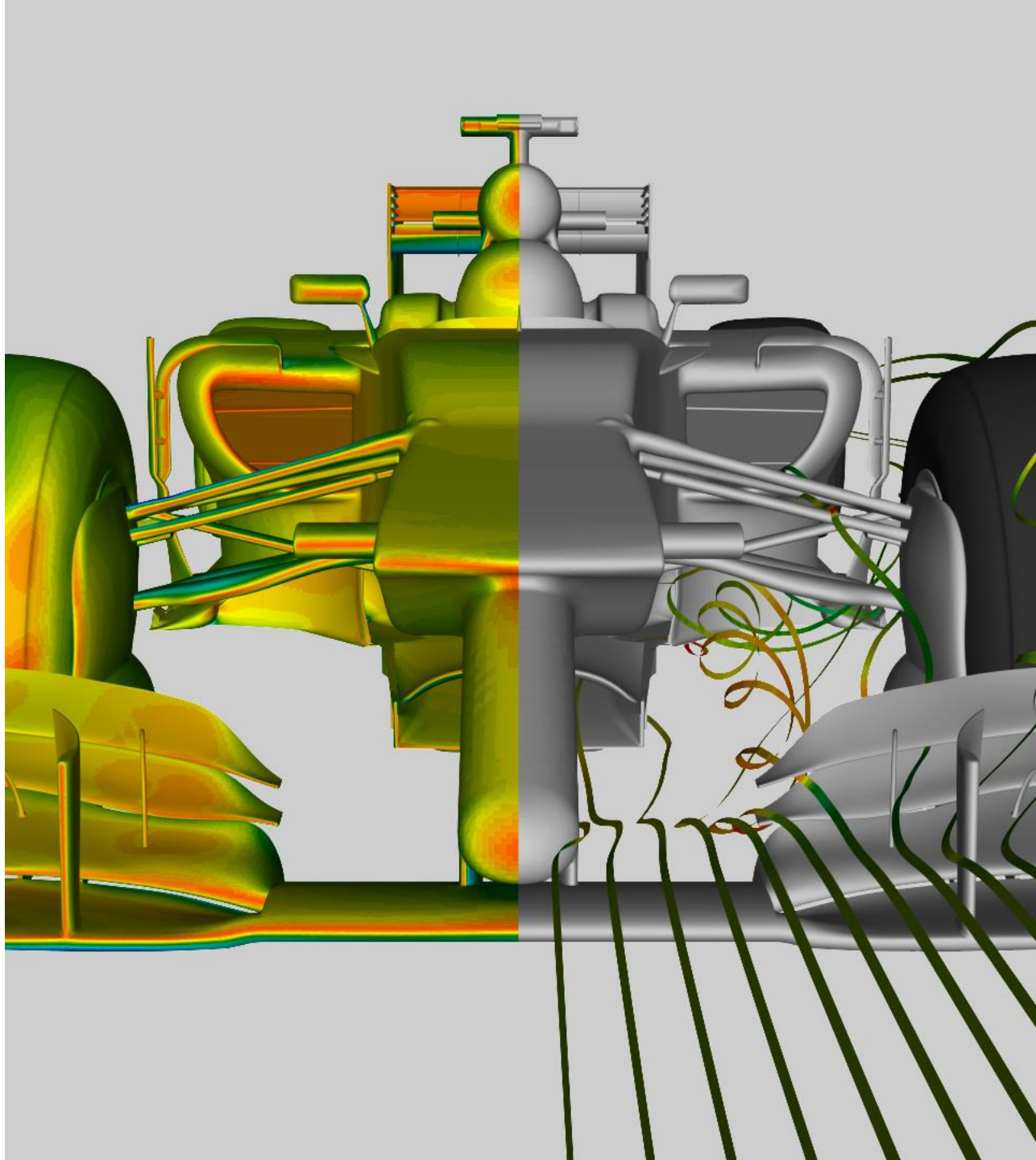
Multiphysics Modeling



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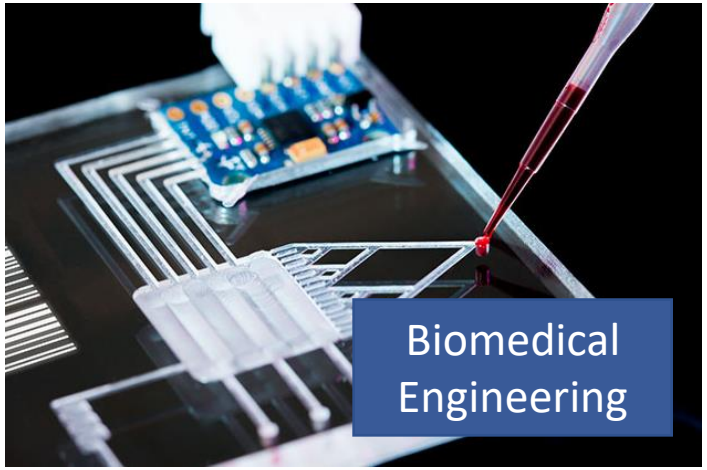
Areas of special focus

