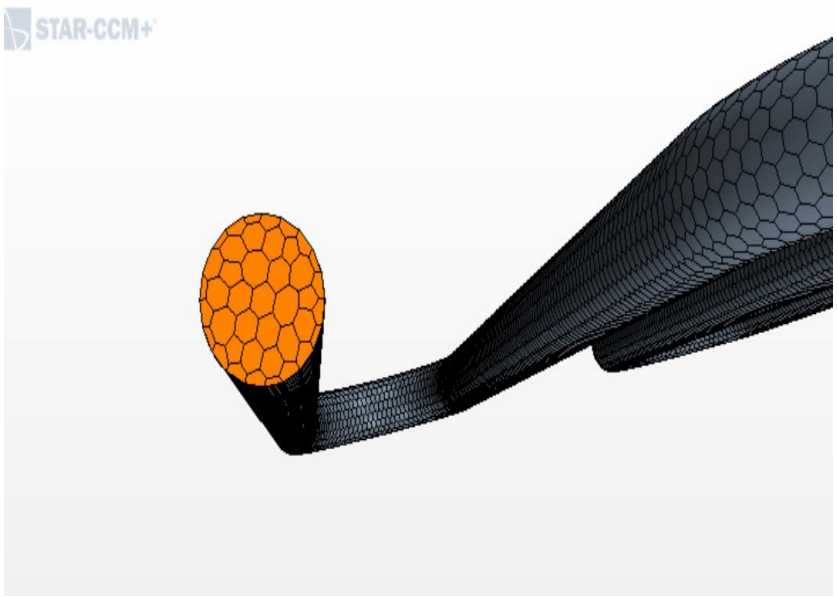



# PRESSURE DROP IN A COILED HEAT EXCHANGER

IPSA - 27/10/23

RESUME

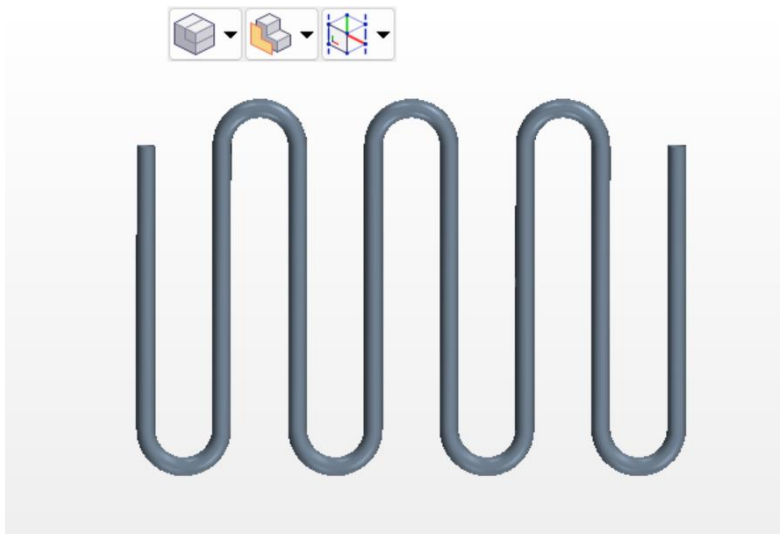
the water's behavior in the heat exchanger is greatly affected by the heat exchanger's shape, including bends and straight sections. Changes in pressure, velocity, and temperature occur because of the intricate interaction of flow patterns, energy losses, and heat transfer processes as water flows through the coil.

