

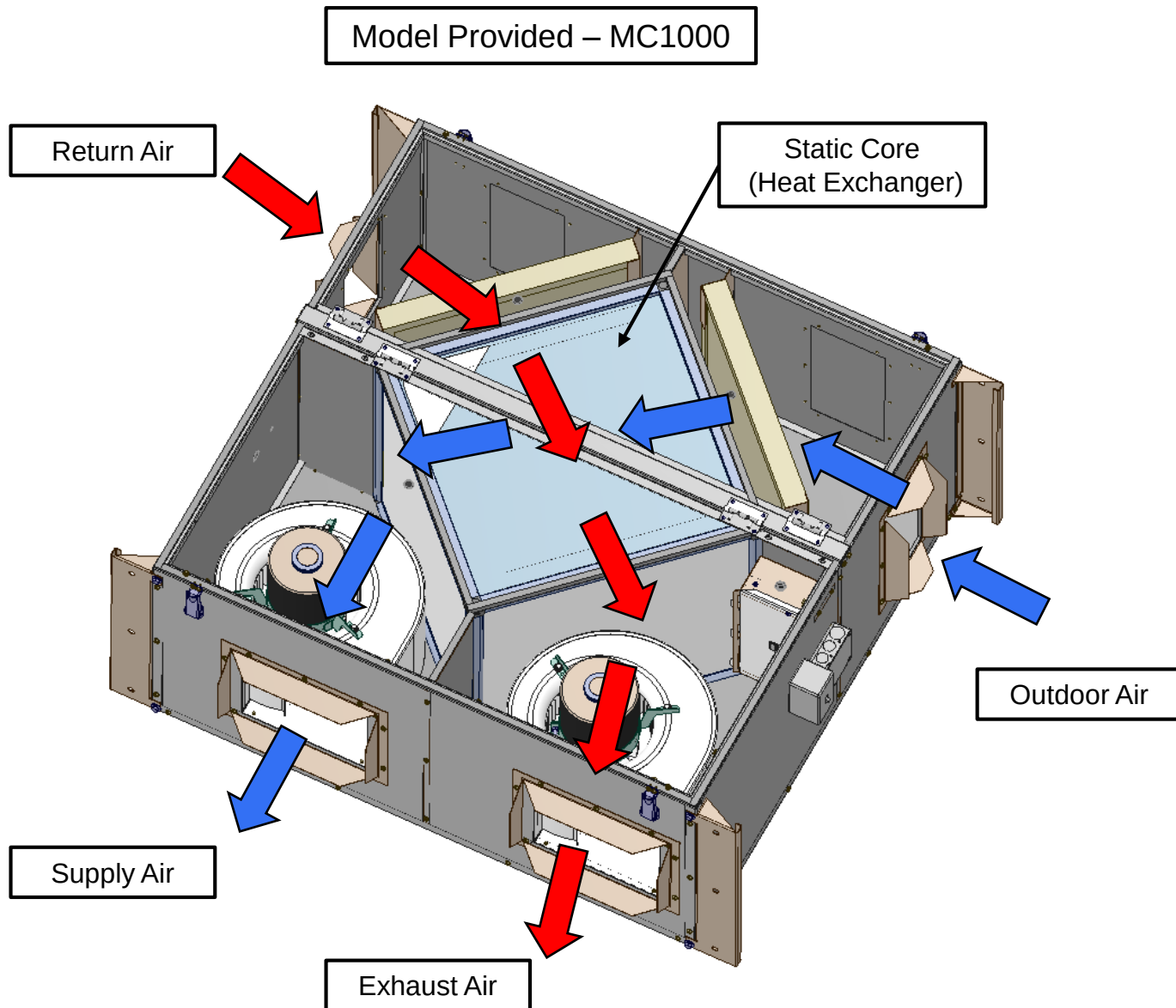
Objective and Scope - CFD

Objective:

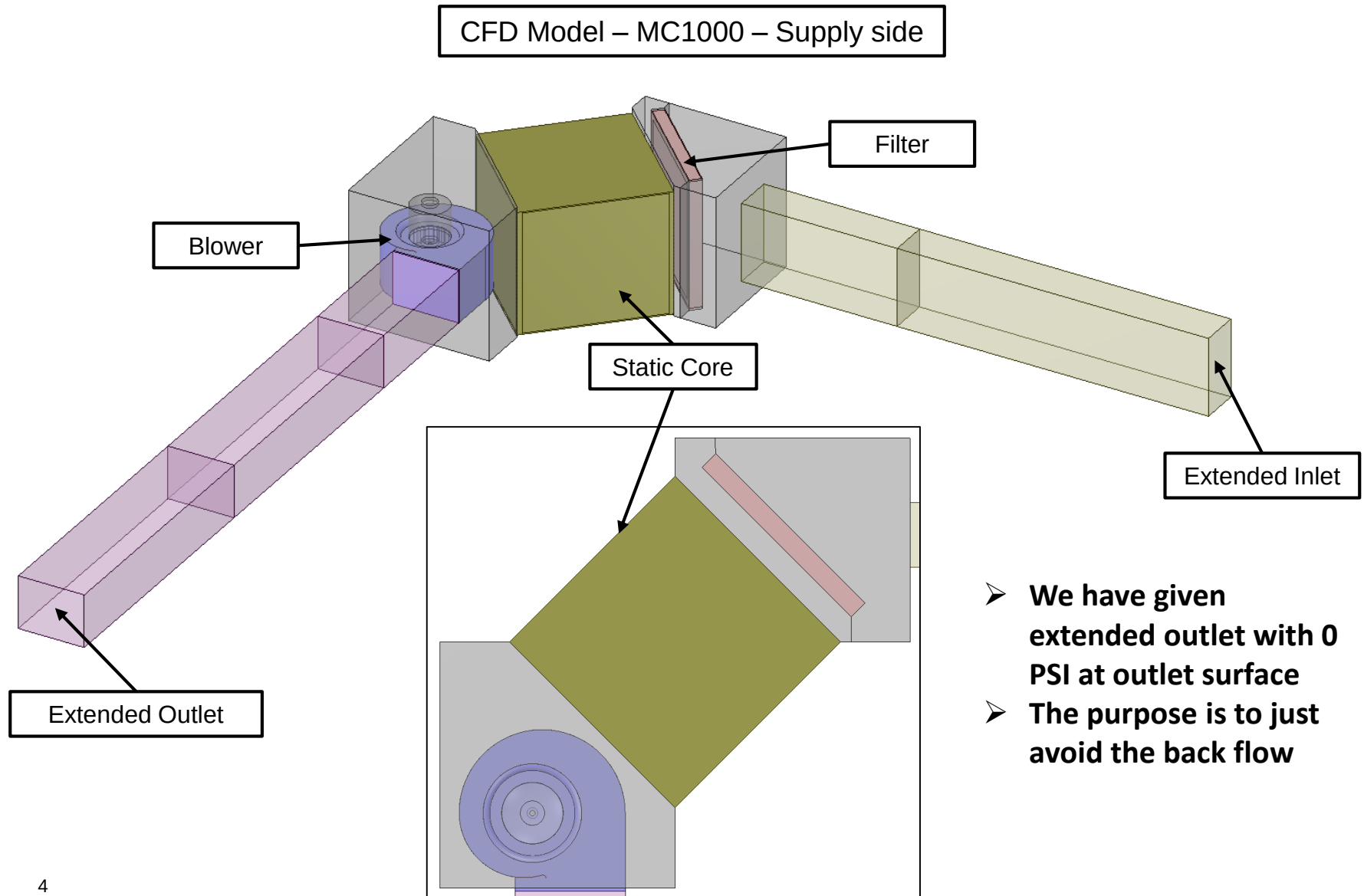
- Run the CFD analysis to check the Airflow performance and identify turbulence region if any inside MC1000 unit.