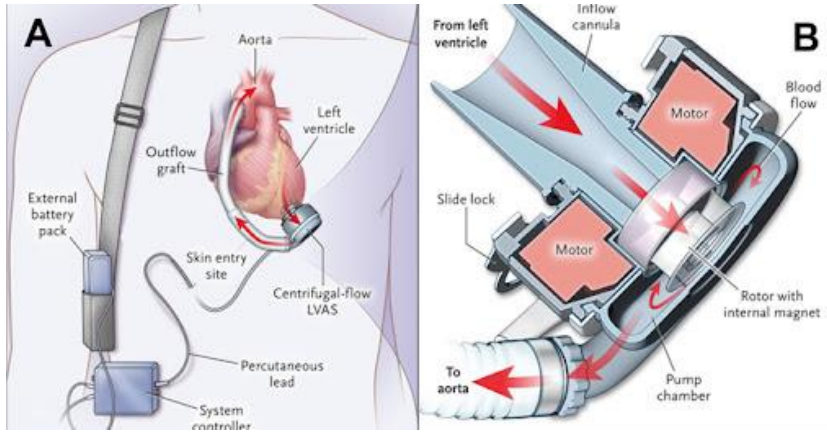


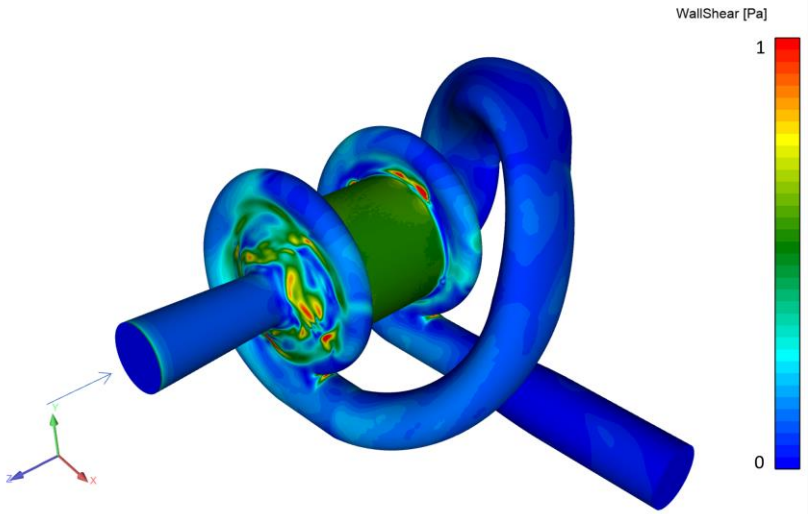
Process Engineering

Biomedical Engineering

Blood pump

- Laminar – turbulent flow
- newtonian vs. non Newtonian
- Fahraeus-Lindqvist effect: Newtonian near-wall behavior of blood
- 3D CFD simulations, validation and hydrodynamic optimization of micro/nano functionalization





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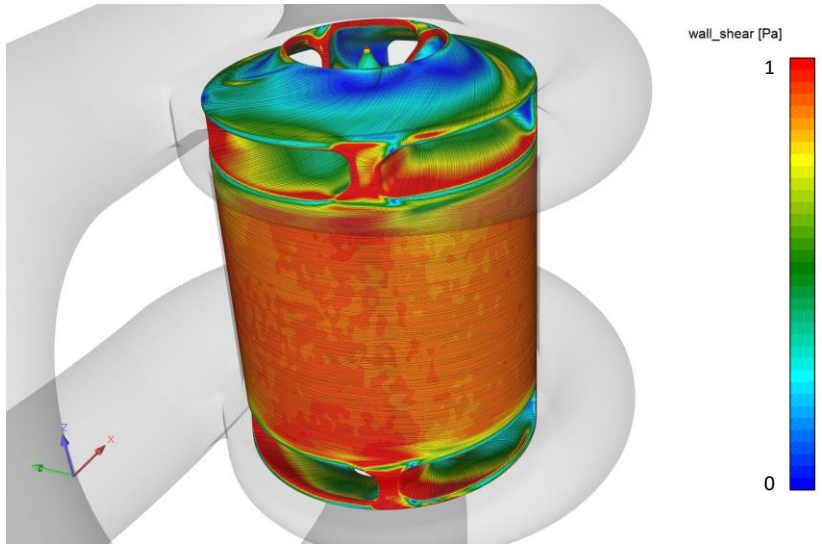
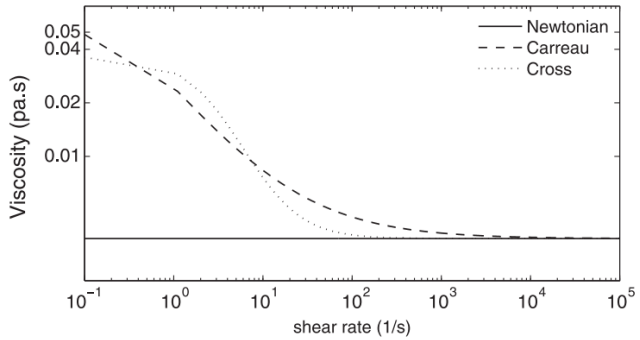


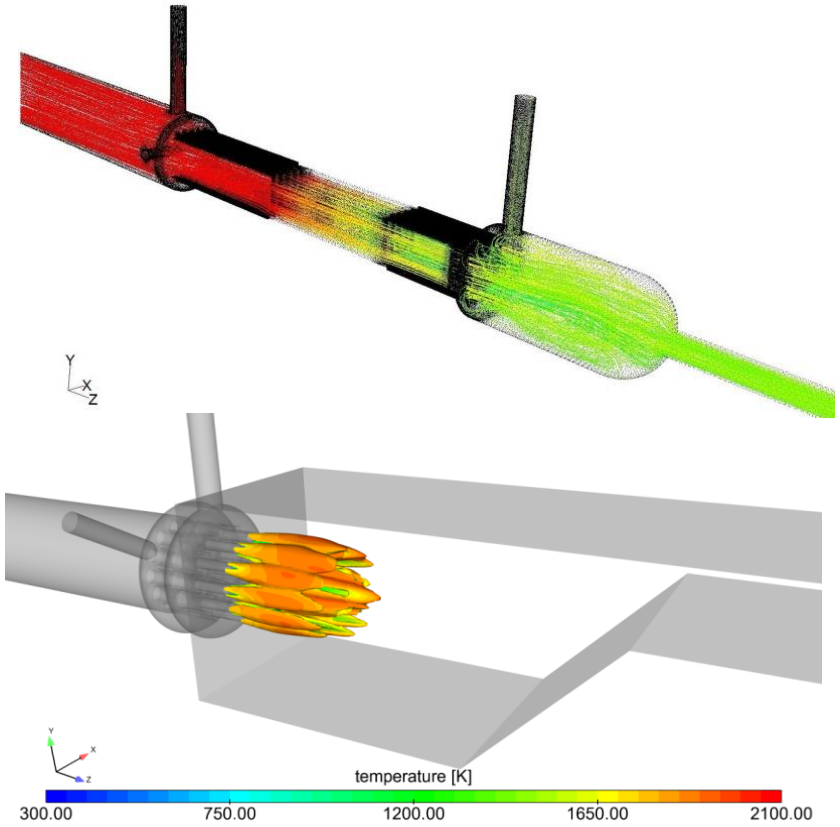


Viscosity of blood for Newtonian and non-Newtonian models versus strain rate.

