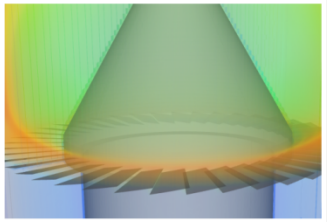
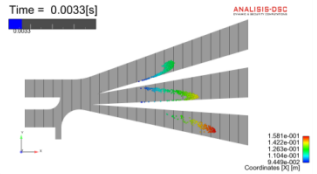
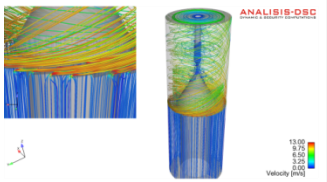
Simulation work development

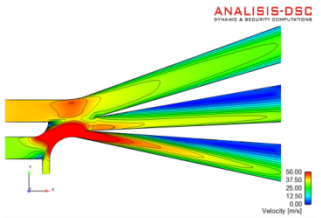
PIN Meeting

Newcastle June 21st. 2016.









ANALISIS-DSC
DYNAMIC & SECURITY COMPUTATIONS

Simulated equipment

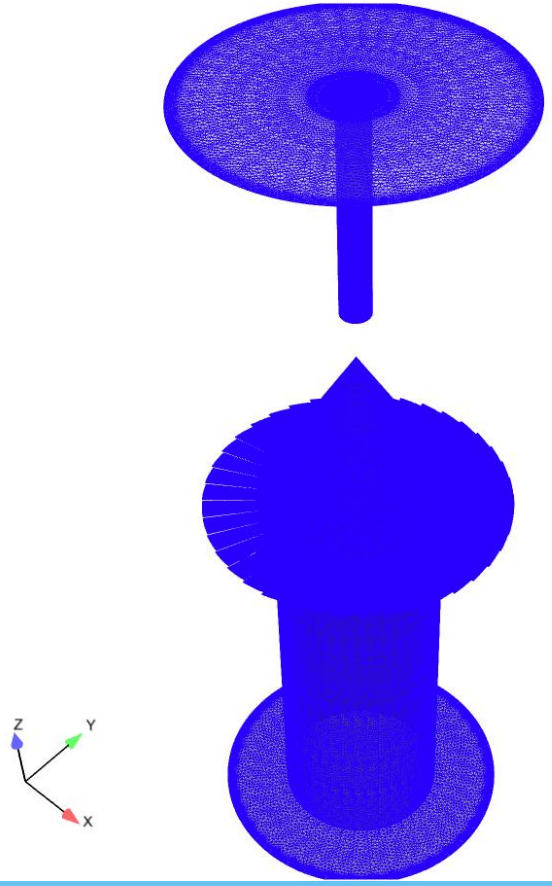
- TORBED:
  1. Geometry
  2. Physics
  3. Results:
     a. Particles volumen fraction
     b. Velocity field
     c. Relative pressure
- ELBOW JET CLASSIFIER:
  1. Geometry
  2. Physics
  3. Results:
     a. Particles movement
     b. Velocity field

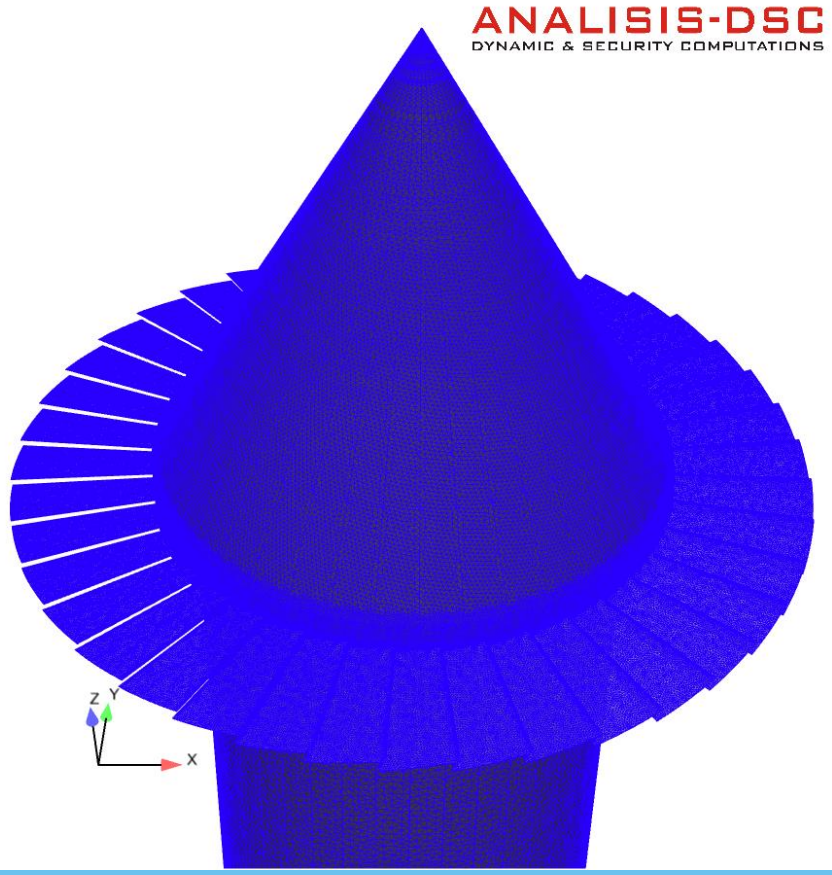
TORBED

TORBED:

1. Geometry:

- Created “qualitatively” as no real geometry definition file available.





TORBED:

2. Physics (I)

- A torbed is a static system (no rotative parts) with fixed blades that produce swirl.
- Balance between flow drag force and particulate weight determines particle suspension (heavier) or outflow (lighter)
- Hence, physics model is:
  - Two phase flow: air (continuous), particulate (disperse).
  - Lagrangian approach required.
  - 1-way coupling: depending on particle concentration (no data available).

TORBED:

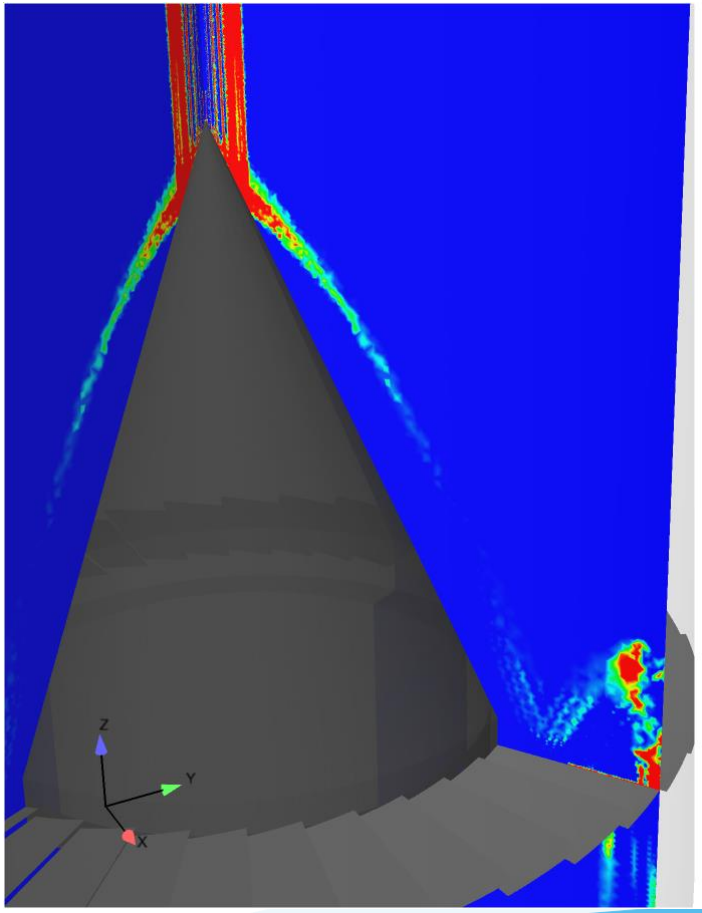
2. Physics (II)