Scope:

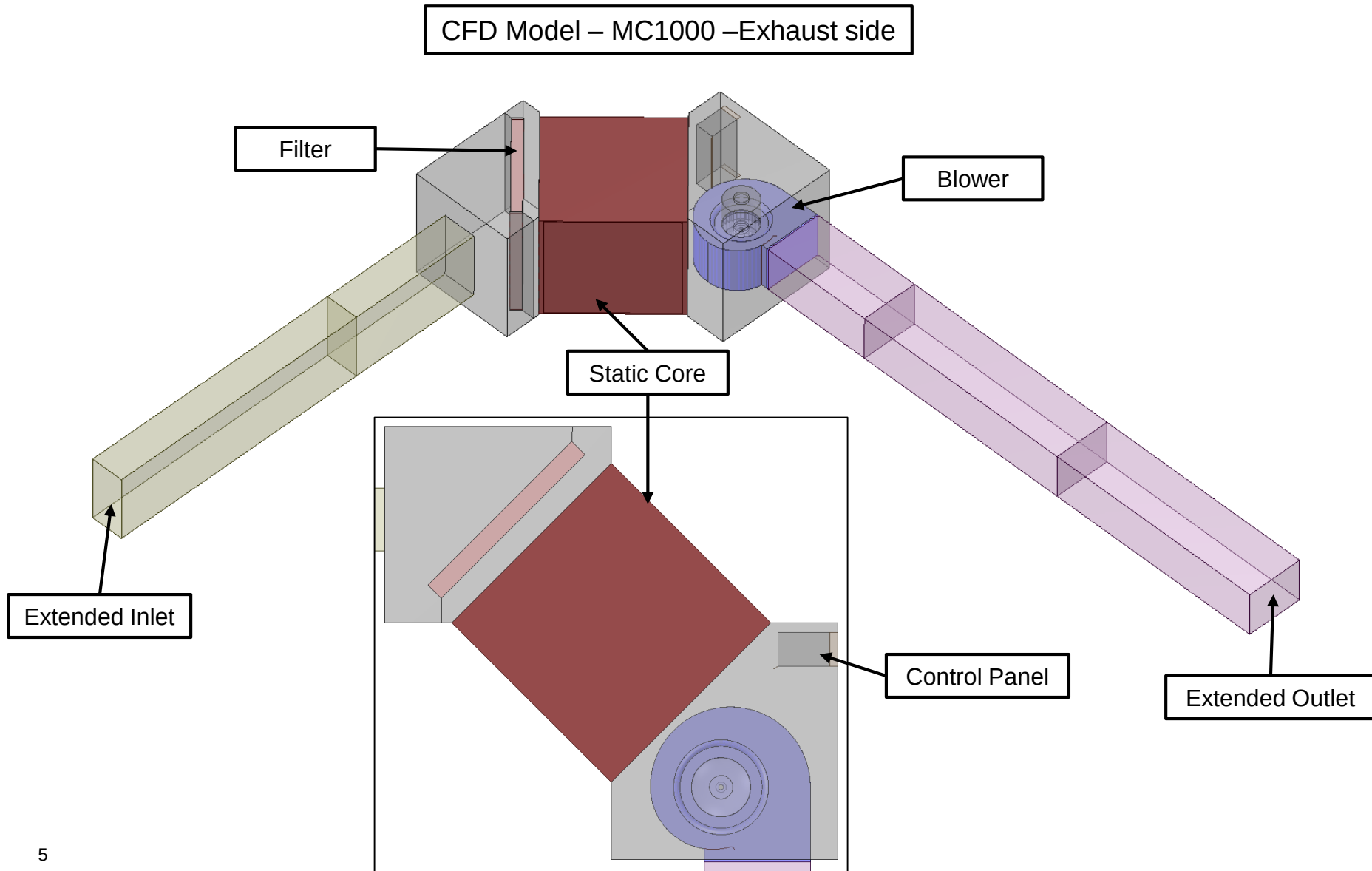
- To predict the Air Flow pattern inside the MC1000 unit



CFD Model – MC1000 – Supply side

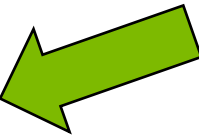
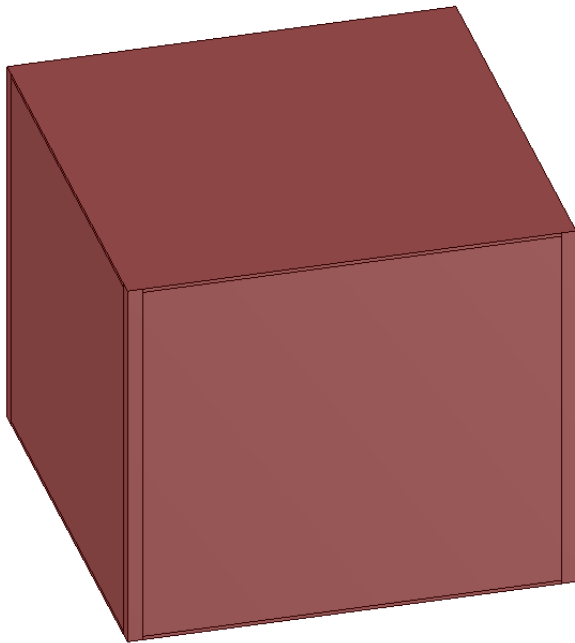


CFD Model – MC1000 – Return side



Modeling Details – Static Core

CFD Model – MC1000 – Supply side

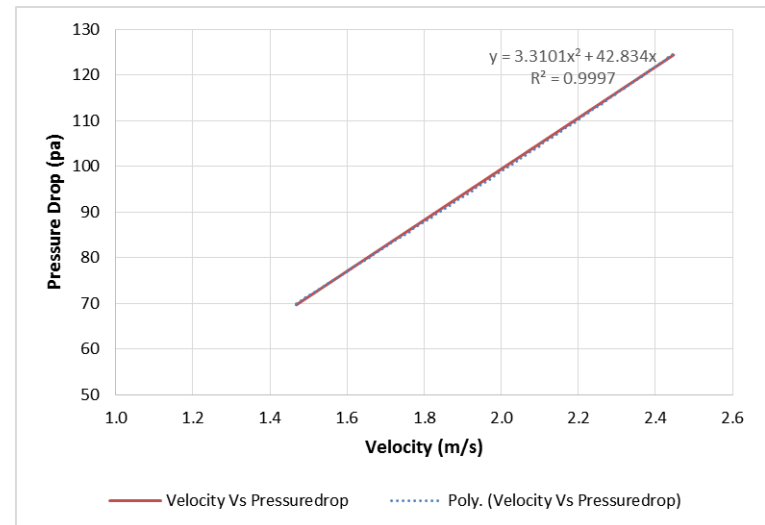


Airflow Direction

Static Core
(21.65" X 18.85" X 21.65")

Static core modelled as block
(porous media) in CFD

Static Pressure Drop Static core – MC1000	
Volume Flowrate (CFM)	Pressure Drop (In Wg)
750	0.28
1000	0.39
1250	0.5