Catalytic Processes – Reaction models

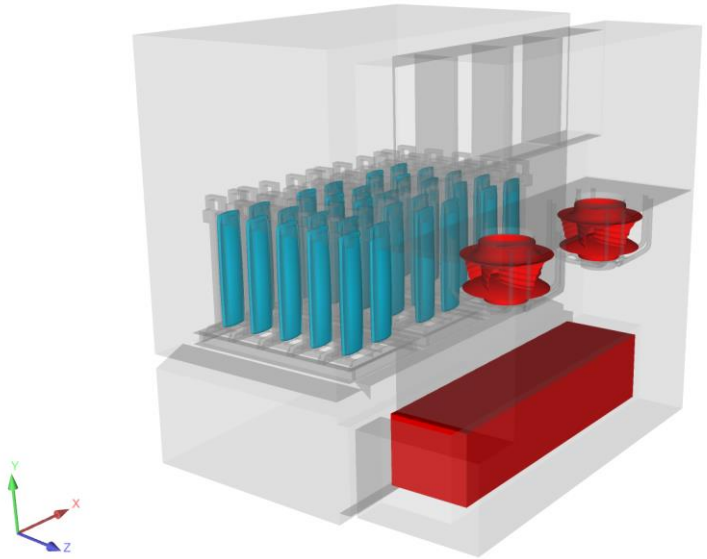
- Build up of digtal twin models
- Chemical reactions
- Thermodynamic
- Heat Transfer, Radiation& Conduction
- Fluid Flow

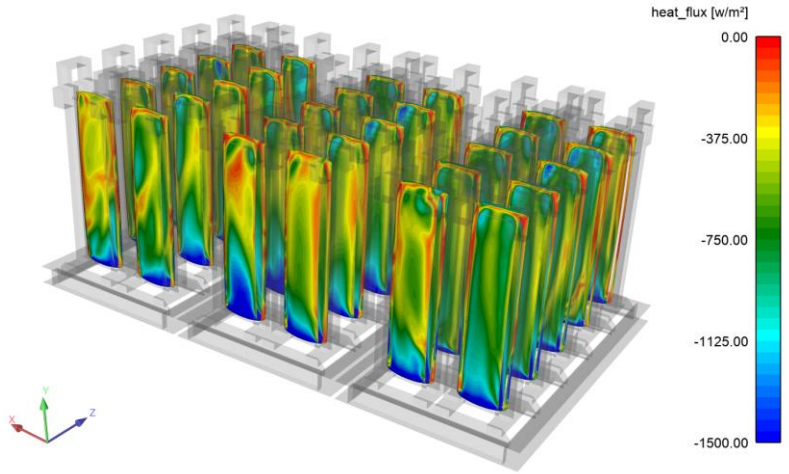
```
! 12/8/08 CVN removed Ar, C3H8, C3H7
!
! GRI-Mech Version 3.0 7/30/99  CHEMKIN format
! See README30 file at anonymous FTP site unix.sri.com, directory gri;
! WorldWideWeb home page http://www.me.berkeley.edu/gri_mech/ or
! through http://www.gri.org , under 'Basic  Research',
! for additional information, contacts, and disclaimer
ELEMENTS
O  H  C  N
END
SPECIES
H2      H       O       O2      OH      H2O     HO2     H2O2
C       CH      CH2     CH2(S)  CH3     CH4     CO      CO2
HCO     CH2O    CH2OH   CH3O    CH3OH   C2H     C2H2    C2H3
C2H4    C2H5    C2H6    HCCO    CH2CO   HCCOH   N       NH
NH2     NH3     NNH     NO      NO2     N2O     HNO     CN
HCN     H2CN    HCNN    HCNO    HOCN    HNCO    NCO
!AR      C3H7    C3H8
CH2CHO  CH3CHO N2
END
!THERMO
! Insert GRI-Mech thermodynamics here or use in default file
!END
REACTIONS
2O+M<=>O2+M                               1.200E+17   -1.000        .00
H2/ 2.40/ H2O/15.40/ CH4/ 2.00/ CO/ 1.75/ CO2/ 3.60/ C2H6/ 3.00/ !AR/  .83/
O+H+M<=>OH+M                              5.000E+17   -1.000        .00
H2/2.00/ H2O/6.00/ CH4/2.00/ CO/1.50/ CO2/2.00/ C2H6/3.00/ !AR/ .70/
O+H2<=>H+OH                               3.870E+04    2.700    6260.00
```



Defrosting equipment

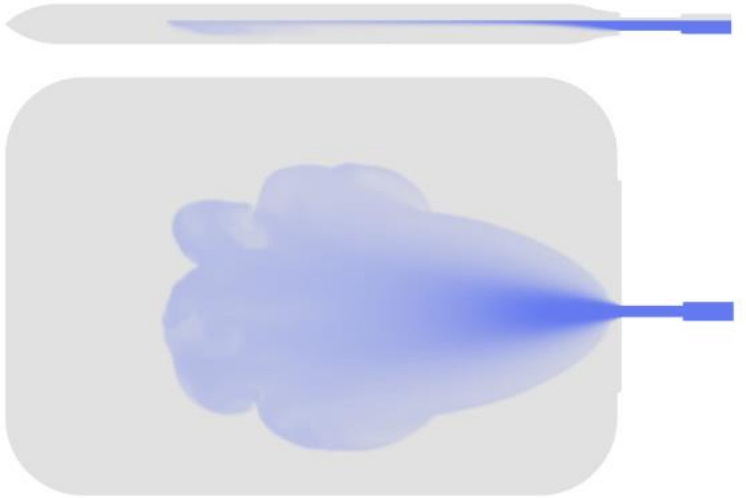
- Ice melting, Shaking of bags
- CHT Simulation
- 3D CFD simulations, validation and hydrodynamic optimization of micro/nano functionalization





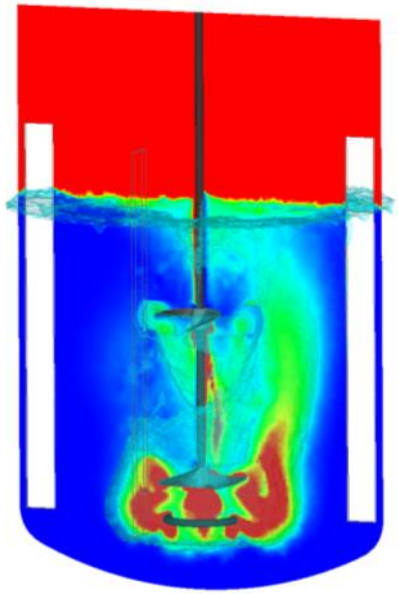
Orbital shaker

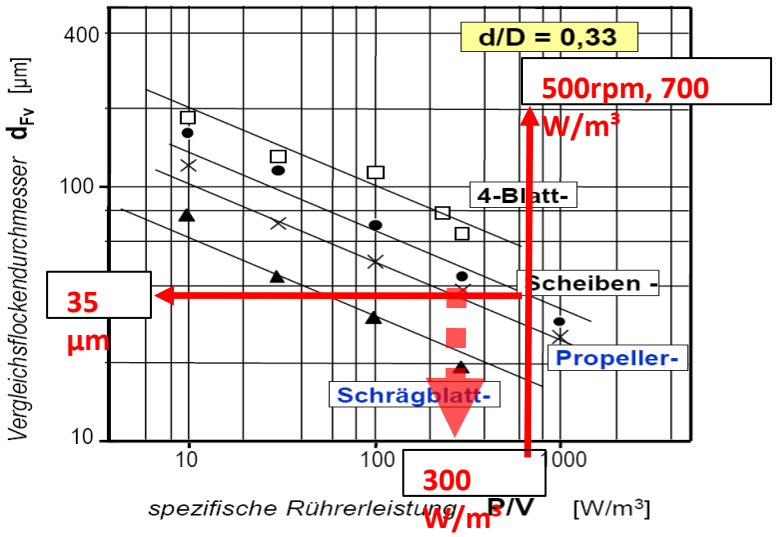
- Multiphase Modell
- Shaking process
- Mixing behavior, Diffusion process