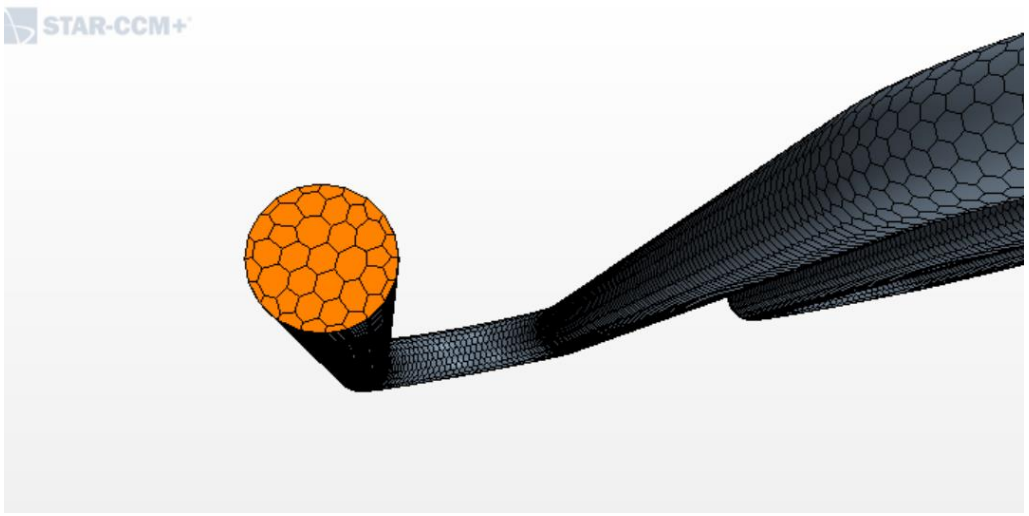
Khady sarah Sall

Fluid Dynamics

C

- **3D CAD and Mesh**

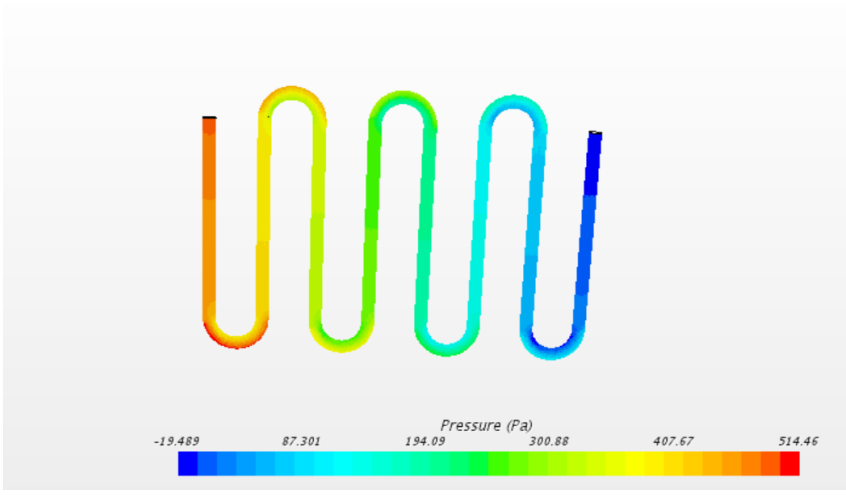


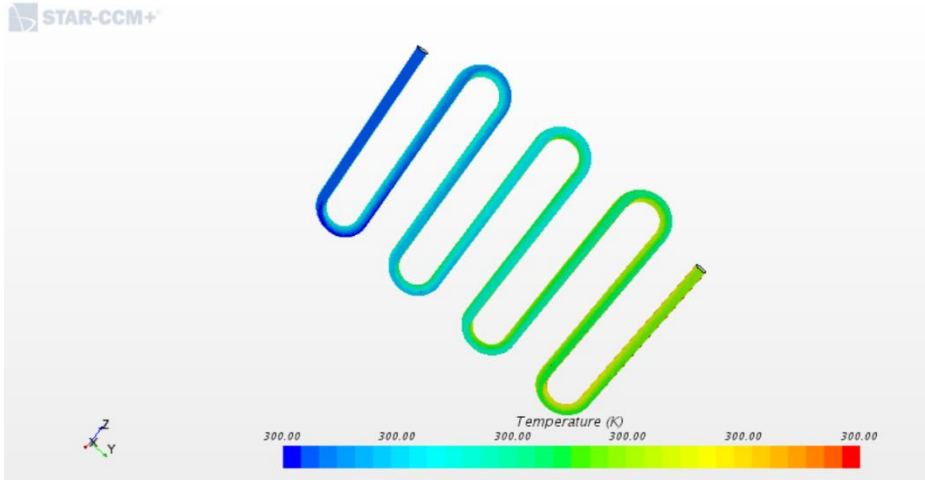


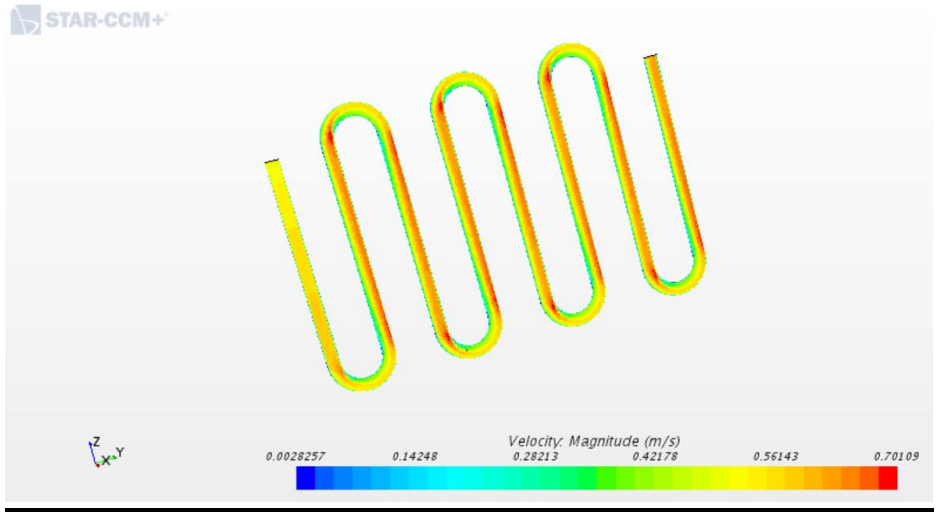


- **Scalar scenes of pressure, velocity, temperature-Longitudinal.P**

- The pressure distribution shows that water experiences changes in pressure as it moves through the heat exchanger. These changes happen because of variations in the shape of the heat exchanger, like bends and straight sections, which can either cause pressure drops or increases.
- The velocity profile indicates that the speed of water changes, especially at the bends. These changes are due to the curved sections, which lead to acceleration and shifts in the flow direction.
- Temperature distributions reveal that the heat transfer mainly occurs in the straight sections of the heat exchanger, where water contacts the heated surface. As a result, we see a gradual temperature increase in those sections.