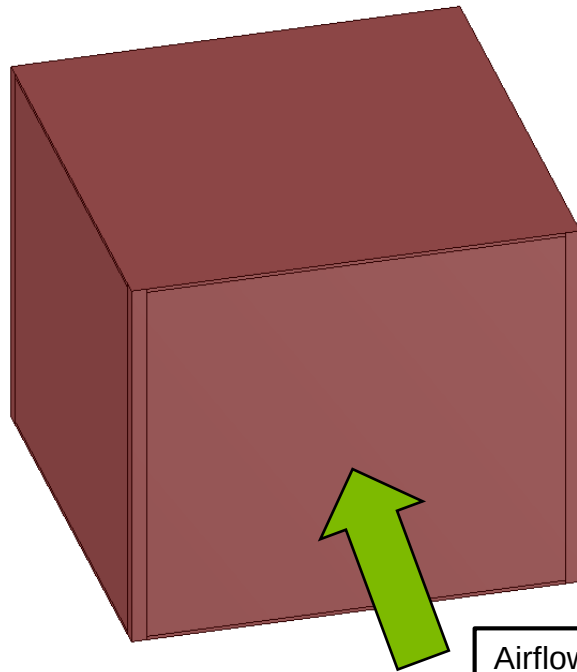


Y – Pressure Drop (pa)

X – Velocity (m/s)

Modeling Details – Static Core

CFD Model – MC1000 – Exhaust side

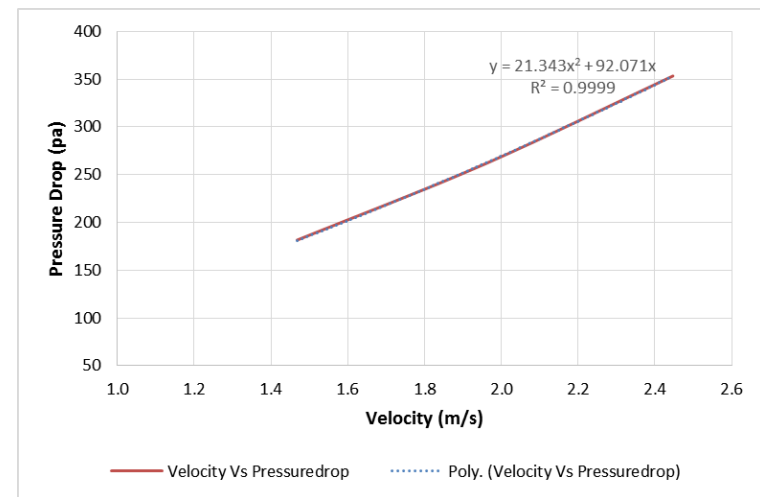


Airflow Direction

Static Core
(21.65" X 18.85" X 21.65")

Static core modelled as block
(porous media) in CFD

Static Pressure Drop Static core – MC1000	
Volume Flowrate (CFM)	Pressure Drop (In Wg)
750	0.73
1000	1.05
1250	1.42

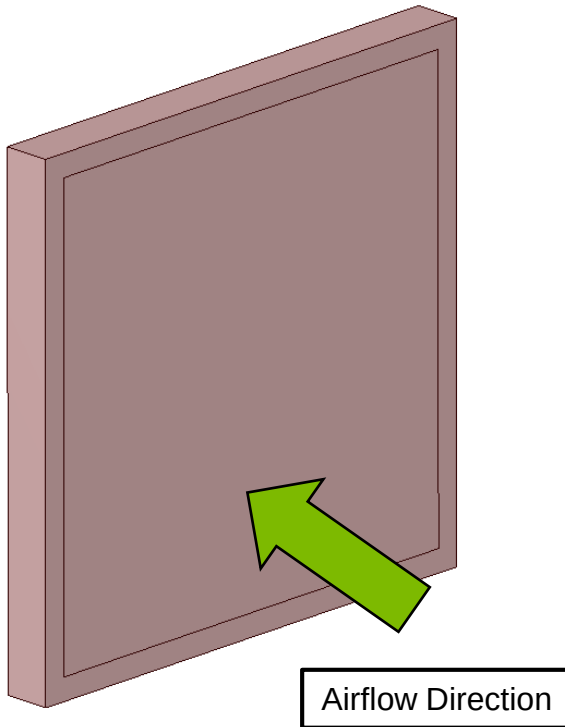


Y – Pressure Drop (pa)

X – Velocity (m/s)

Modeling Details – Filter

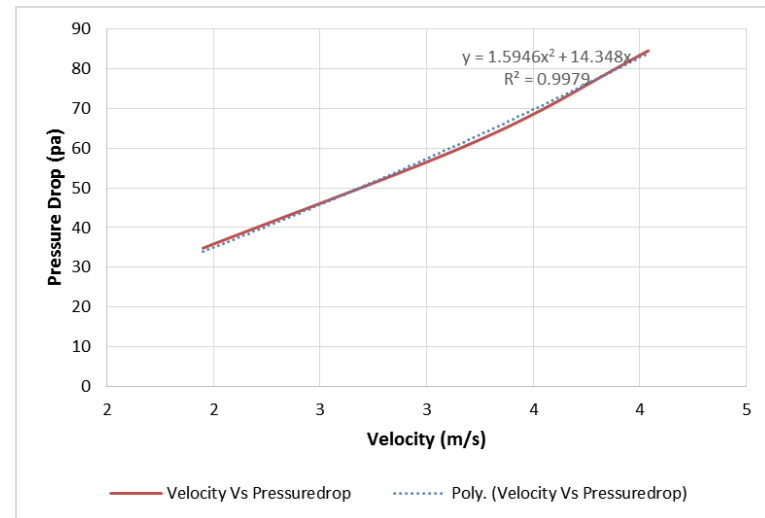
CFD Model – MC1000 – Filter



Filter
(19.5" X 19.5" X 1.785")

Filter modelled as block
(porous media) in CFD

Static Pressure Drop Filter – MC1000	
Volume Flowrate (CFM)	Pressure Drop (In Wg)
840	0.14
1400	0.25
1740	0.34



Y – Pressure Drop (pa)

X – Velocity (m/s)

Boundary Conditions

Boundary Conditions – MC1000

Boundary Conditions (Supply & Exhaust)	
Extended Inlets	Pressure Inlet (0 PSI)
Extended Outlets	Pressure Outlet (0 PSI)
Fan Blades	Moving Reference Frame (1800 RPM)
Filters	Porous Medium
Static Core	Porous Medium

- Fan blades rotation are modelled by the Moving Reference Frame (MRF) method.

CFD Results

- Pressure drop for MC1000 Filter and Static Core has been recorded in the table below