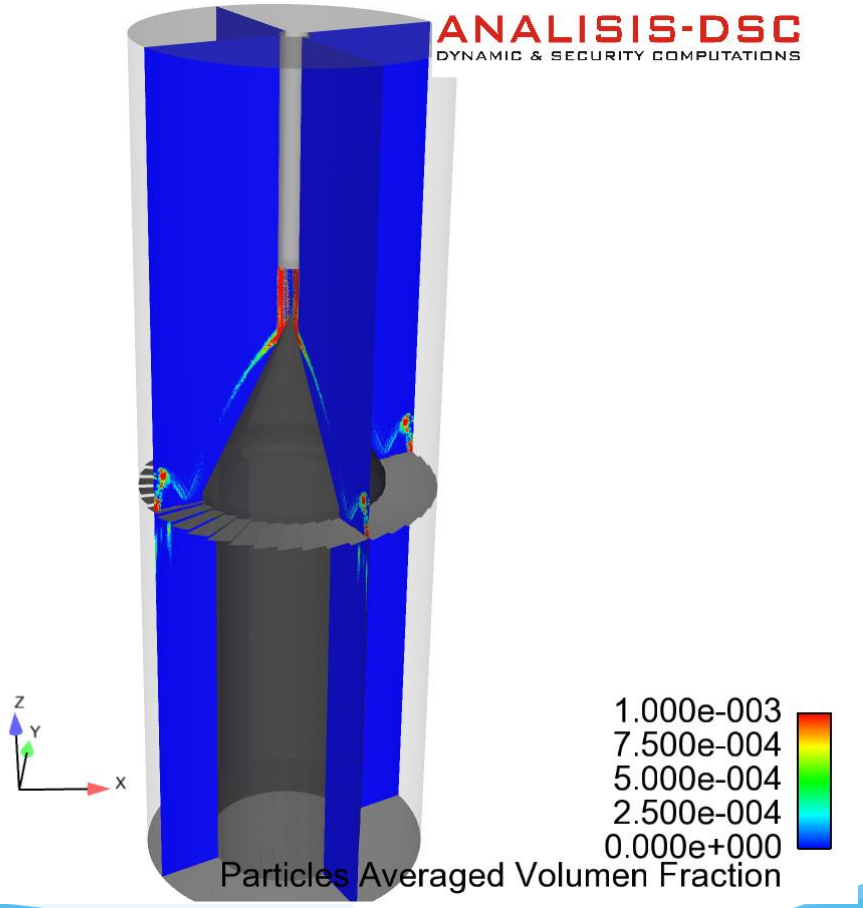
- Physics. Boundary Conditions:
  - Lower air inlet.
  - Upper pneumatic flow: air + particles.
- Parameters:
  - Continuous fluid: density (as function of temperature), viscosity (as function of temperature). Example done with air.
  - Particles: concentration, diameter and density. Example done with library model for aluminium.

TORBED:

3.Results (I)

3.a. Particles Volumen Fraction (I)

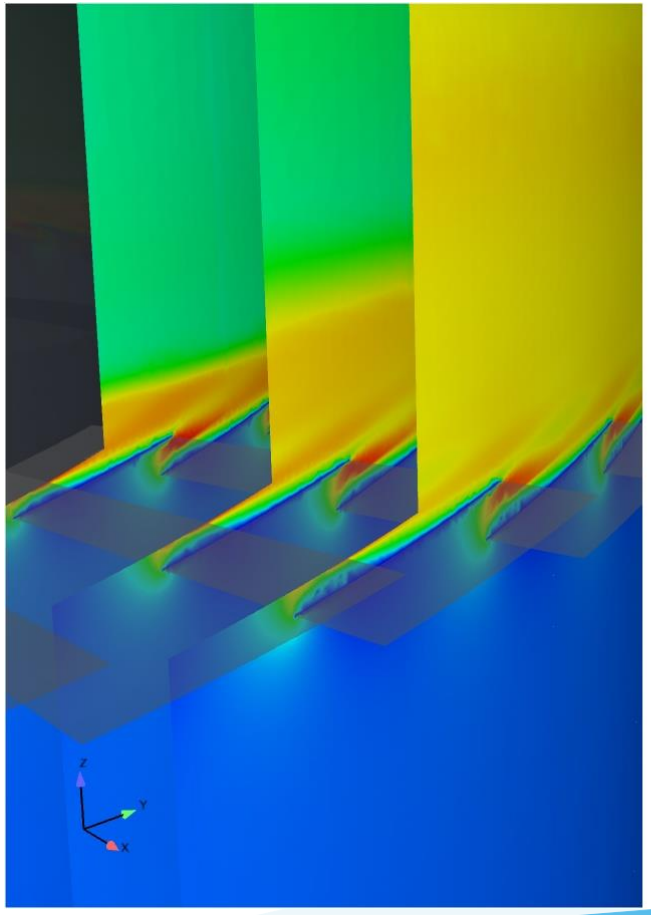


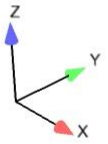


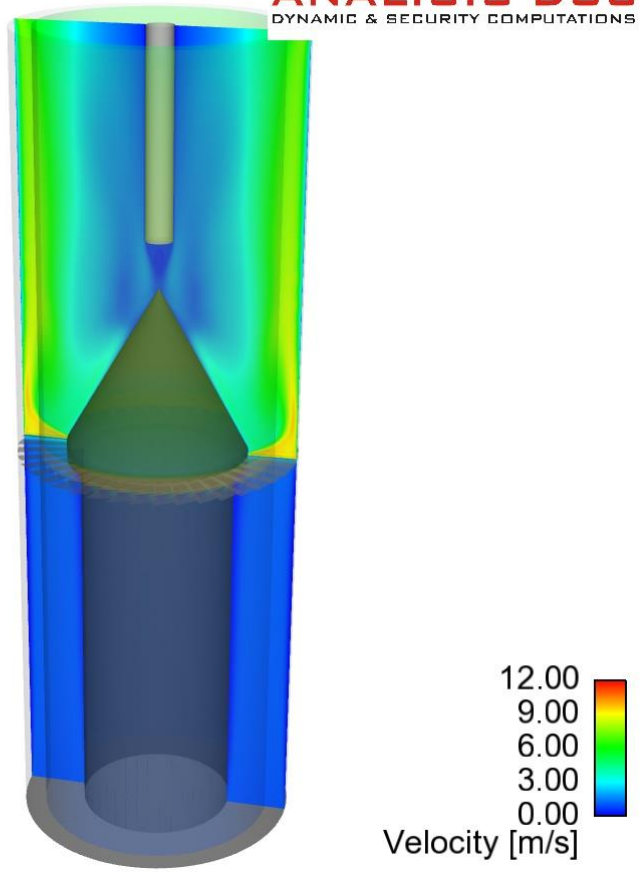
TORBED:

3.Results (II)

3.b. Velocity field (I)