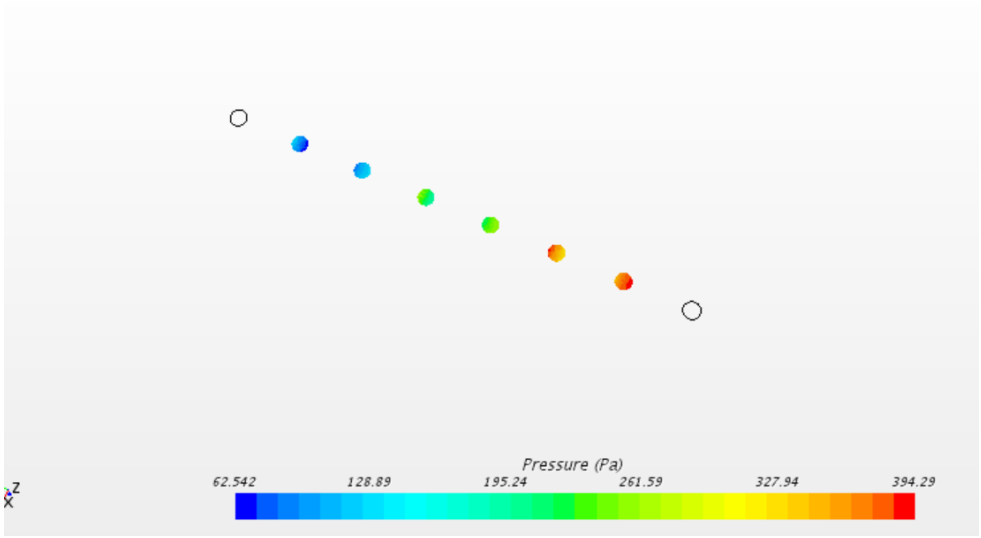


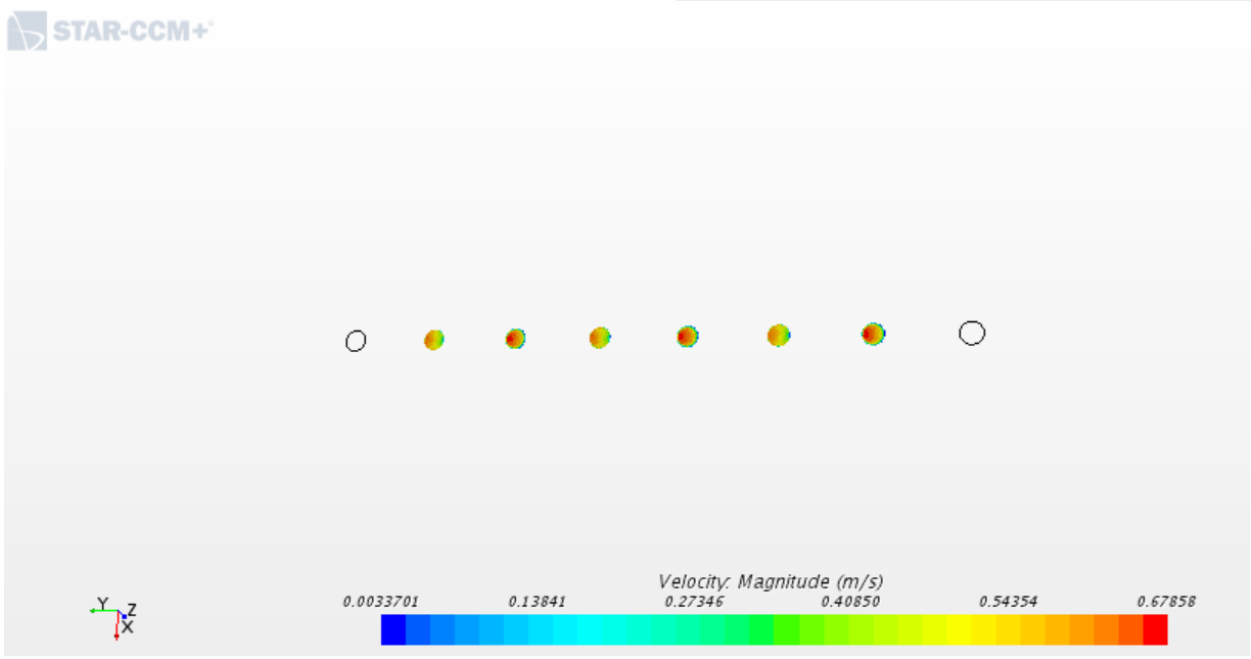

- **<u>Scalar scenes of pressure, velocity, temperature- At the exit</u>**

- At the exit of the first bend, the pressure starts to recover slightly, but it may not fully return to its initial value due to energy losses during the bend.
- Velocity and temperature profiles show that the fluid experiences significant changes within the bend, including acceleration and heat transfer. This is because of the bend's shape and length, which influence how the fluid behaves.