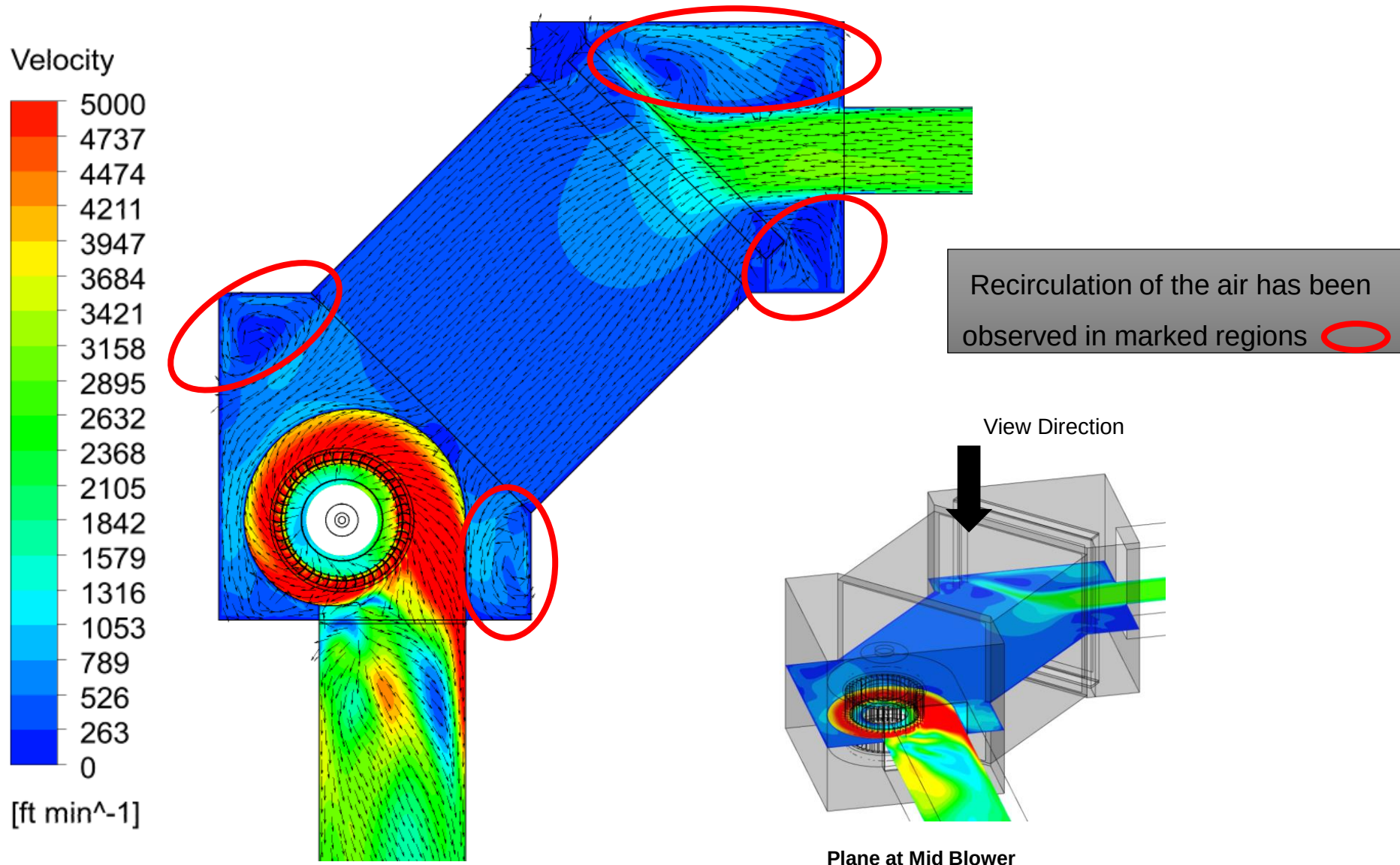
	Supply Air Unit	Exhaust Air Unit
Flowrate (CFM)	1335	1073

	Supply Air Unit Δ Ps (in.w.g.)	Exhaust Air Unit Δ Ps (in.w.g.)
Filter	0.209	0.128
Static Core	0.420	0.714