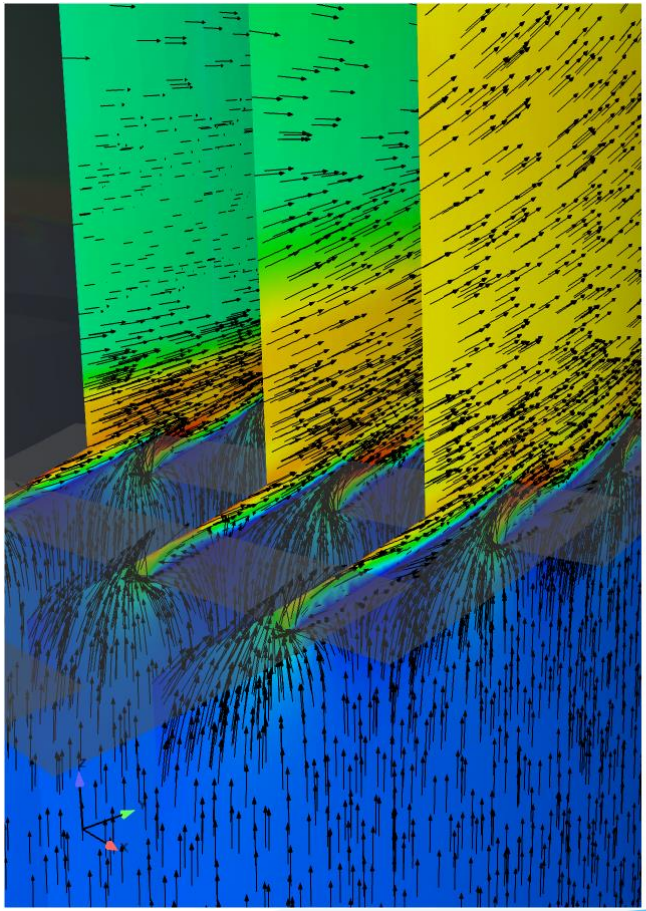


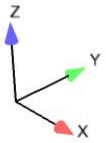


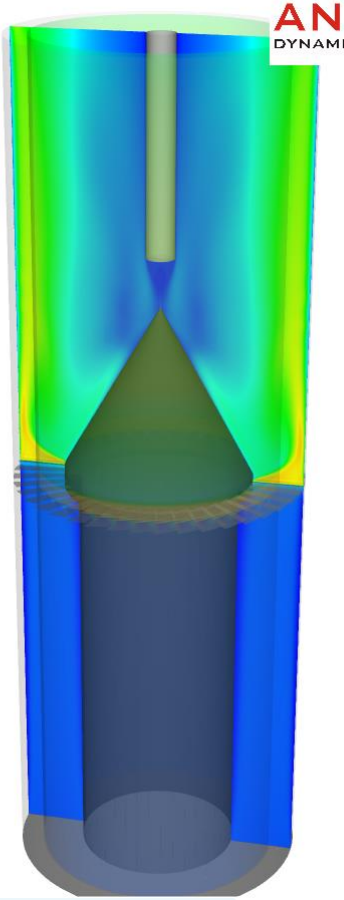
TORBED:

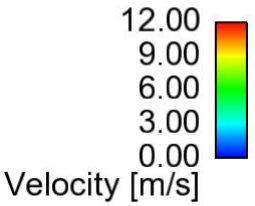
3.Results (III)

3.b. Velocity field (II)





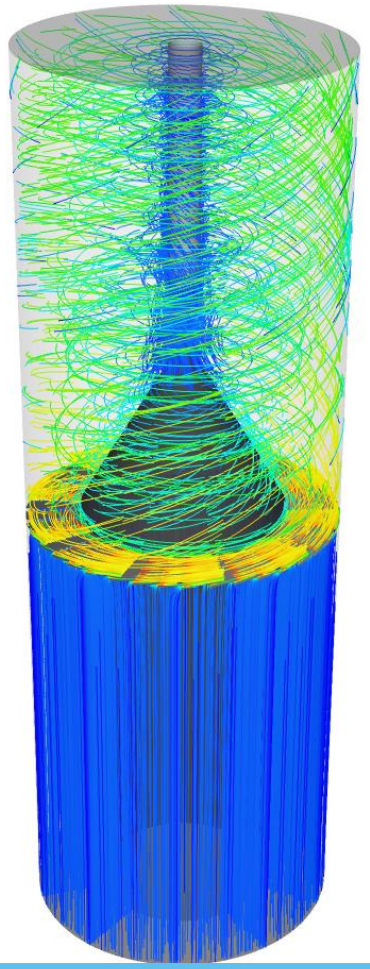




TORBED:

3.Results (IV)

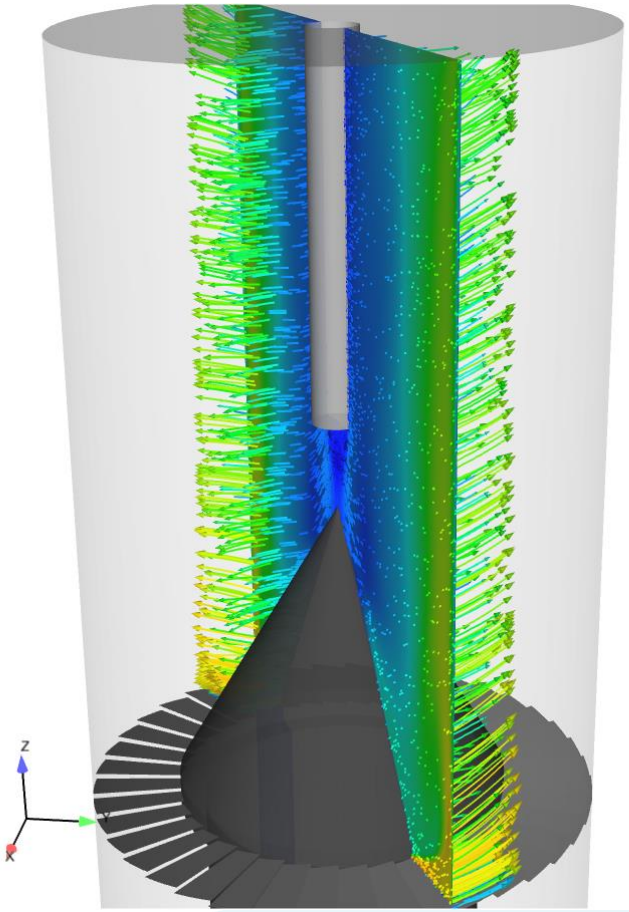
3.b. Velocity field (III)

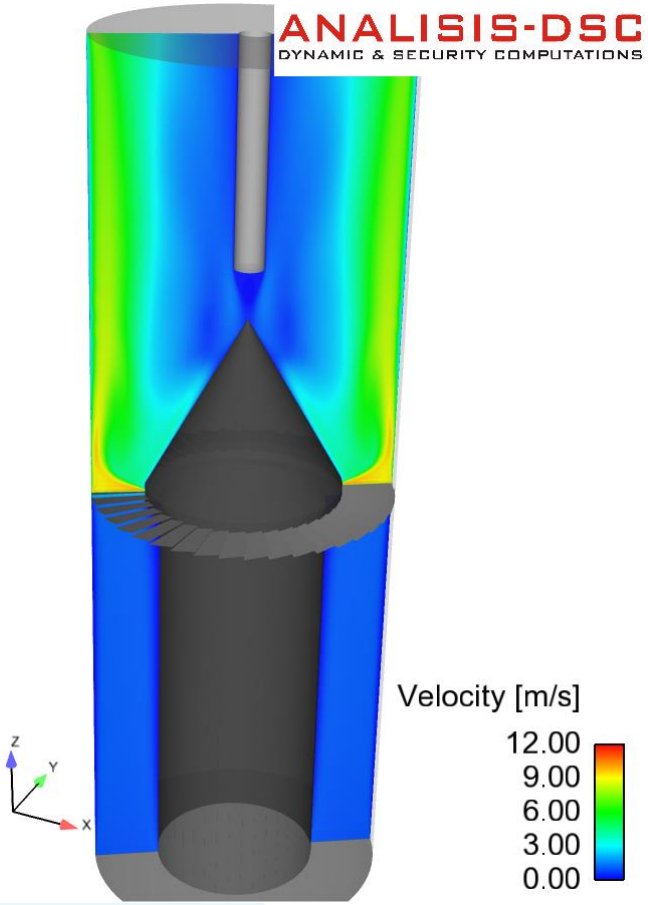


TORBED:

3.Results (V)

3.b. Velocity field (IV)

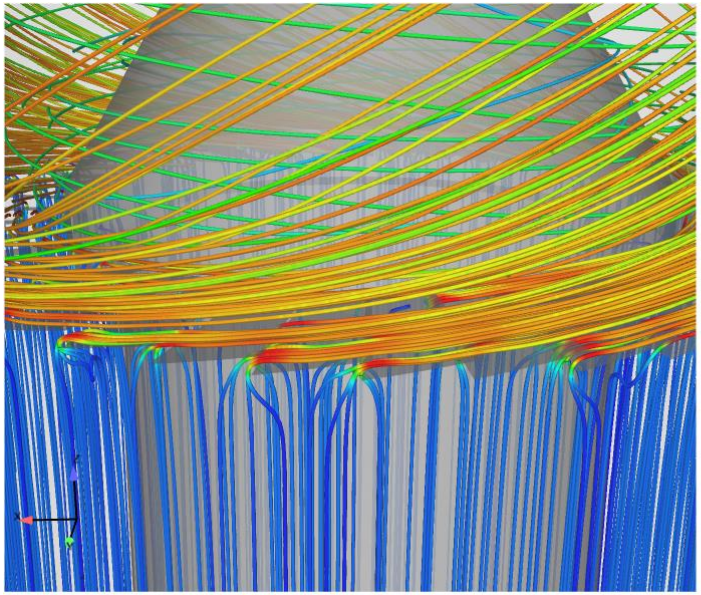


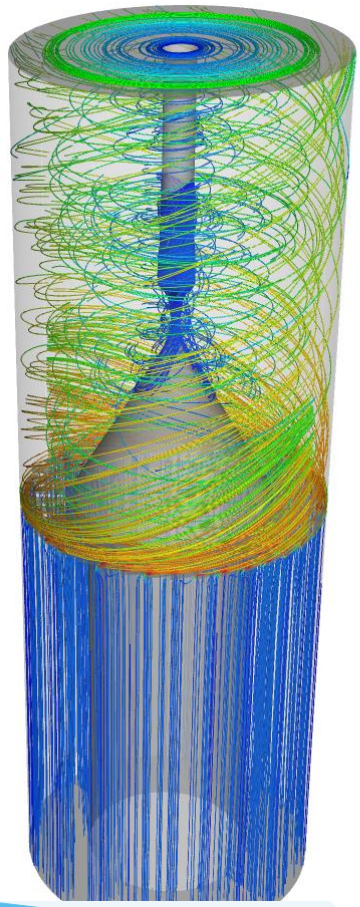


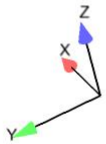
TORBED:

3.Results (VI)

3.b. Velocity field (V)







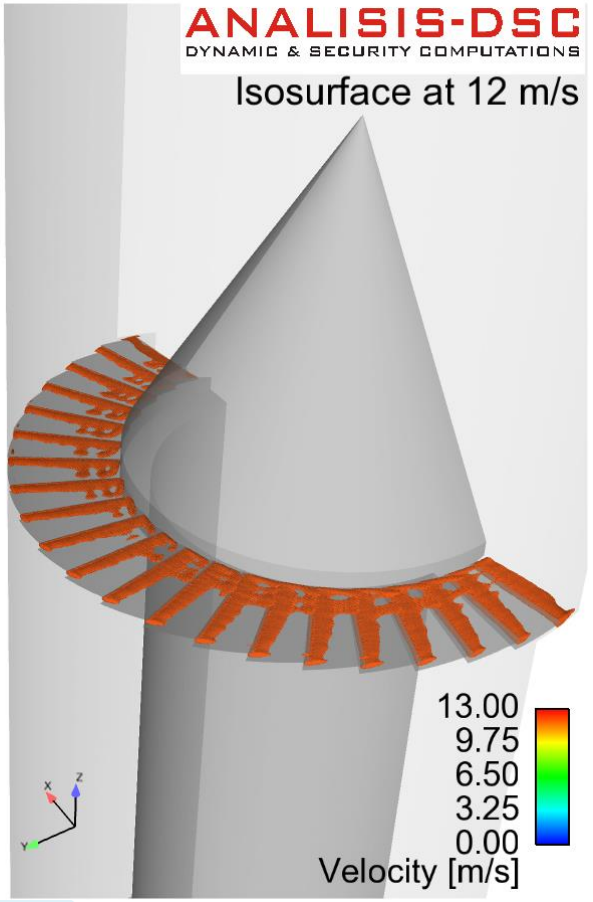
TORBED:

3.Results (VII)

3.b. Velocity field (VI)

Isosurface at 5 m/s

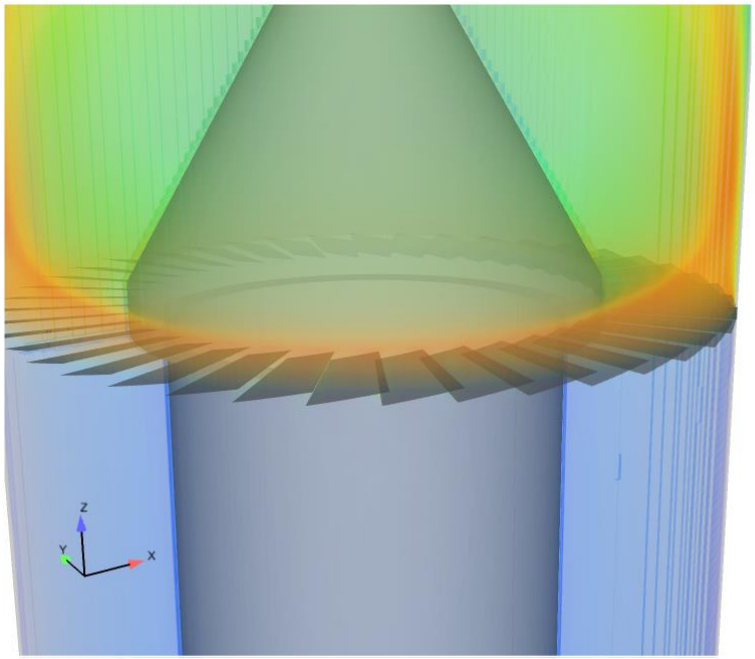
Isosurface at 10 m/s

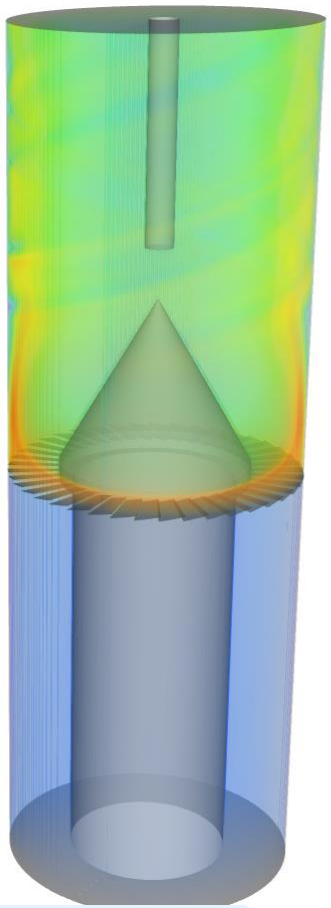


TORBED:

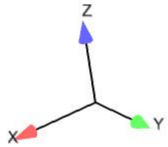
3.Results (VIII)

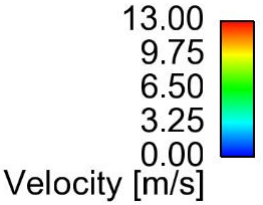
3.b. Velocity field (VII)