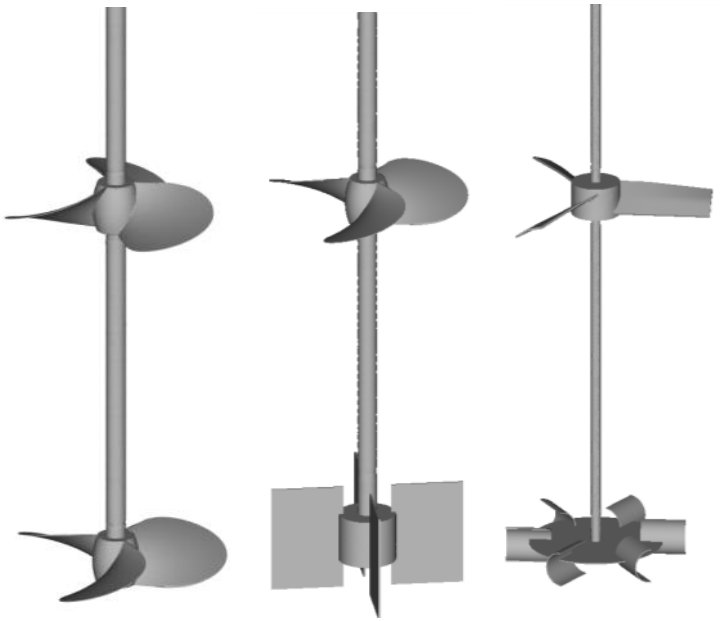


Fermenter analysis

- Multiphase Modell
- Mixing behavior
- Up- Downscaling behavior

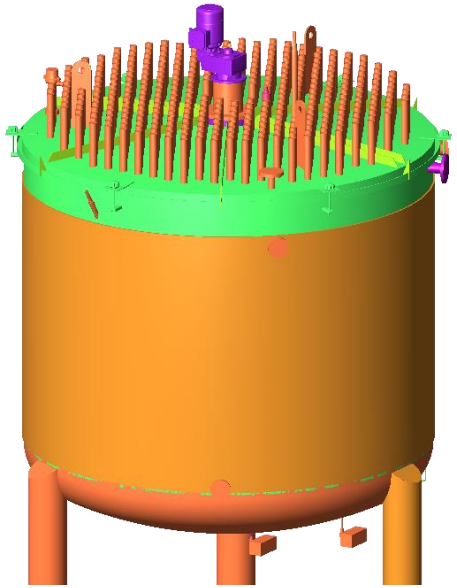


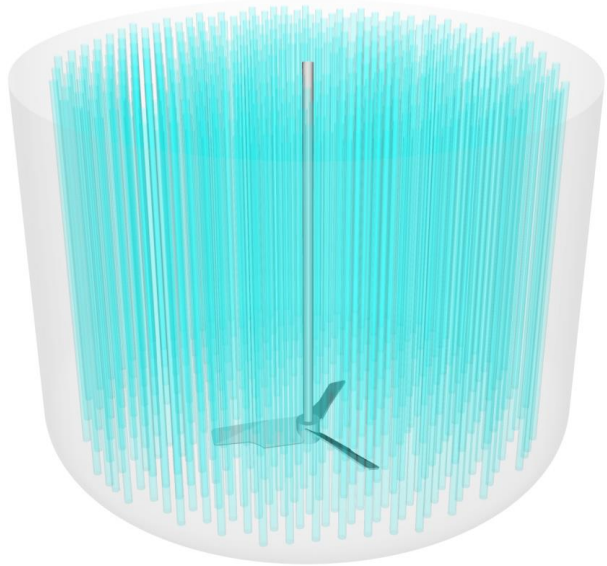


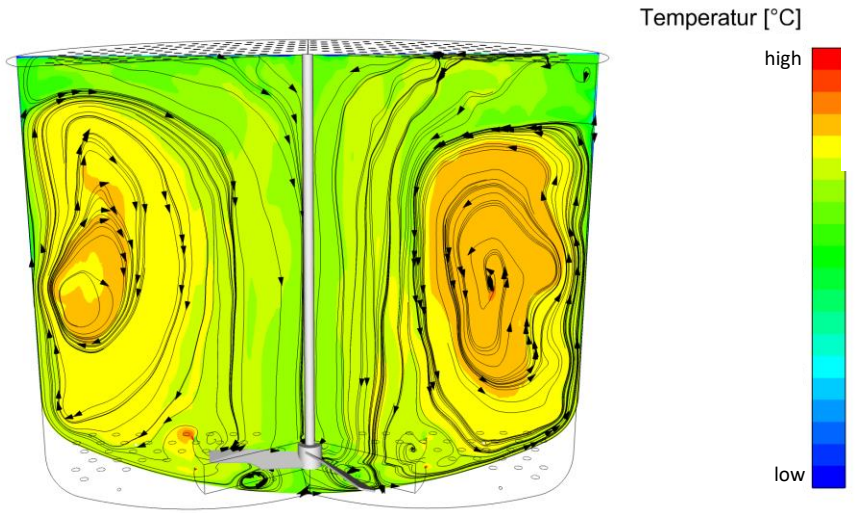


Agitator vessel

- Heat sources and sinks
- Mixing behavior
- Up- Downscaling behavior
- Shear rates