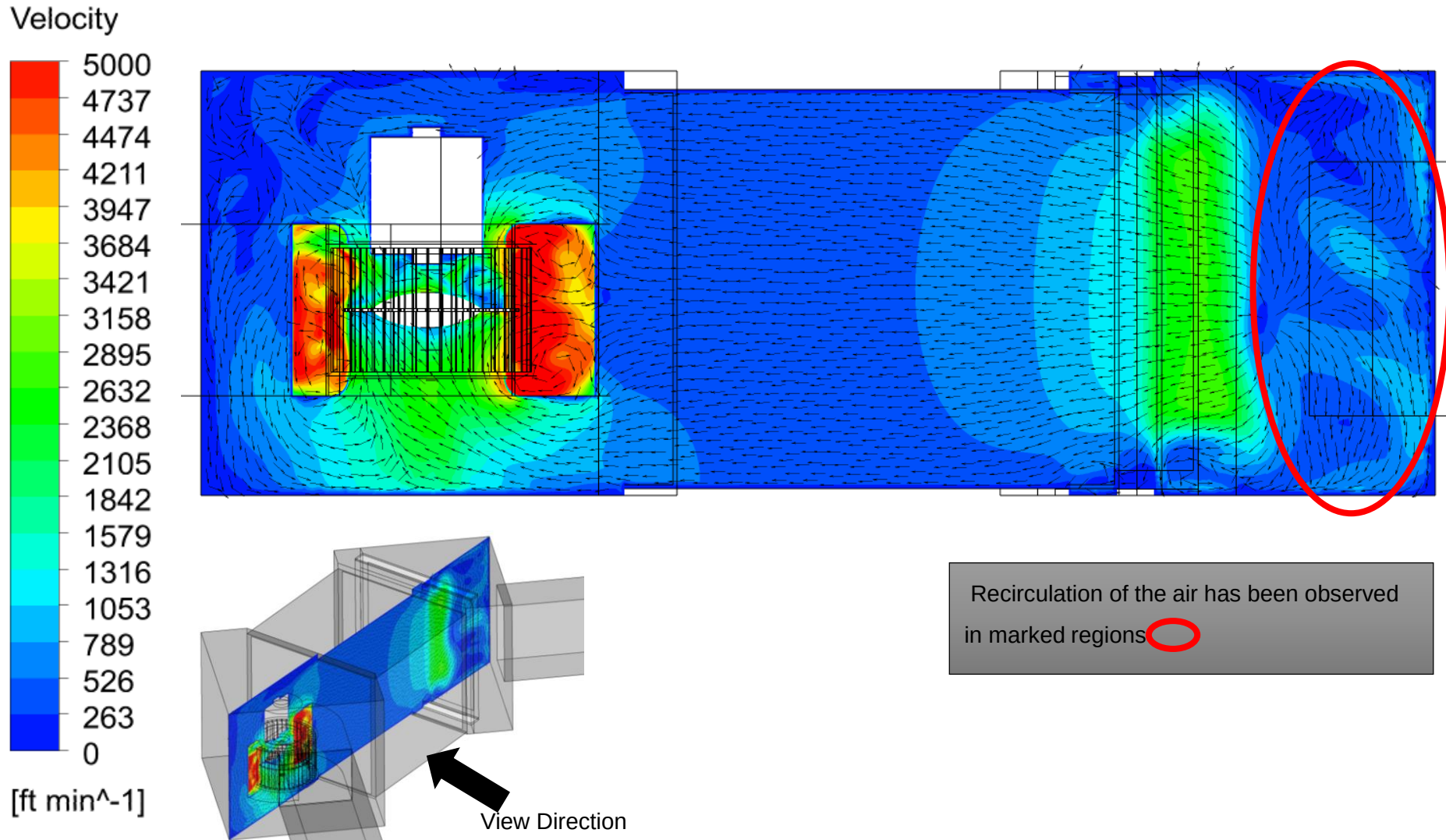


CFD Results – MC1000 Supply Side

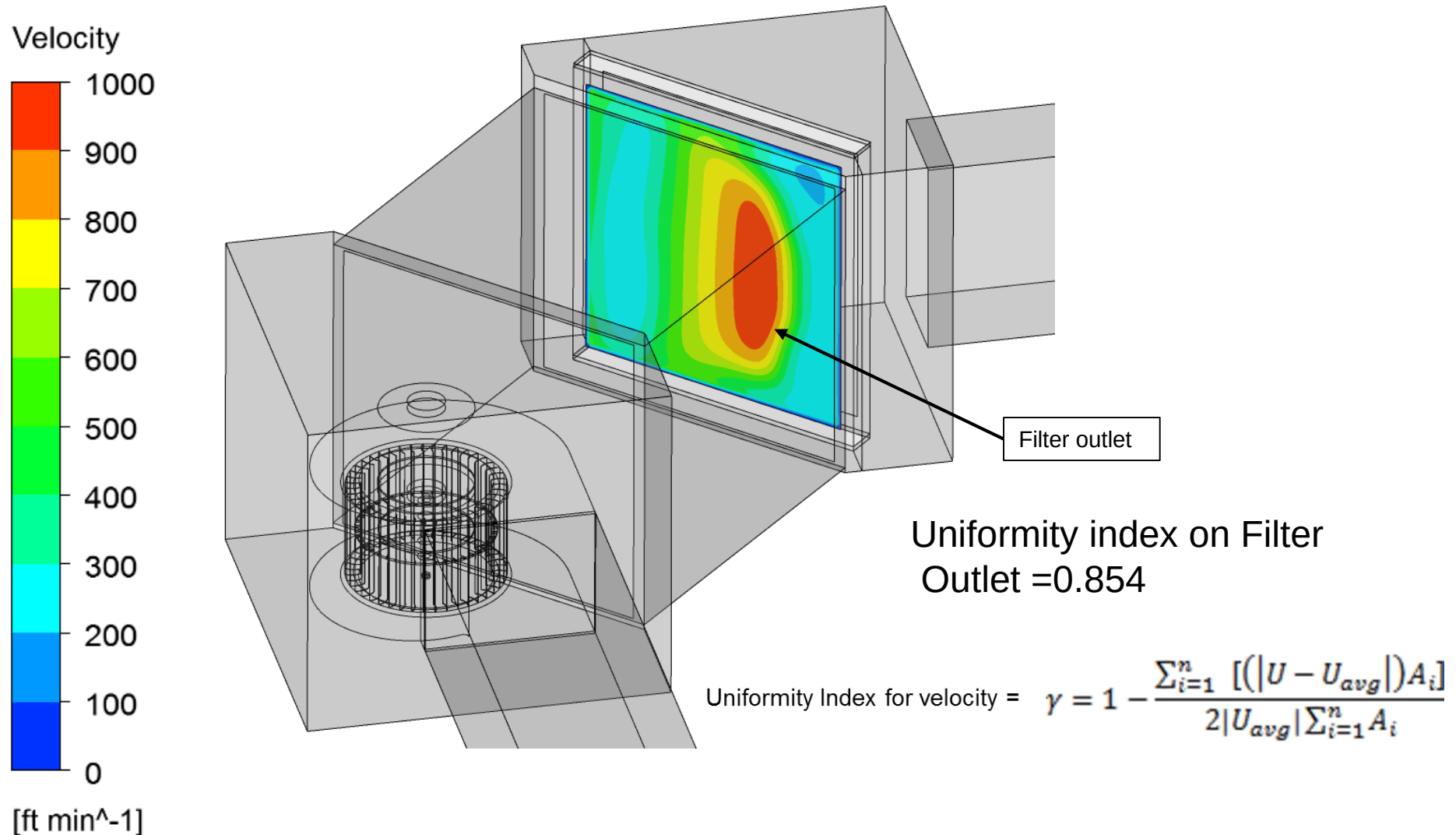
Results : Velocity Contour



Results : Velocity Contour