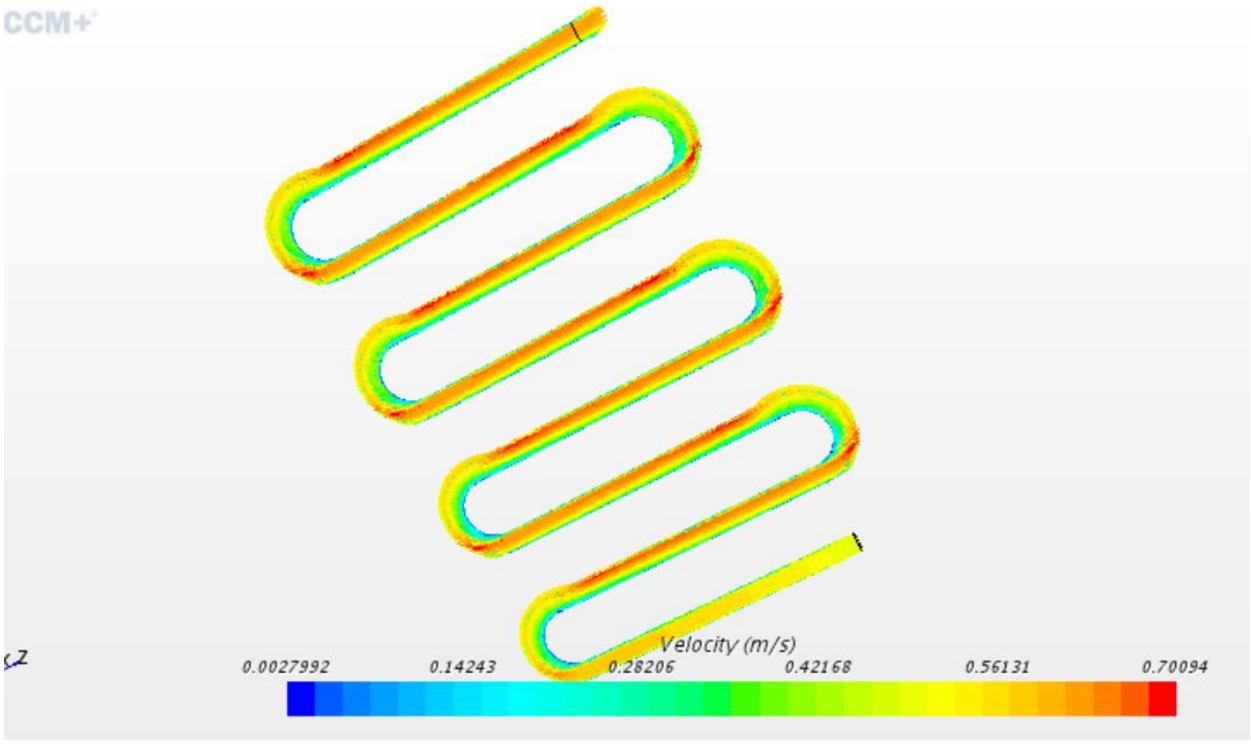




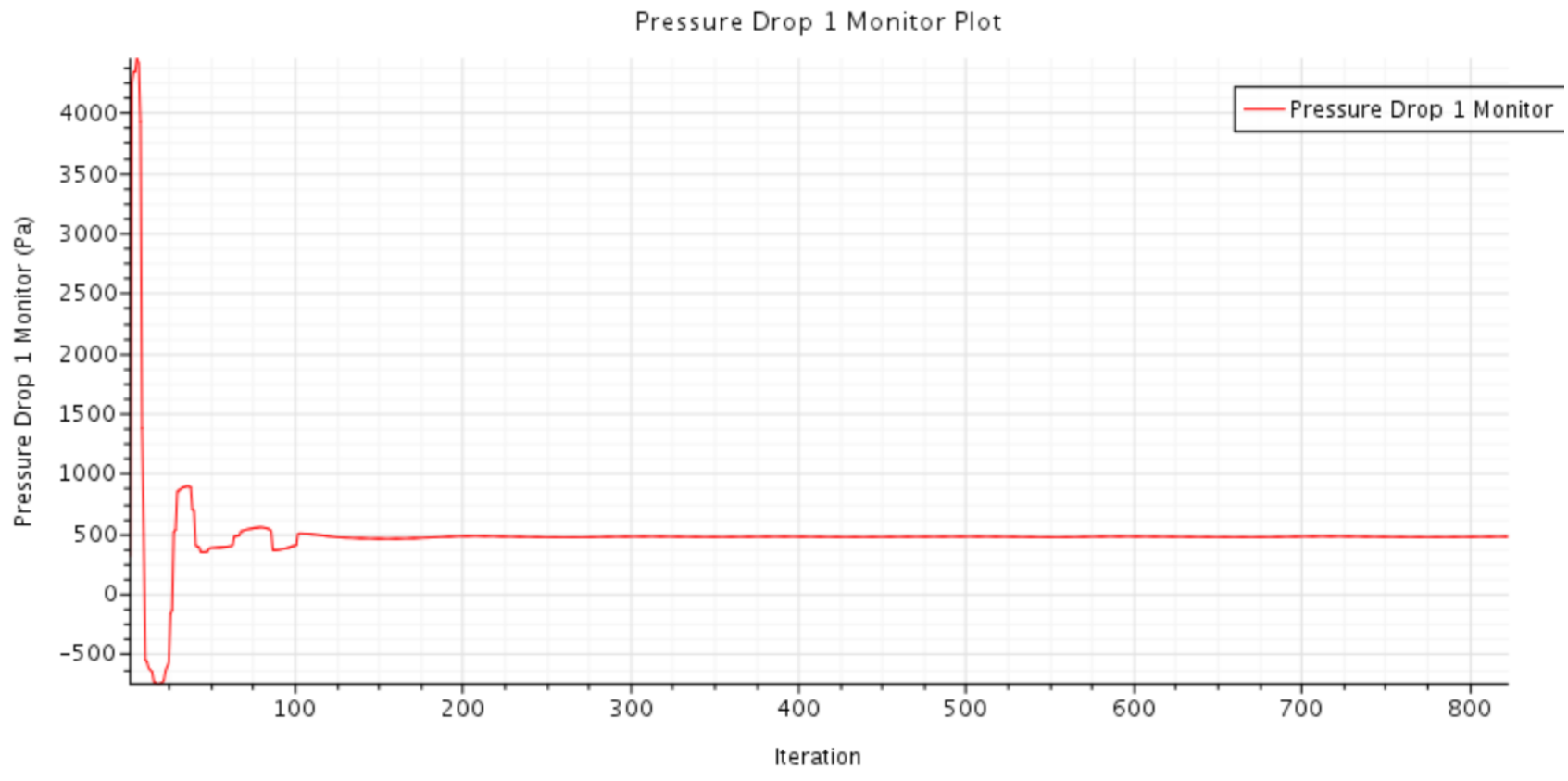



- **Vector scenes in a Longitudinal.P**

- The vector diagrams depict complex flow patterns within the heat exchanger. In the bends, you can see swirling and vortices, which happen because of shifts in flow direction and speed.
- These flow patterns are caused by the sudden changes in the heat exchanger's shape at the bends. These changes lead to the formation of swirls and pressure changes. Flow separation and reattachment also contribute to these patterns.