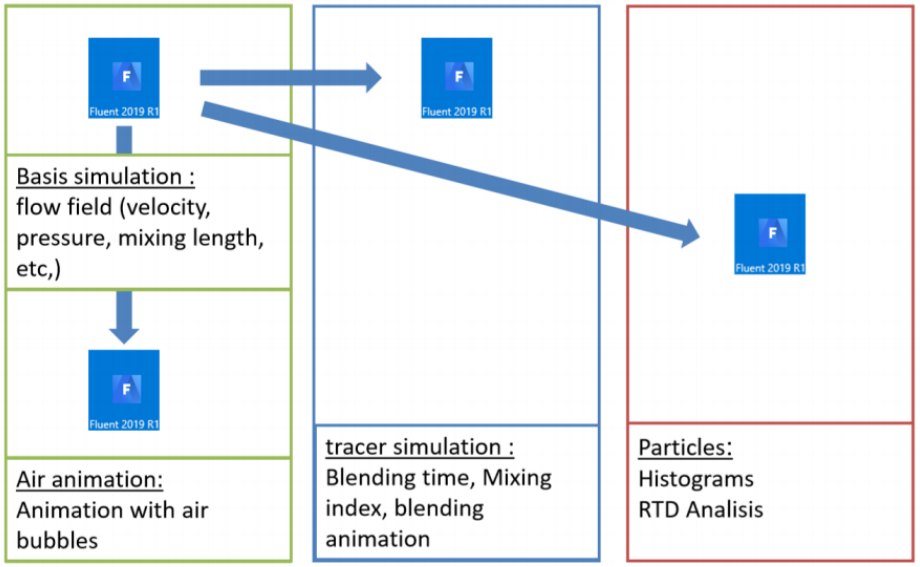


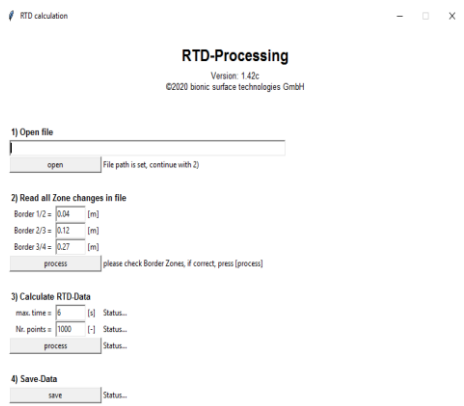


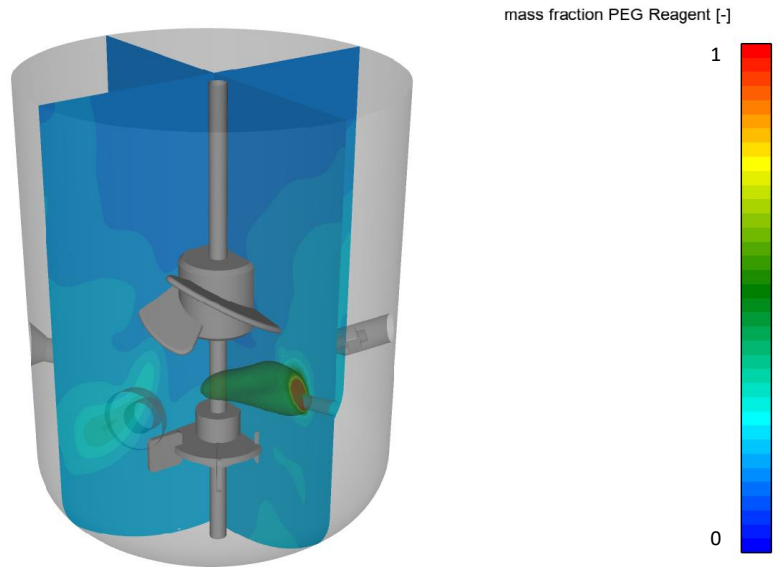


Bioreactor modeling

- Developing of new designs
- Troubleshooting
- Redesign
- Product development
- Evaluation tools with Modeling
- Software development (Particle residence time distribution)







Bioreactor modeling

- Developing of new designs
- Troubleshooting
- Redesign
- Product development
- Evaluation tools with Modeling

Numbers
Tip speed
Re Number
Torque
Power
Power Number
Froud Number
Total Power
Power/Volume
Average Strain Rate
Av Eddy Dissipation Rate
Av Kolmogorov Mixing Length
Av Micromixing Timescale
Av meso mixing Timescale

Air water
Water surface
Animation bubbles

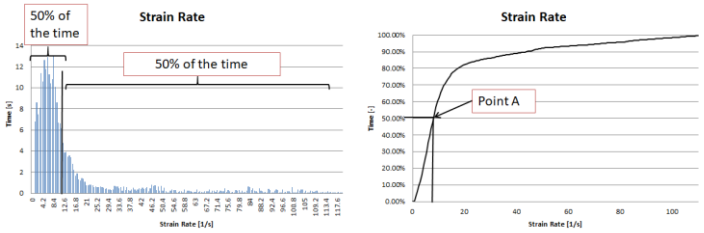
Cell number increase
viscosity change
densitiy change

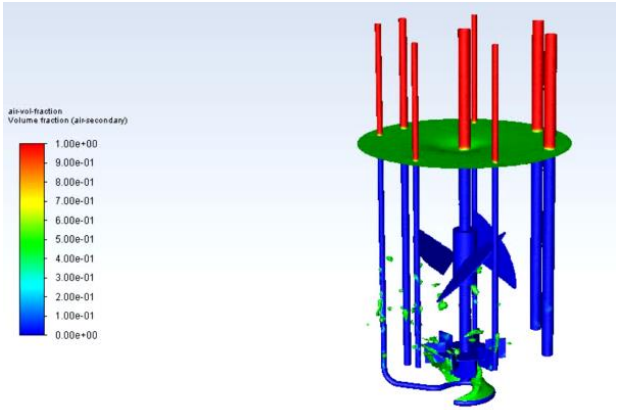
Contours
Velocity
Pressure
Hydrostatic Pressure
Velocity vectors
Meso mixing time
Micro mixing time
Strain rate
Turb eddy disipation
Kolmogorov mixing length

Histogramms
Mixing index vs time
Strain rate histogram
Kolmogorov mixing length histogram
Turb dissip hrate histogram
Dimensionless Z coord histogram
Zonal RTD histogram