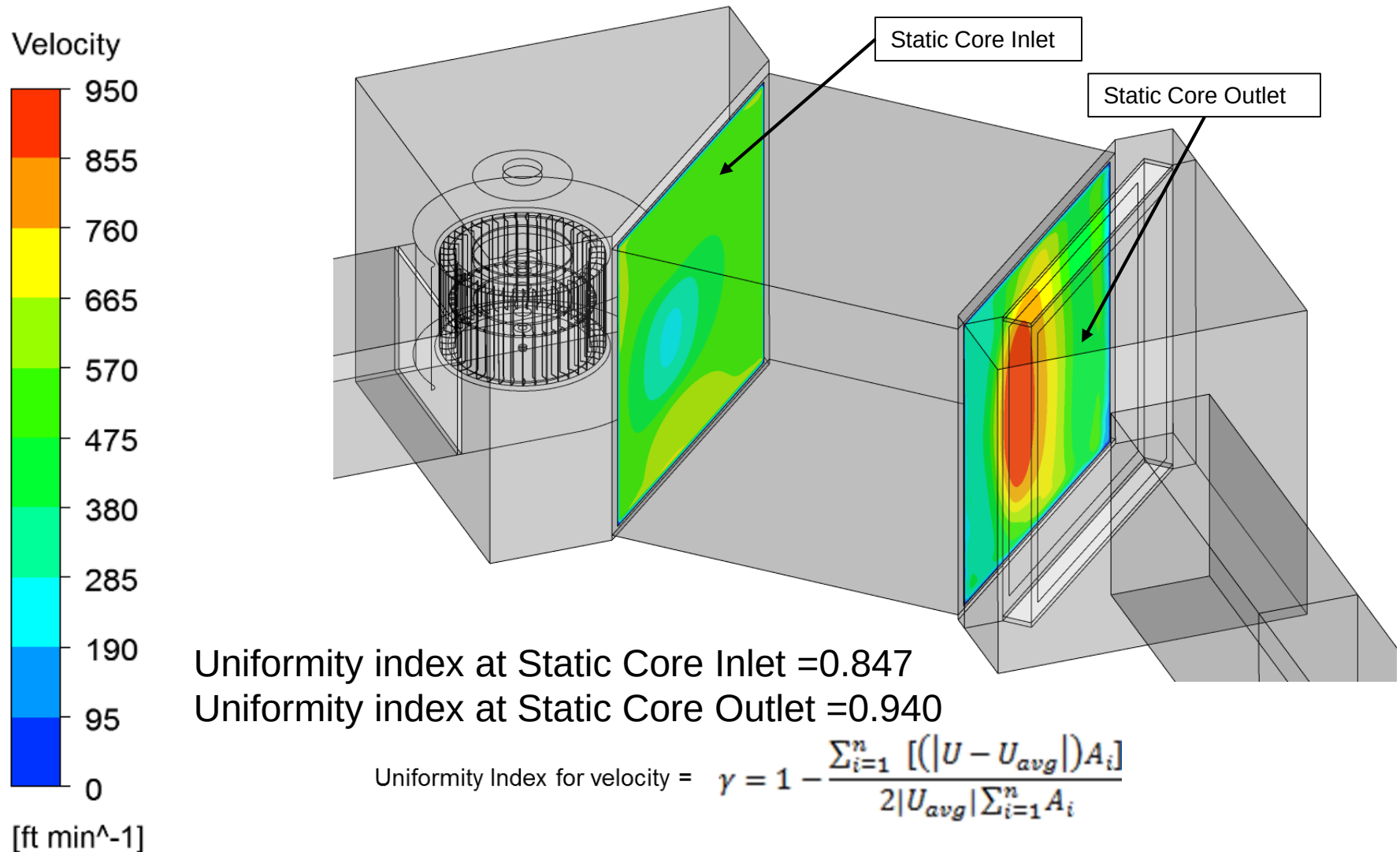


Results : Velocity Contour at Filter Outlet



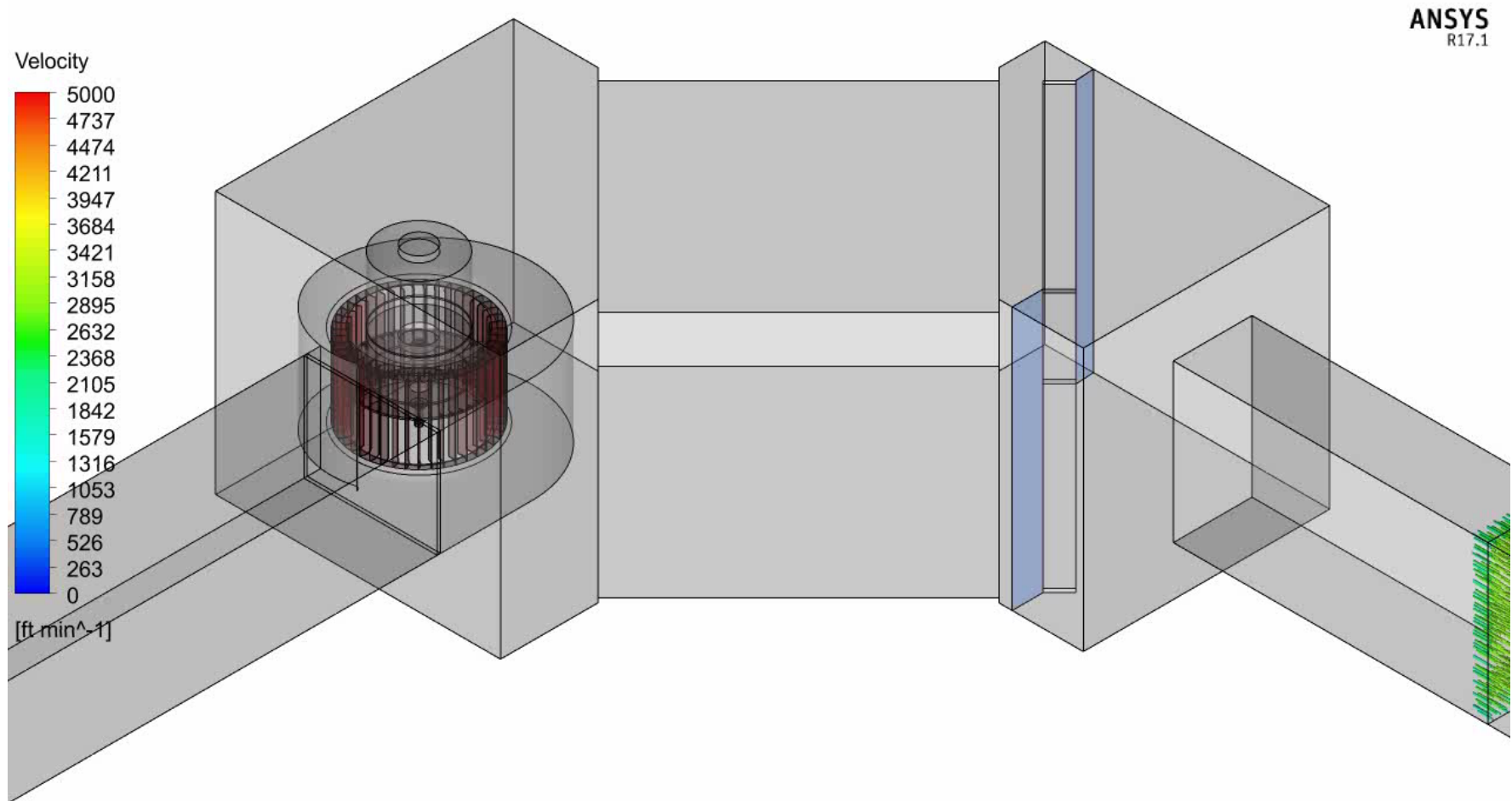
Uniformity index close to 1 which indicates uniform air-flow