ANALISIS-DSC
DYNAMIC & SECURITY COMPUTATIONS

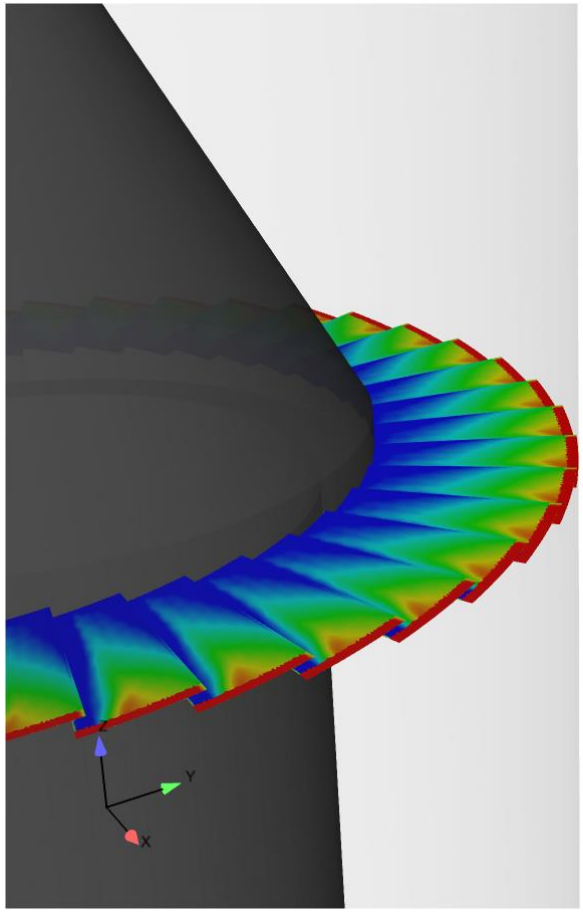


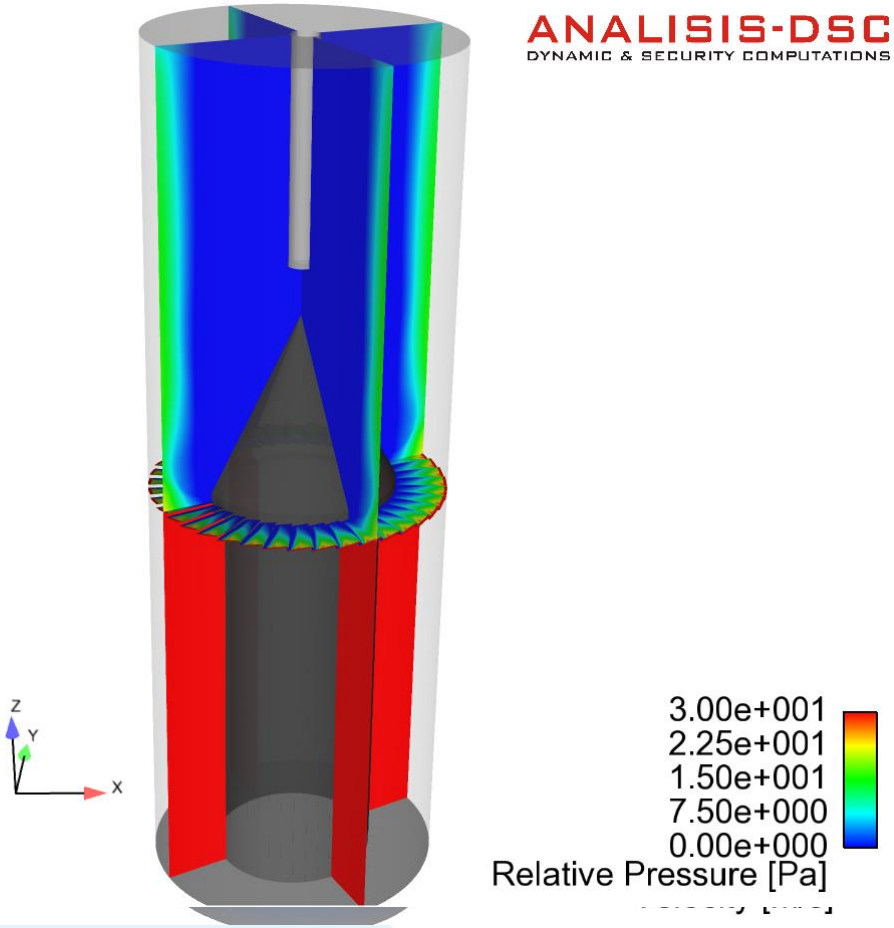


TORBED:

3.Results (IX)

3.c. Relative Pressure (I)



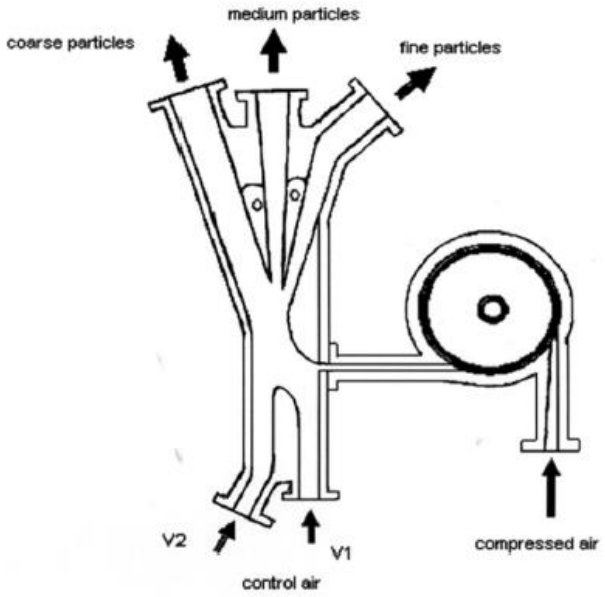


ELBOW JET CLASSIFIER

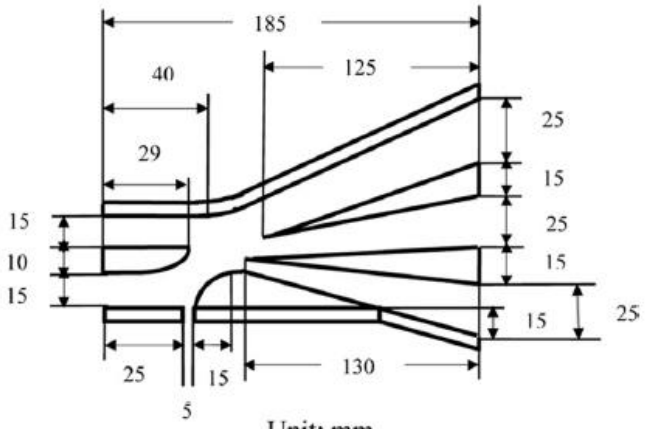
ELBOW JET CLASSIFIER:

1.Geometry:

– Created by printing lines above publicity brochure picture of manufacturers sent by Mr. Bianchin (MBN) (only information available).



(a)



Unit: mm

(b)

Paper used to make the approximate geometry: "Numerical study of classification of ultrafine particles in a gas-solid field of elbow-jet classifier".

ELBOW JET CLASSIFIER:

2.Physics(I):

- An Elbow Jet Classifier is an static system (no rotative parts) with several channels and curvatures to classify particles according to their size.
- Balance between flow drag force and particulate weight determines trajectories to the different channels.
- Hence, physics model is:
  - Two phase flow: air (continuous), particulate (disperse).
  - Lagrangian approach required.
  - 1-way coupling: depending on particle concentration (no data available).

ELBOW JET CLASSIFIER:

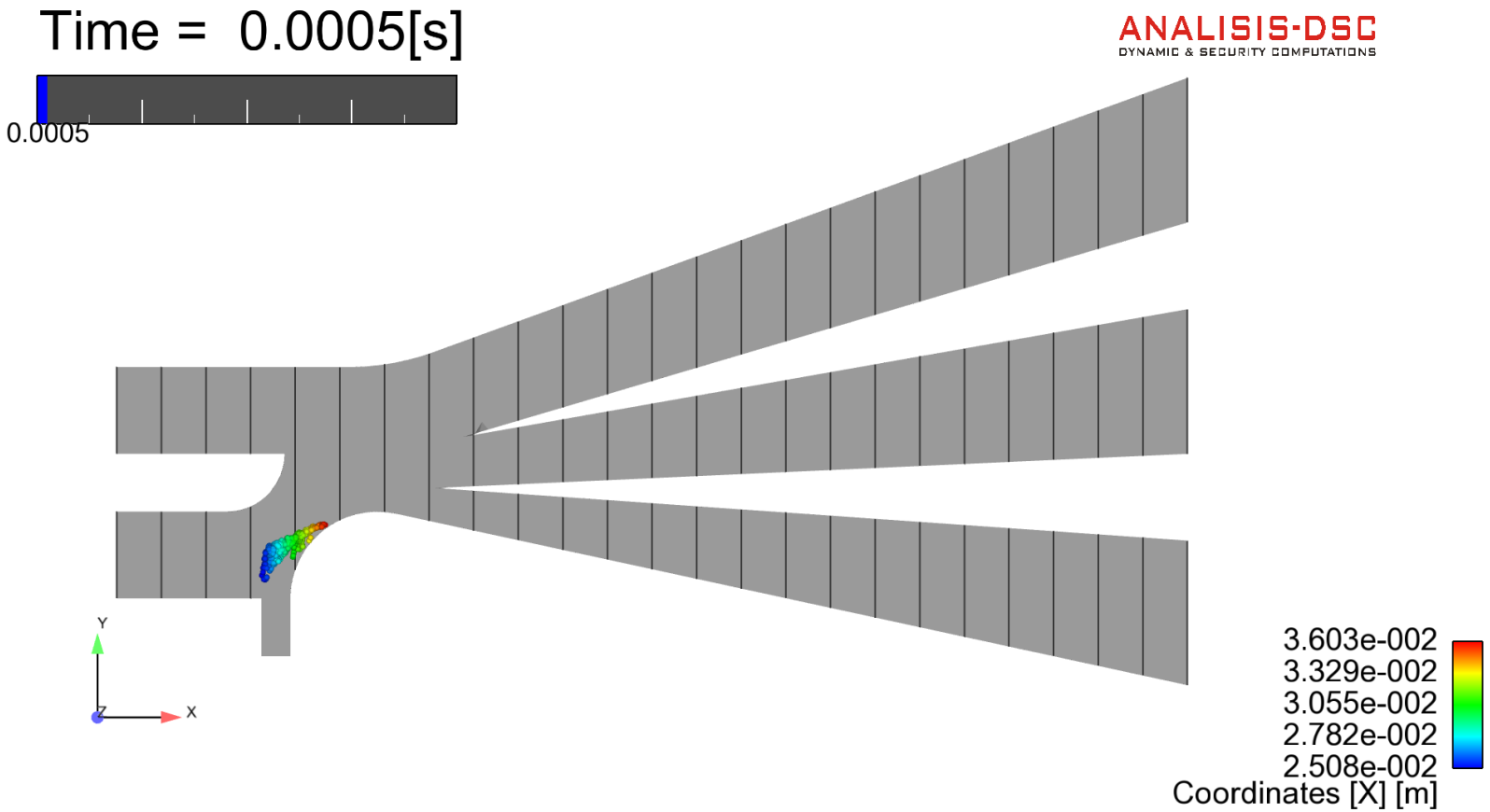
2.Physics (II):