Diagrams
Av Vel convergence
Av Moment convergence
Blending time monitors

Animation
tracer blending

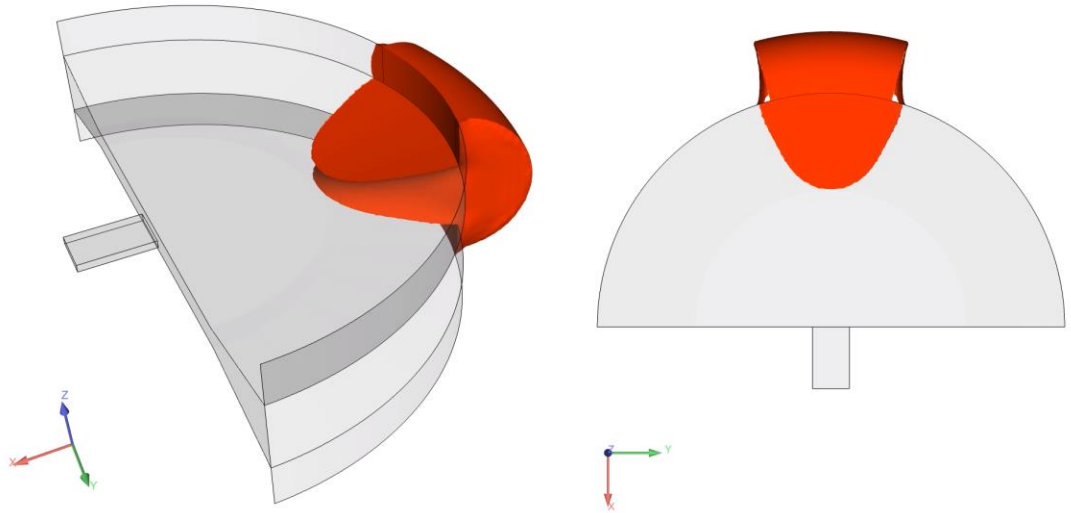




Microfluidic - Passive flow

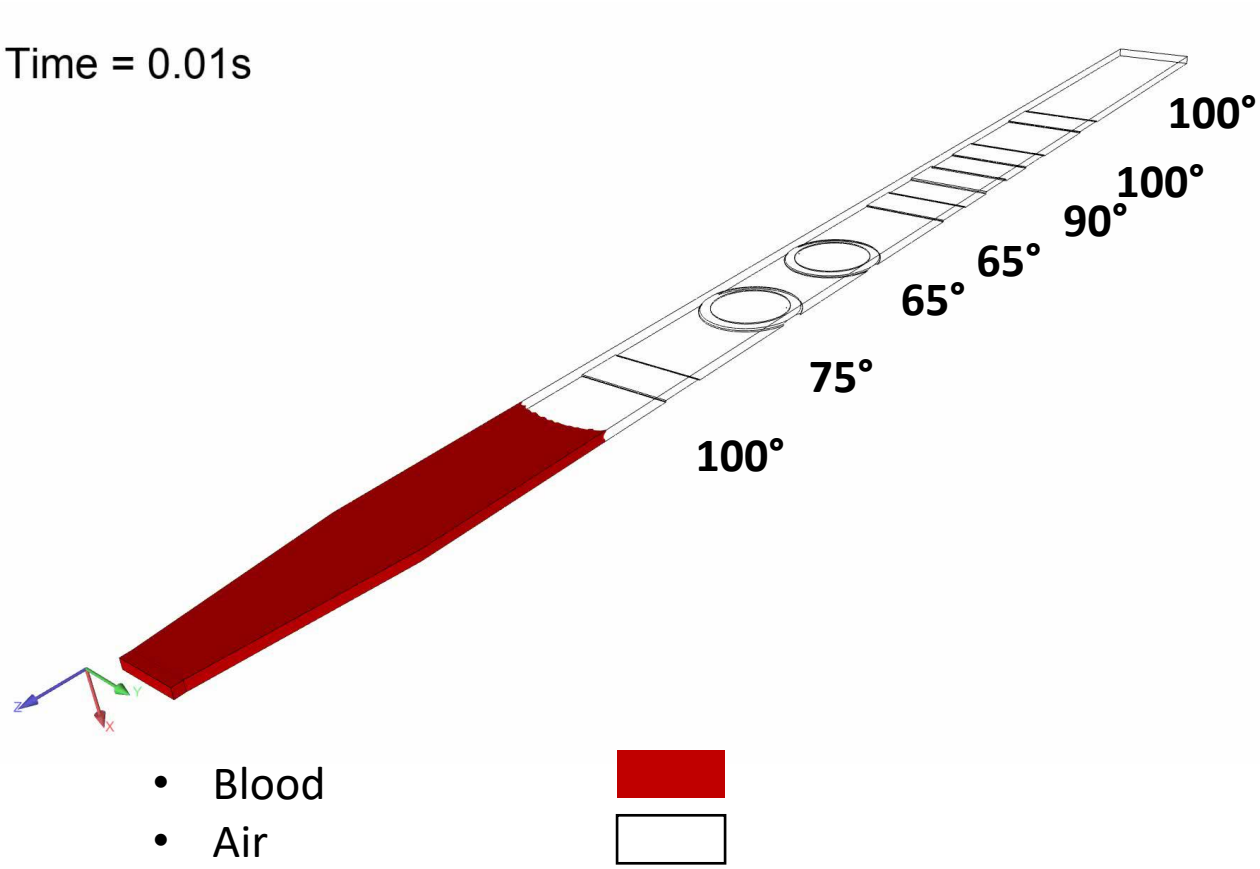
- Capillary driven
- Is the meniscus moving?
- Is the test sample uptaken?
- Implementation of stop valves, crossings possible
- Mixing of samples

Blood uptake for sensing device



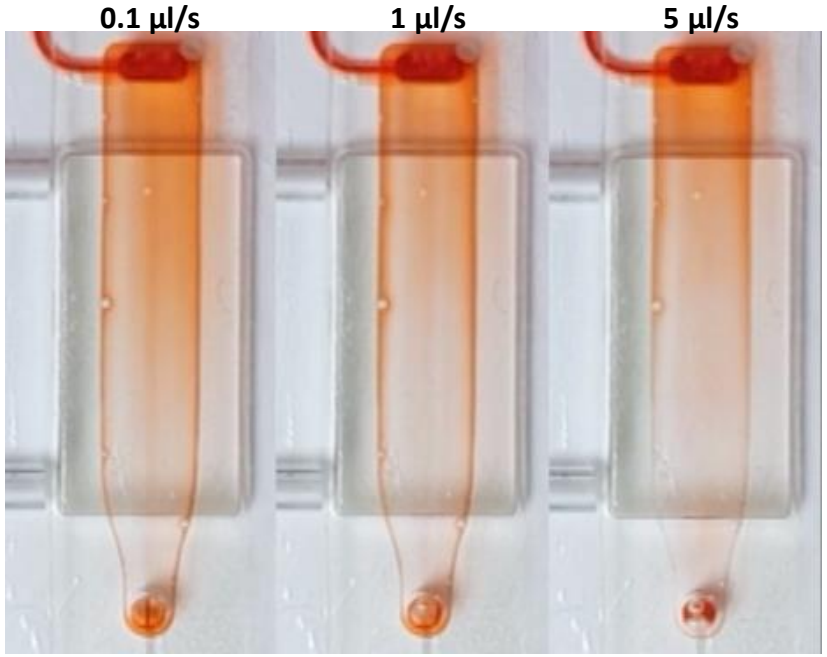
Microfluidic - Passive flow

- Capillary driven
- Is the meniscus moving?
- Is the test sample uptaken?
- Obstacles due to sensor areas