Results : Velocity Contour at Static Core



Uniformity index close to 1 which indicates uniform air-flow

Results :Streamlines

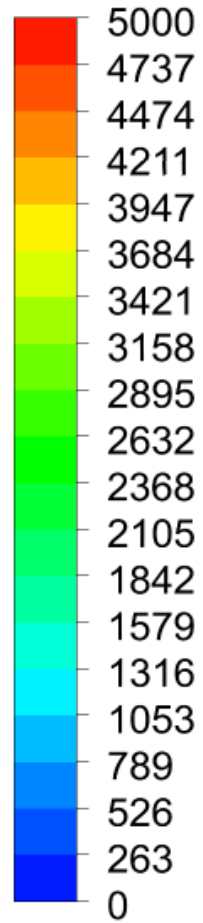




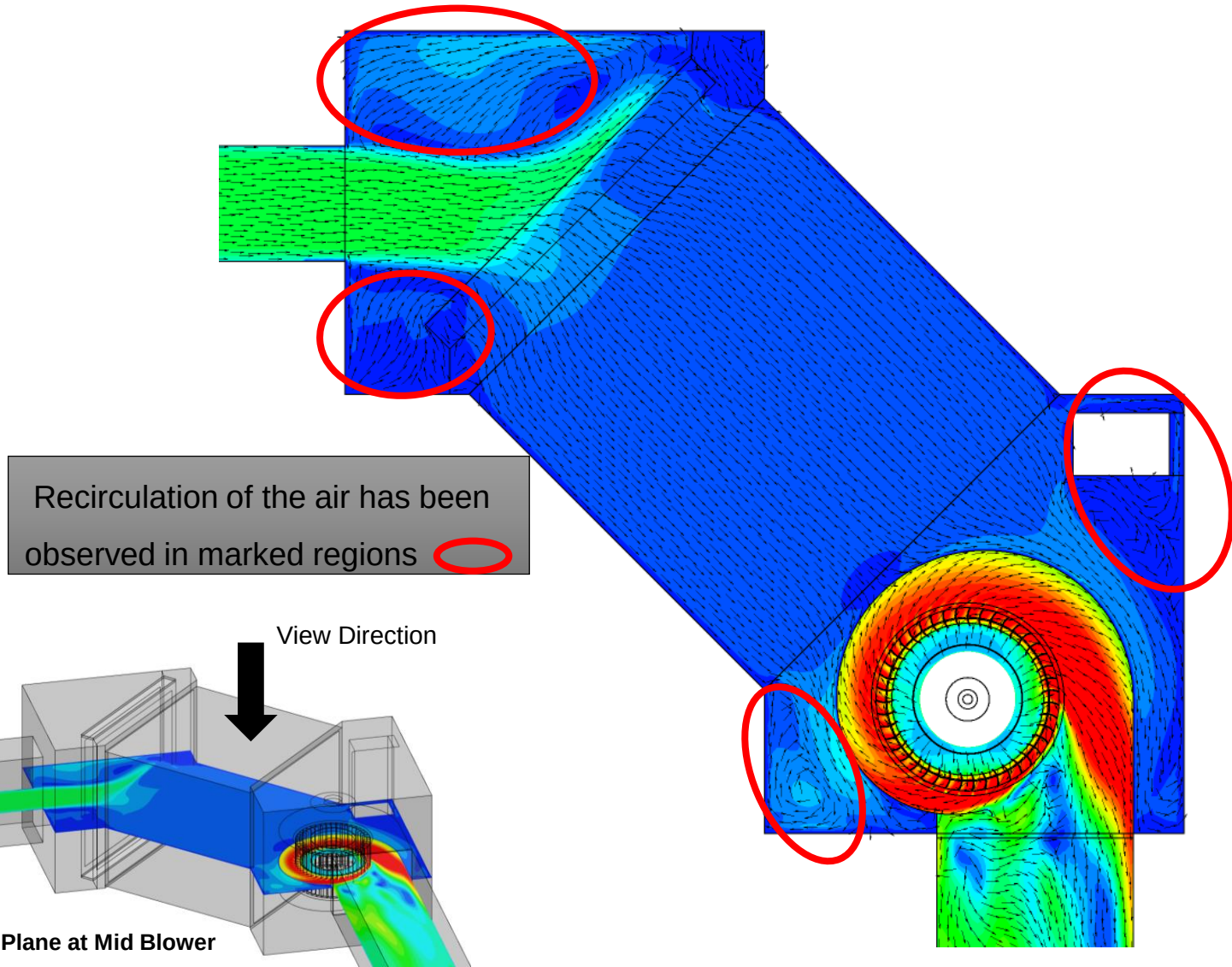
CFD Results – MC1000 Exhaust Side

Results : Velocity Contour

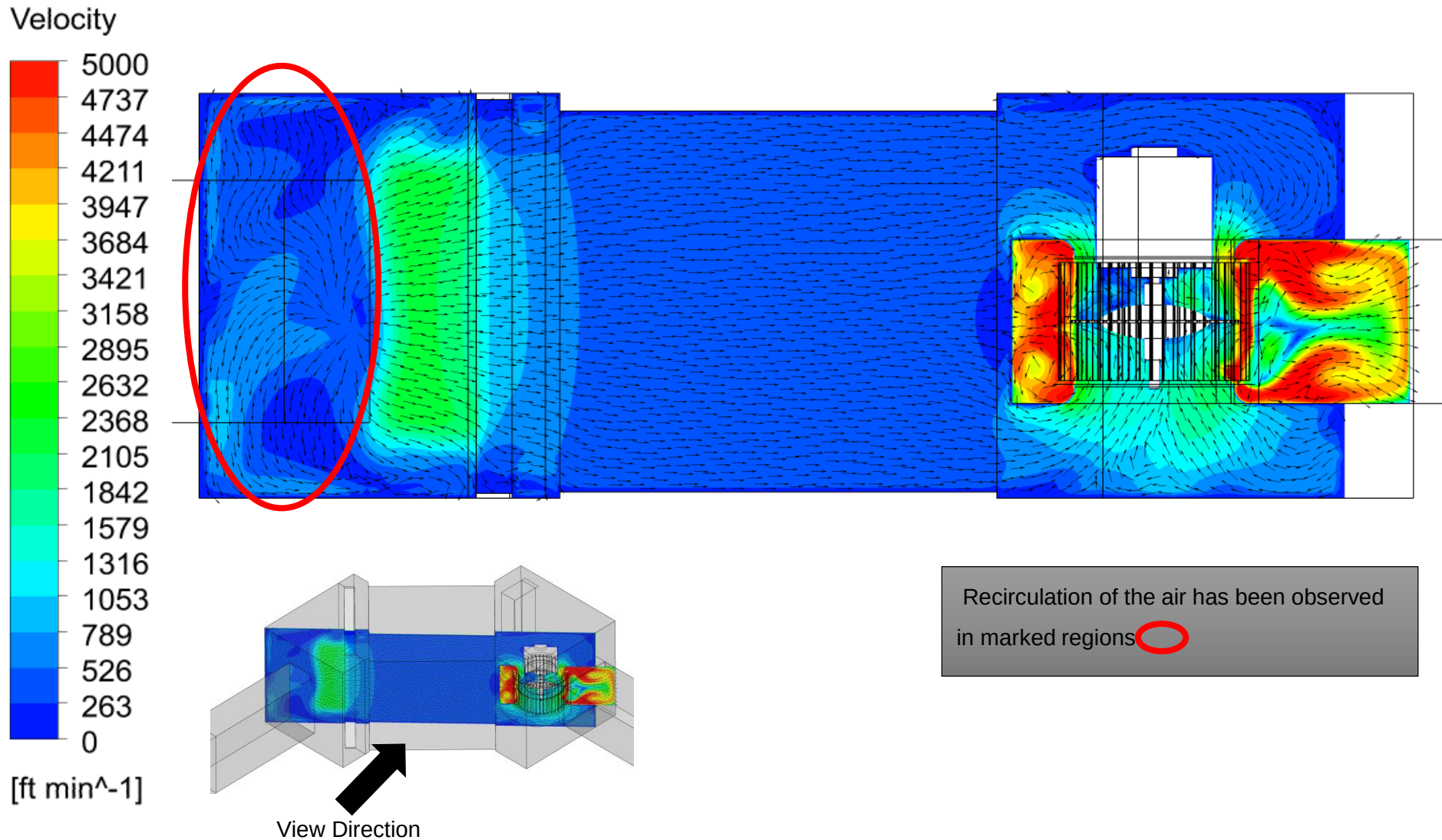
Velocity



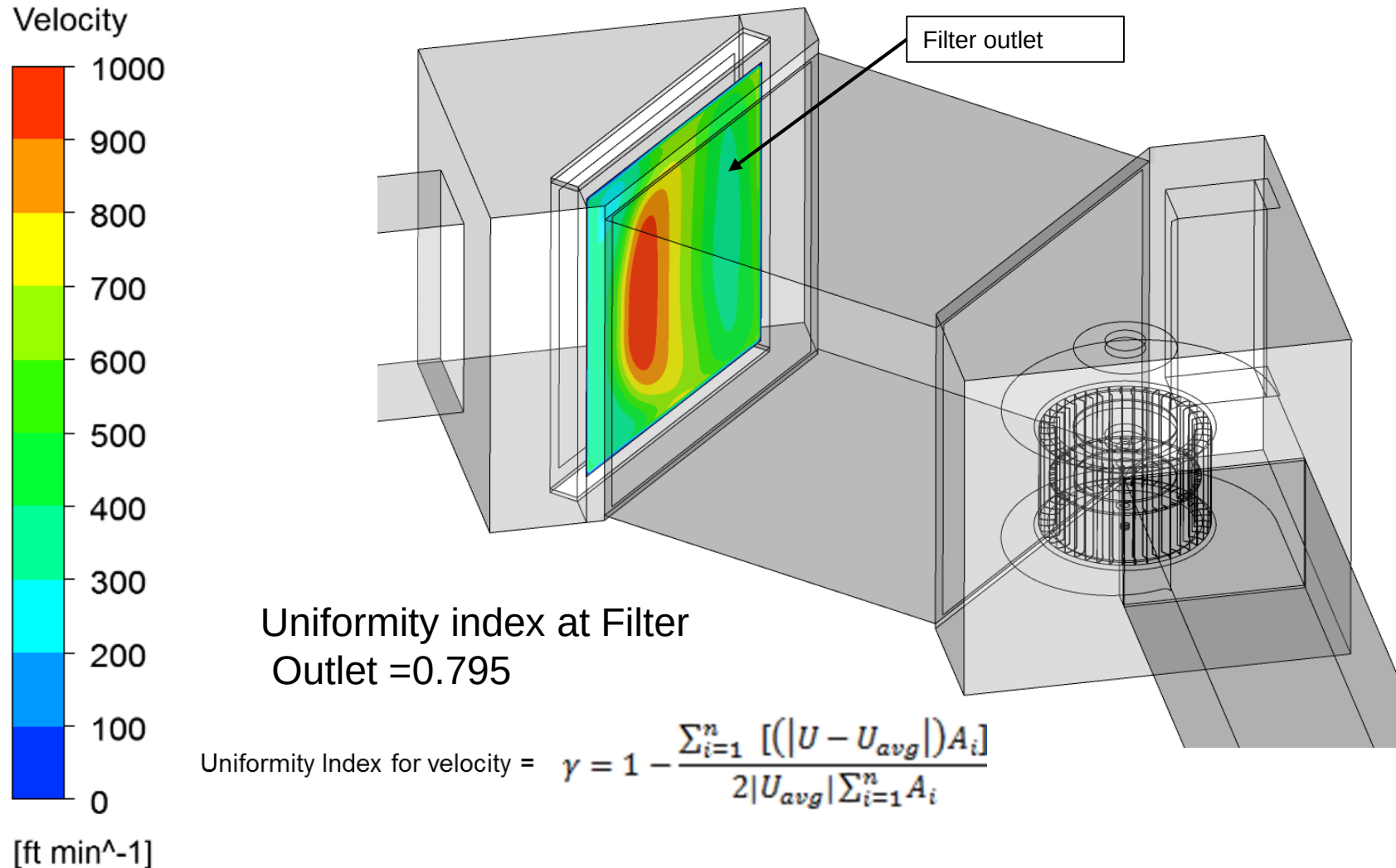
[ft min⁻¹]