- Physics. Boundary Conditions:
  - Lateral pneumatic flow inlet: air + particles.
  - Two upper air flow inlets to produce required flow field.
  - Three lower outlets for particles to exit according to their size.
- Parameters:
  - Continuous fluid: density (as function of temperature), viscosity (as function of temperature).
  - Particles: concentration, diameter and density.

ELBOW JET CLASSIFIER:

3.Results (I)

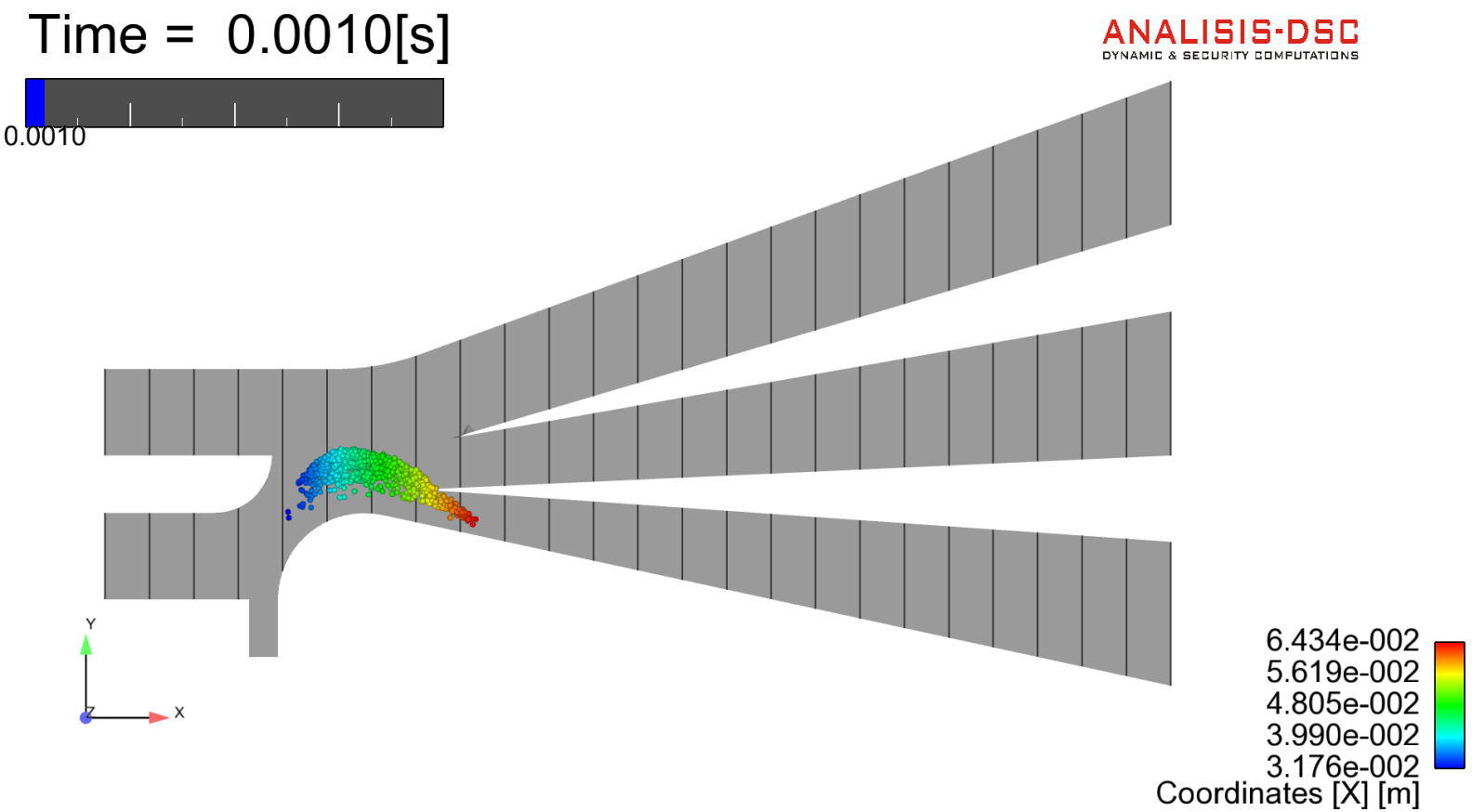
3.a. Particles movement(I)



ELBOW JET CLASSIFIER:

3.Results (II)

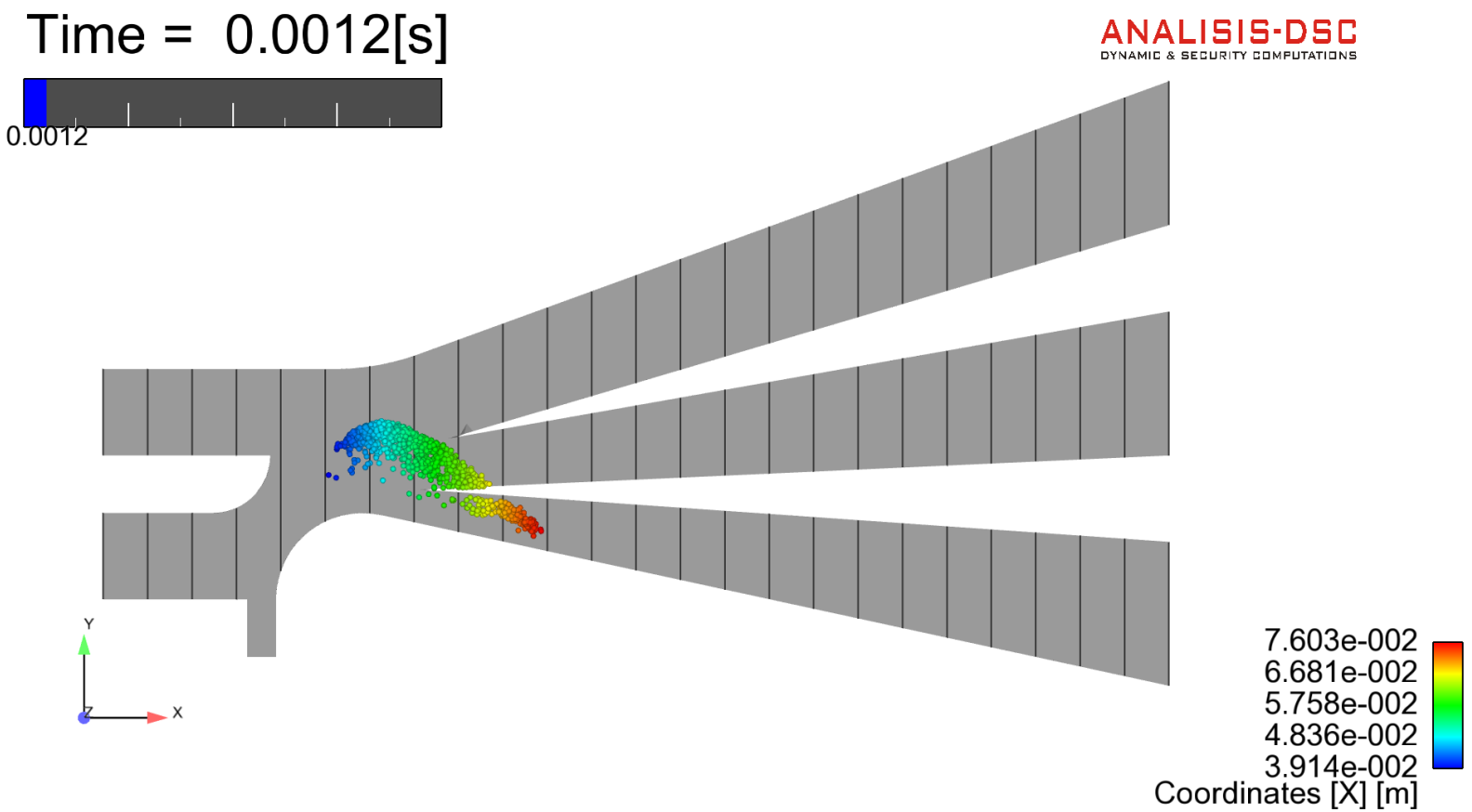
3.a. Particles movement(II)