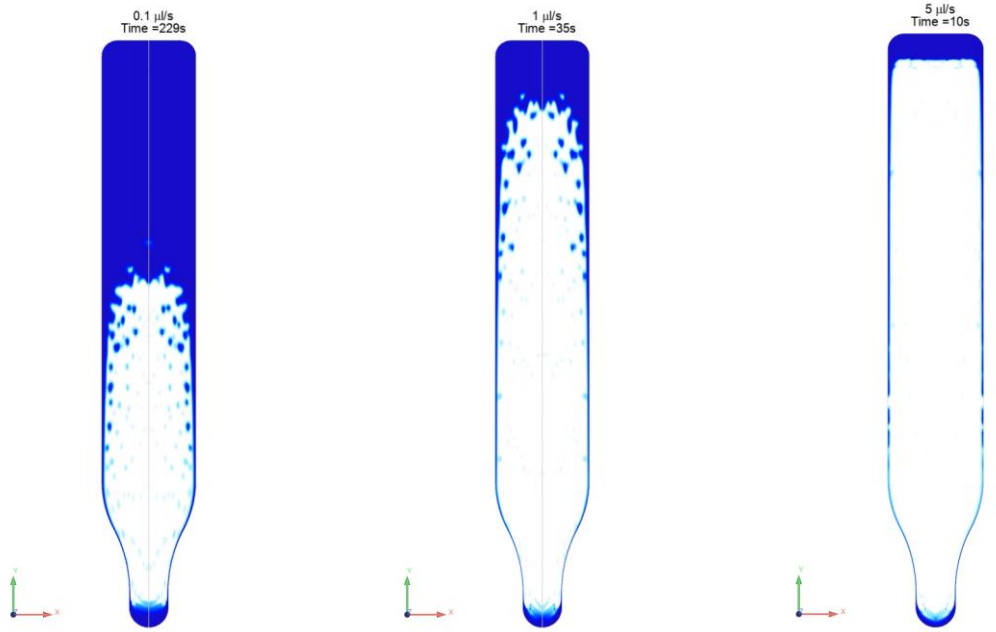
Microfluidic - Active flow - Rinsing

Testdesign 1



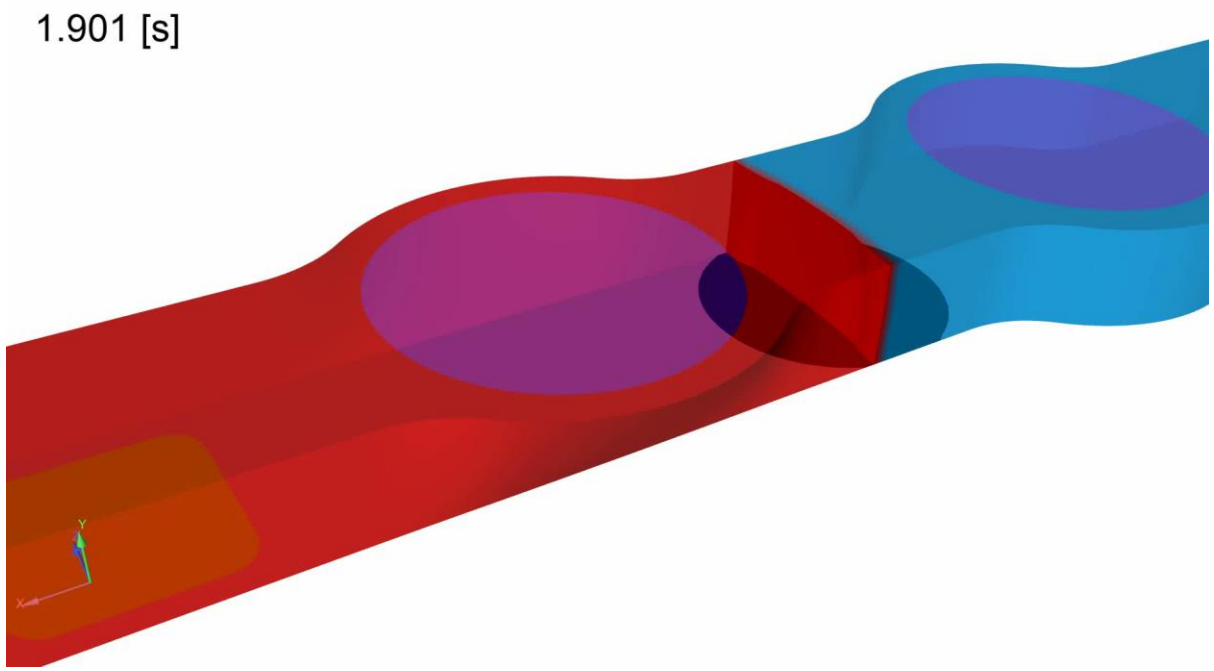
Simulation

- Water ink
- Water pure

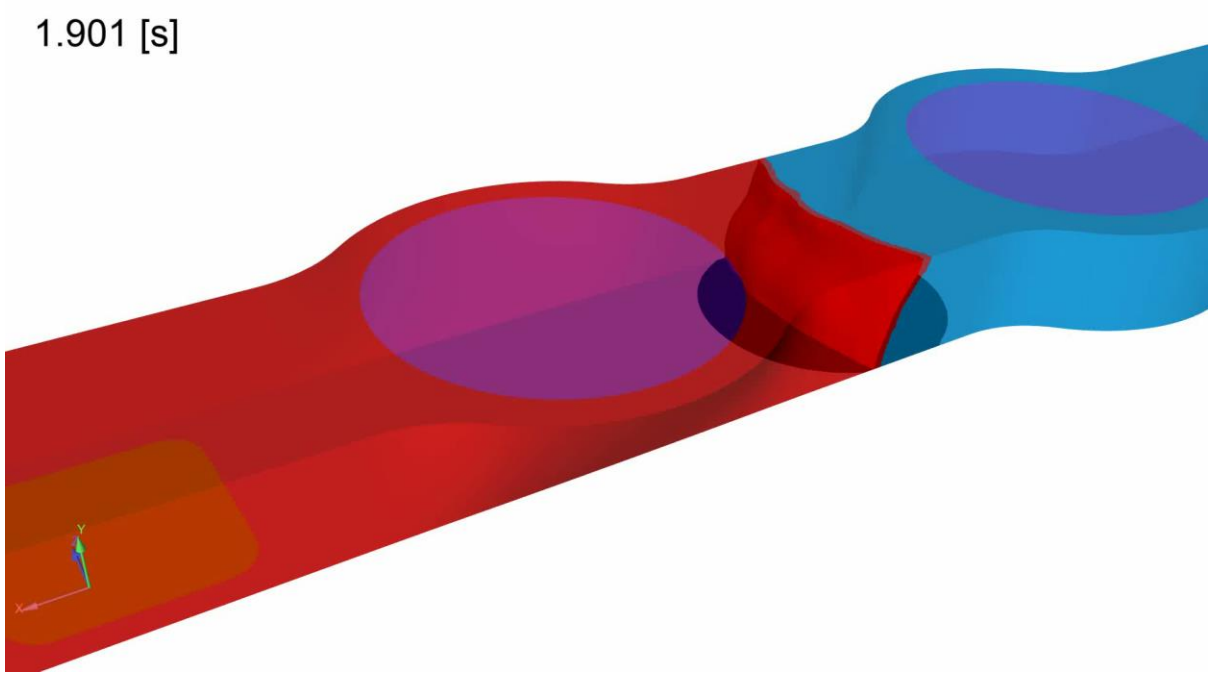


Microfluidic - Active flow - Emptying

- Static CA



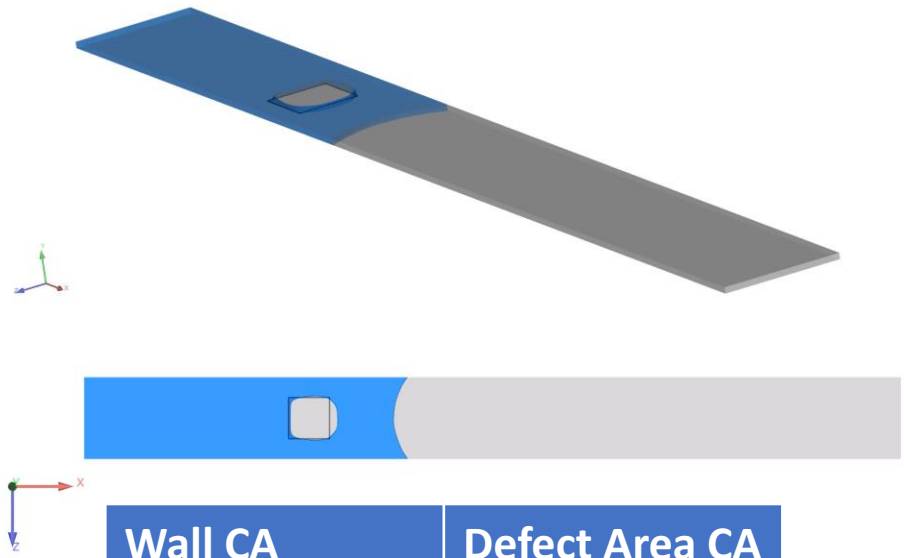
- Receding CA



Microfluidic - Bubble formation

Case A

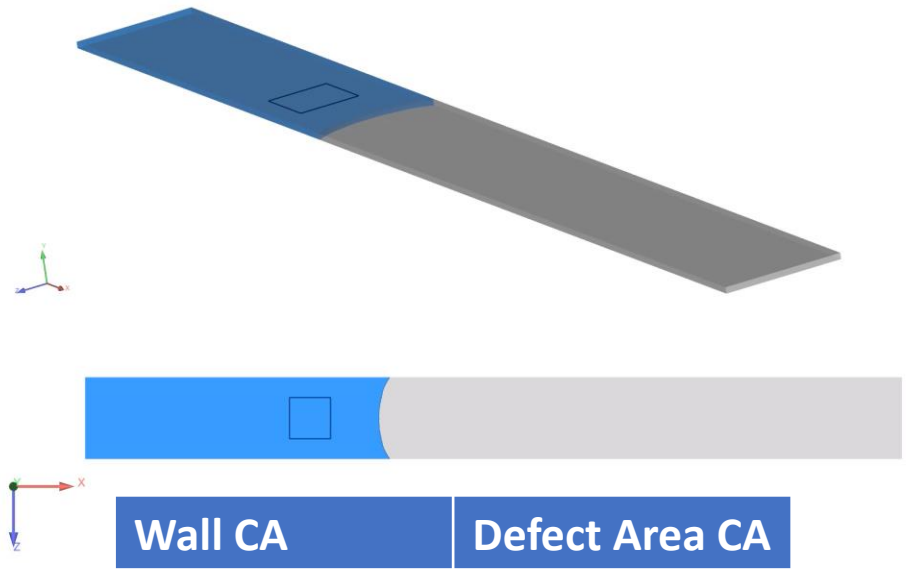
Bubble formation