Results : Velocity Contour

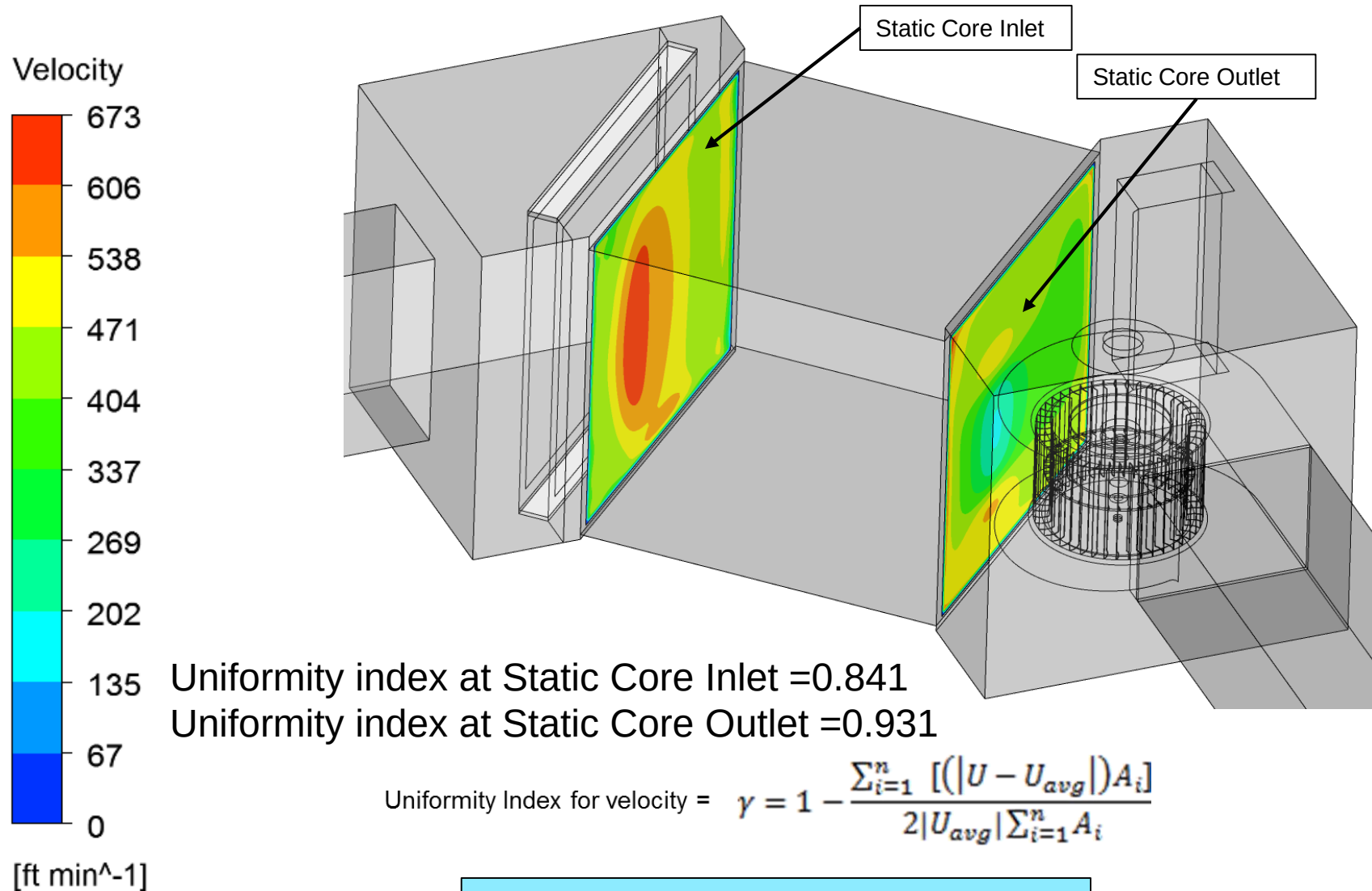


Results : Velocity Contour at Filter Outlet

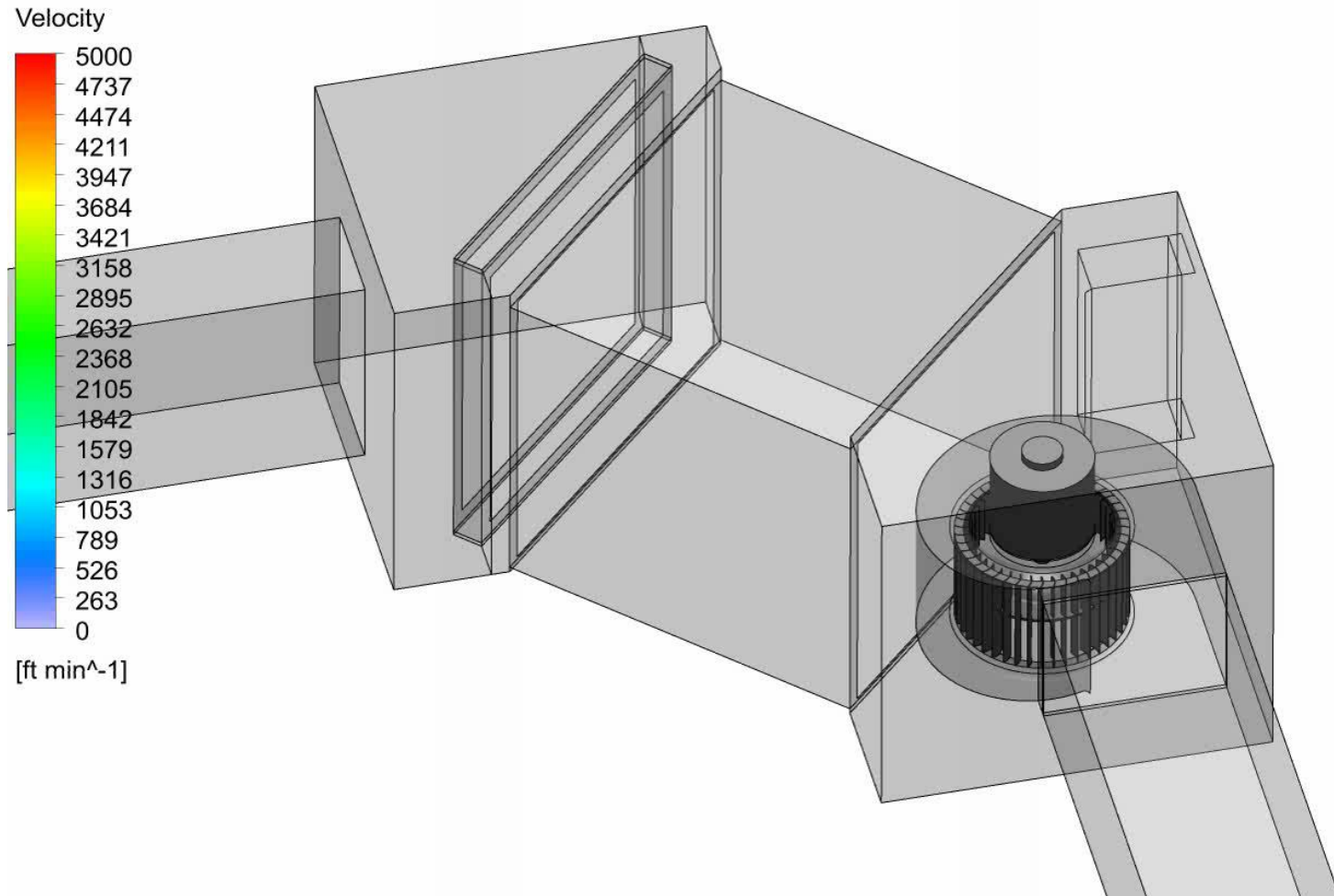


Uniformity index close to 1 which indicates uniform air-flow

Results : Velocity Contour at Static Core Inlet & Outlet



Results :Streamlines



Results :Streamlines