ELBOW JET CLASSIFIER:

3.Results (III)

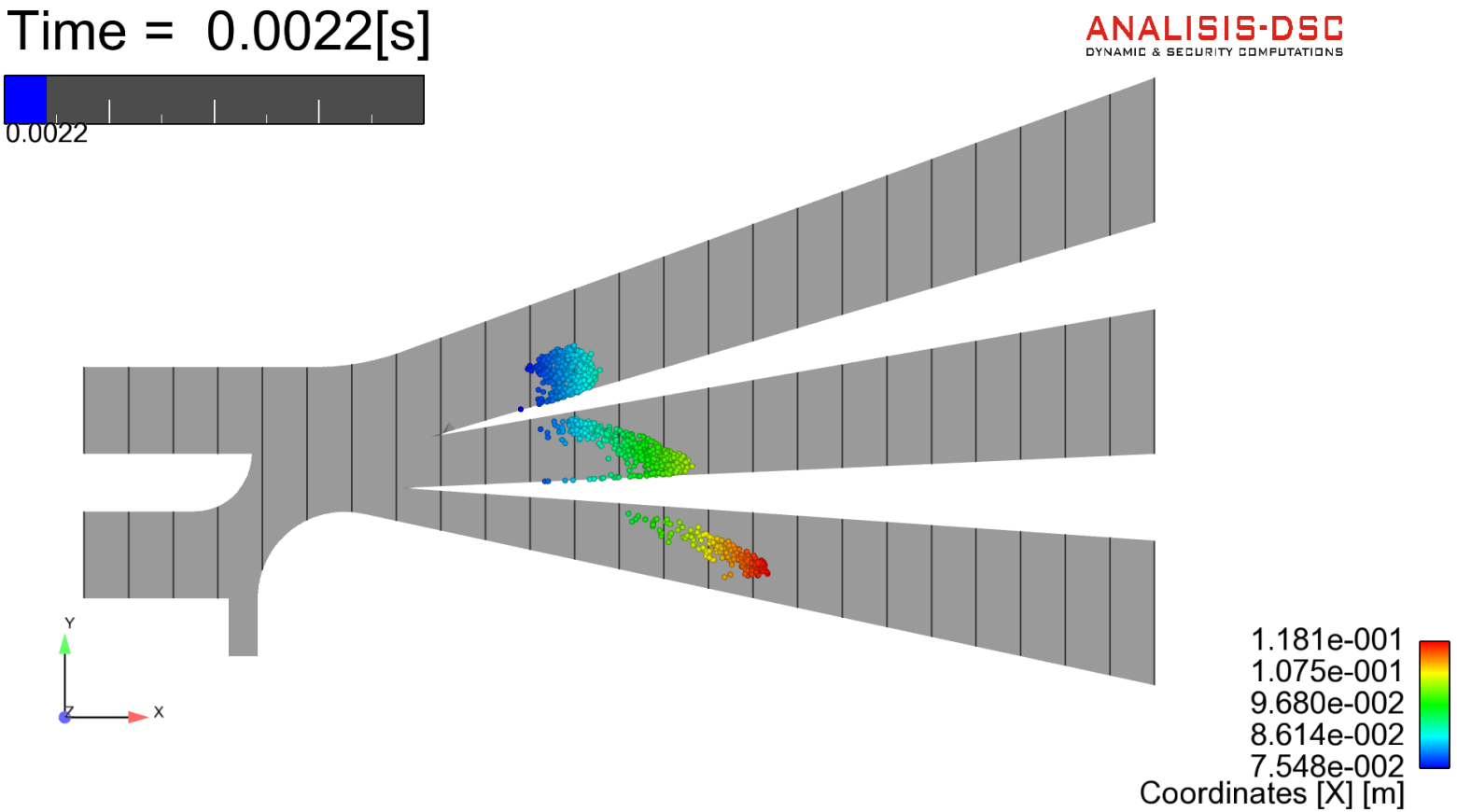
3.a. Particles movement(III)



ELBOW JET CLASSIFIER:

3.Results (IV)

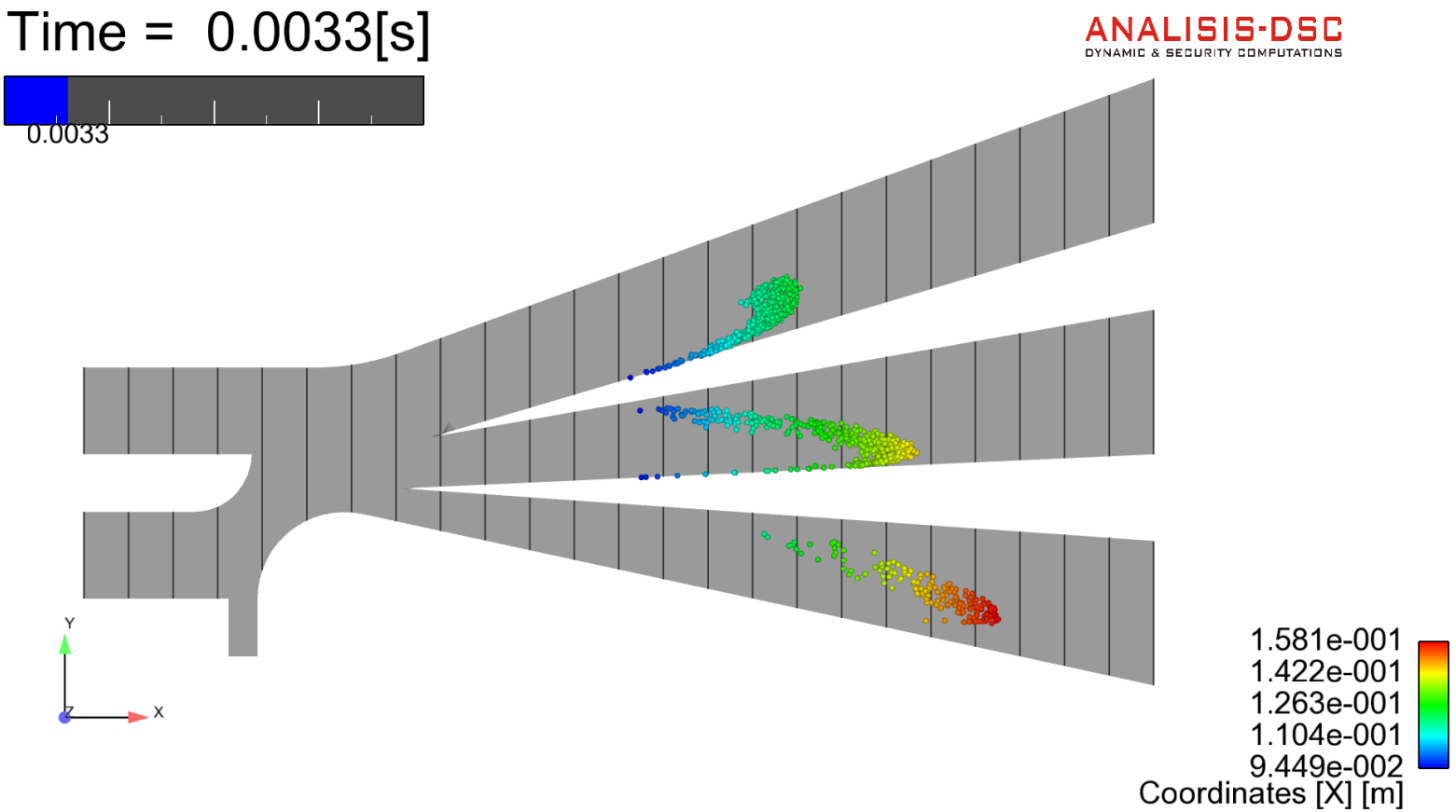
3.a. Particles movement(IV)