Wall CA	Defect Area CA
55 deg	160 deg

Case B

No bubble formation

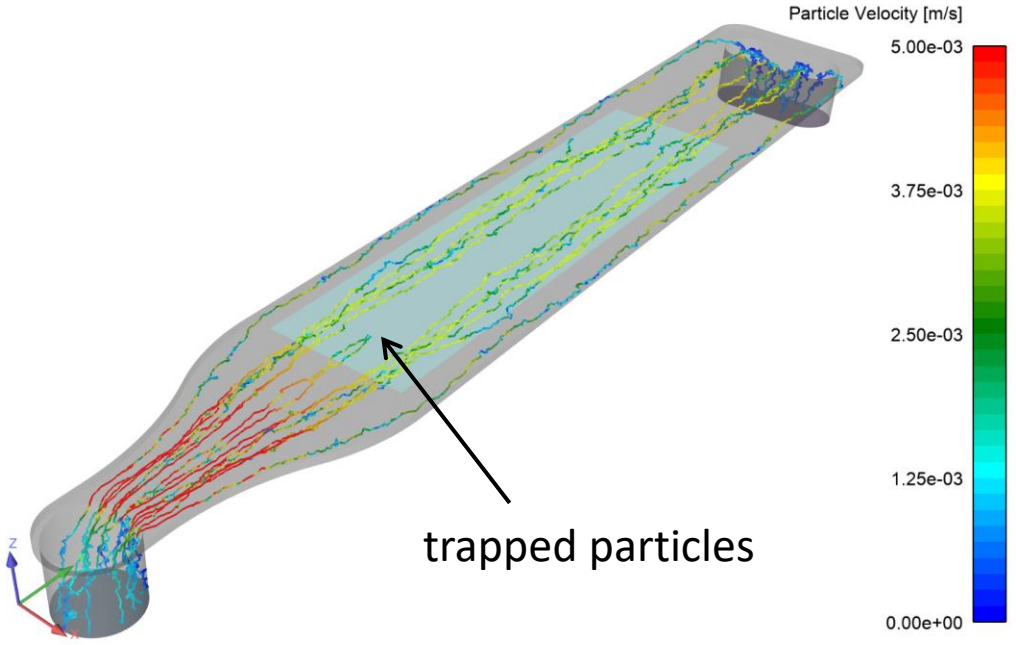


Wall CA	Defect Area CA
55 deg	80 deg

Microfluidic - Particle simulation

- **Particles**: equivalent diameter of D = 1000e-8 cm²/s
- 16 Particles injected :
  - 10 escaped
  - 6 trapped
- Brownian Motion can be seen in **fluctuating particle trajectories**

  → Amplitude = f(T)



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