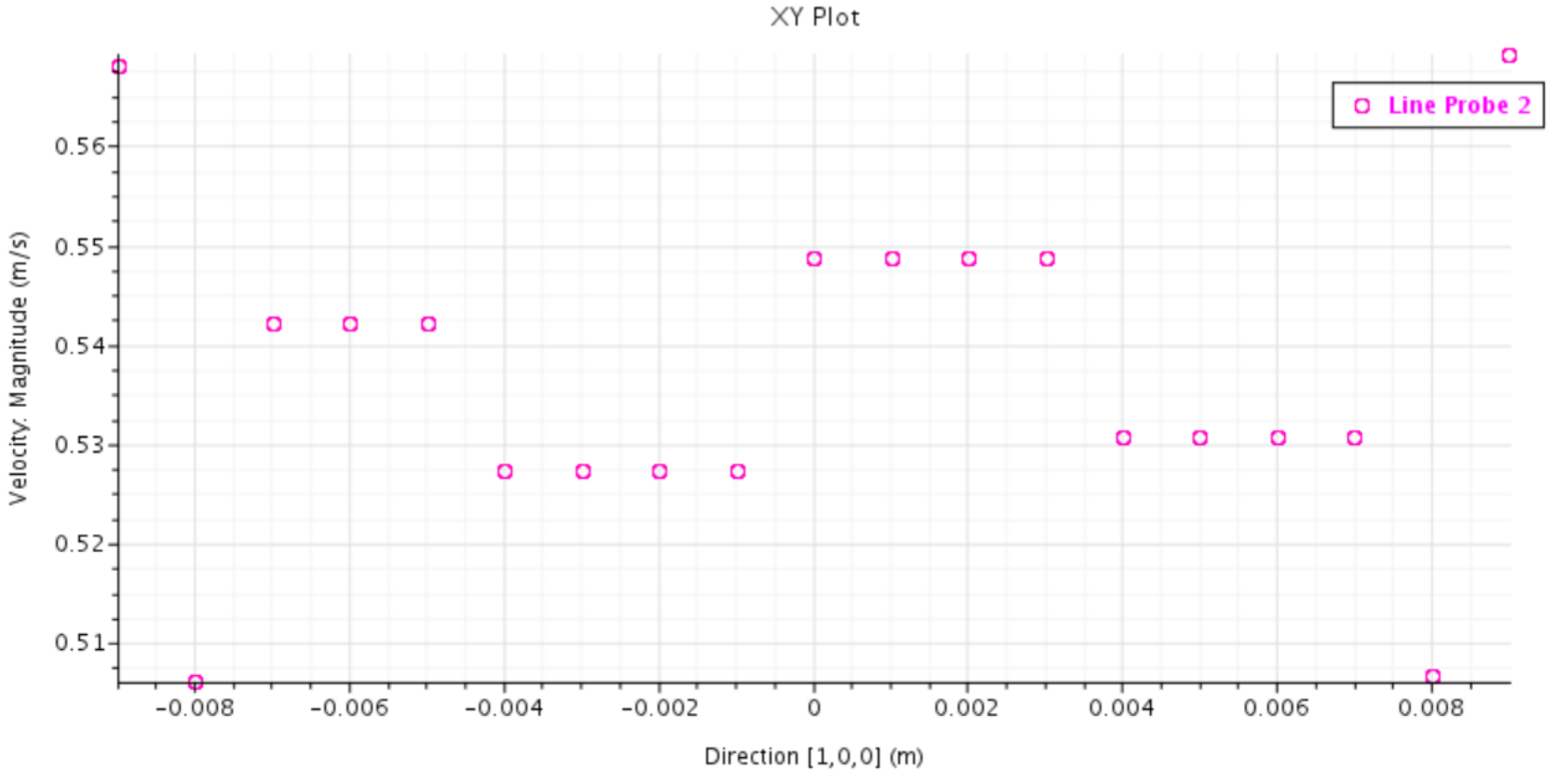

- **<u>The Plot of the pressure drop within iteration</u>**



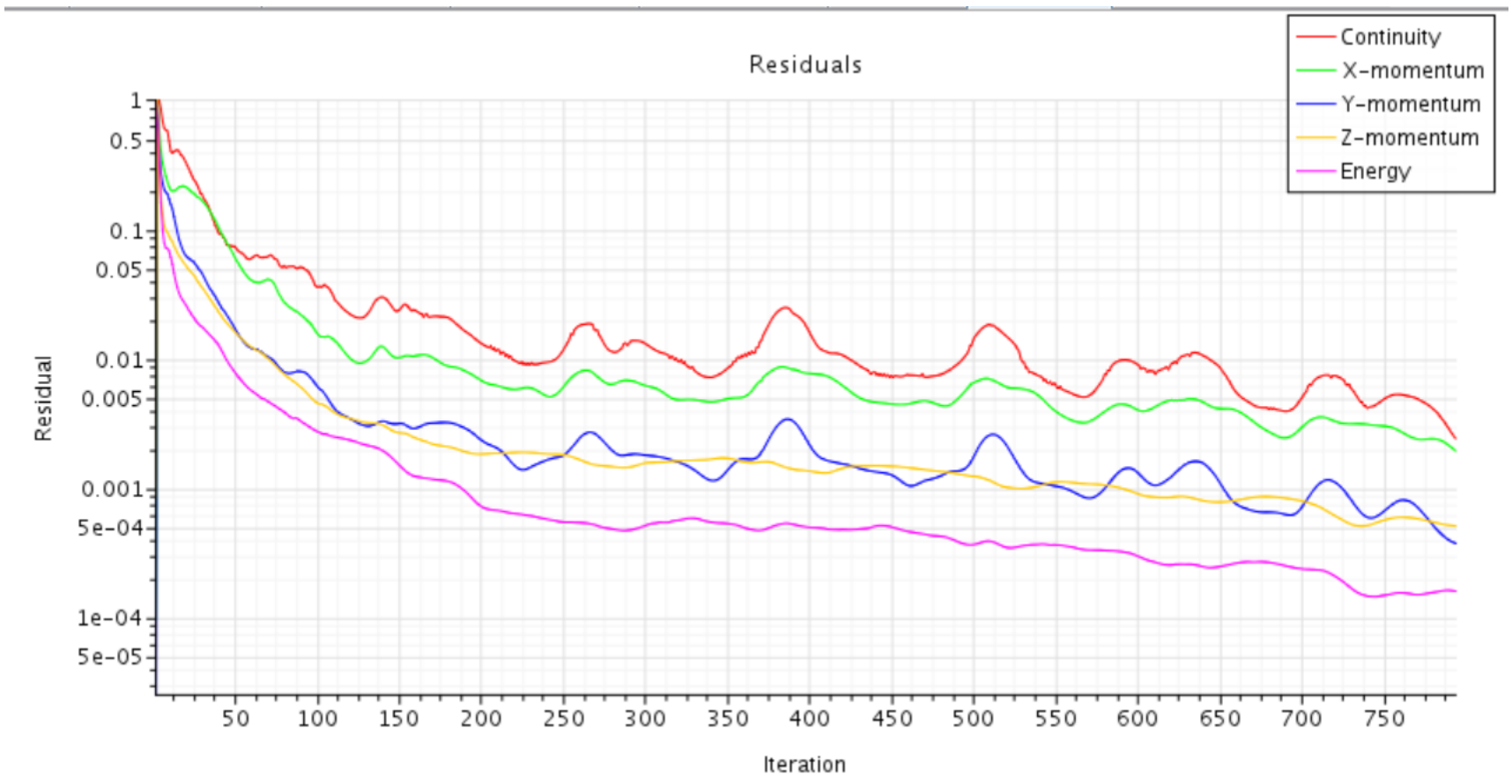

The plot of the pressure drop shows that the simulation reaches a stable value after several iterations. It indicates that the initial pressure variations gradually settle, which means that the model is getting closer to a consistent state.

- **<u>The Plot of the velocity profile downstream the 1st bend</u>**

- The velocity profile downstream of the first bend illustrates a recovery in velocity as the fluid exits the bend. The flow tends to stabilize as it enters the straight section.
- The initial change in velocity is mostly due to the influence of the bend on the flow direction and acceleration.


XY Plot
Line Probe 2
Velocity: Magnitude (m/s)
0.56
0.55
0.54
0.53
0.52
0.51
-0.008
-0.006
-0.004
-0.002
0
0.002
0.004
0.006
0.008
Direction [1,0,0] (m)

- **Residuals**


Residuals
Continuity
X-momentum
Y-momentum
Z-momentum
Energy
Residual
1
0.5
0.1
0.05
0.01
0.005
0.001
5e-04
1e-04
5e-05
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
Iteration

.