ELBOW JET CLASSIFIER:

3.Results (V)

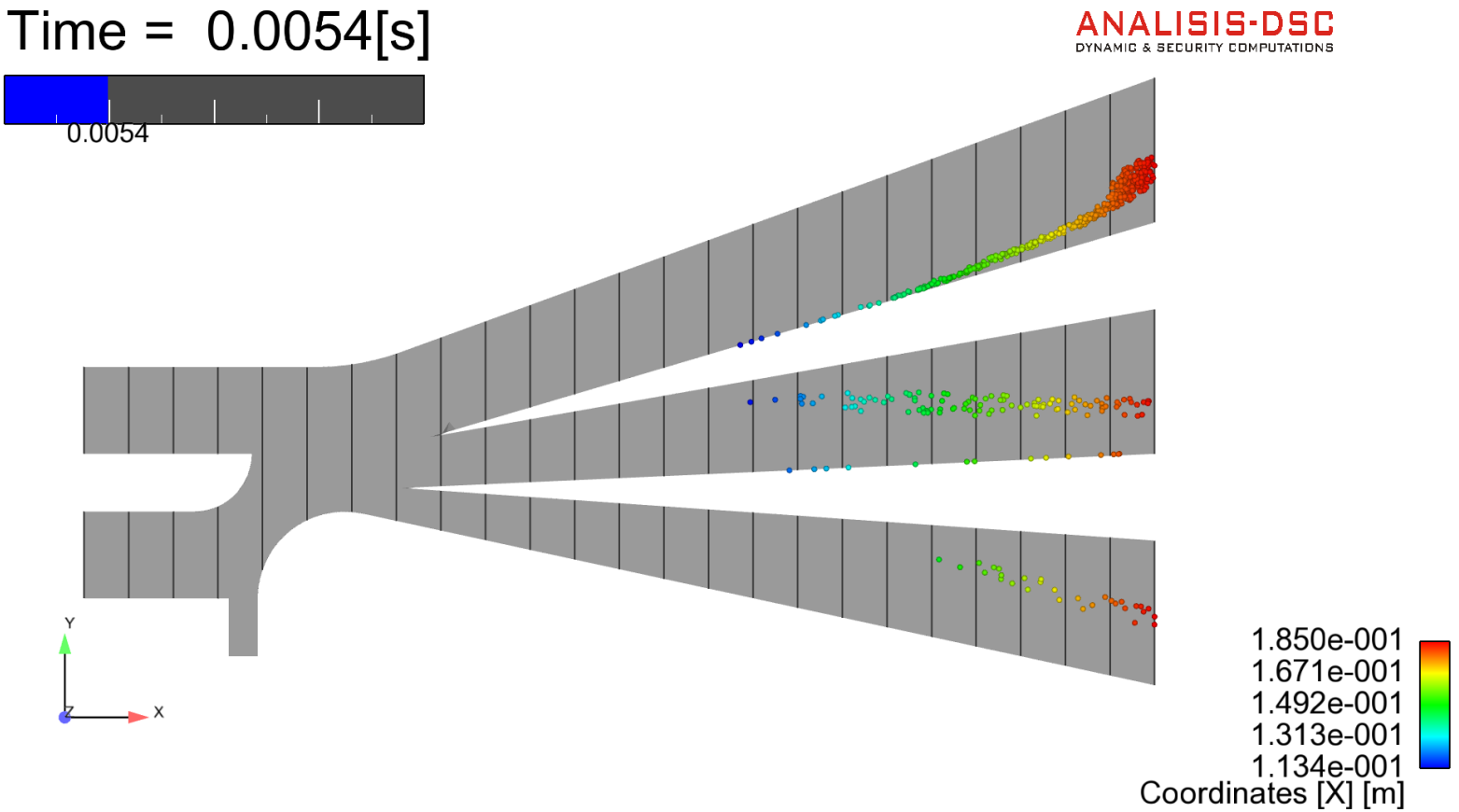
3.a. Particles movement(V)



ELBOW JET CLASSIFIER:

3.Results (VI)

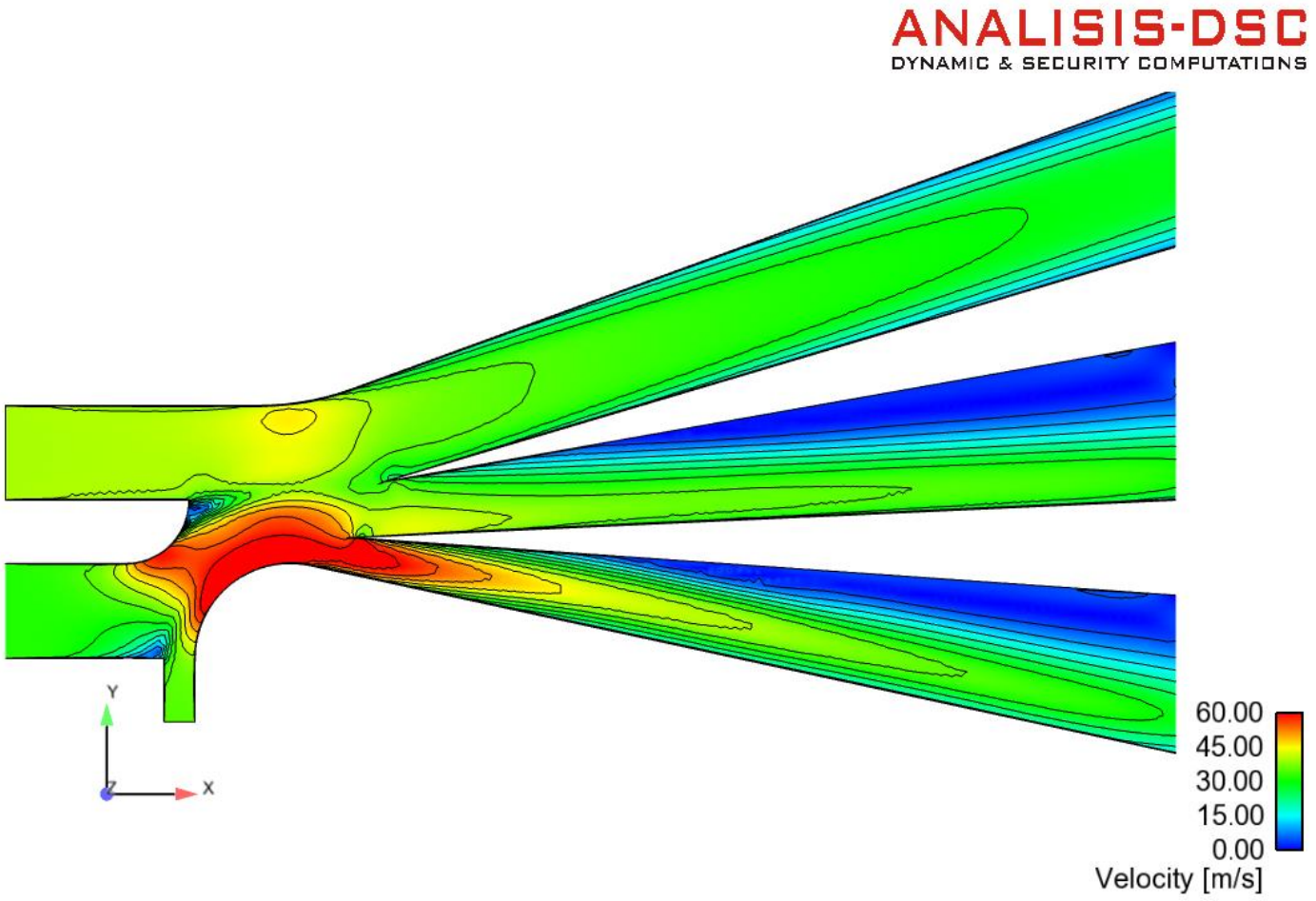
3.a. Particles movement(VI)



ELBOW JET CLASSIFIER:

3.Results (VI)

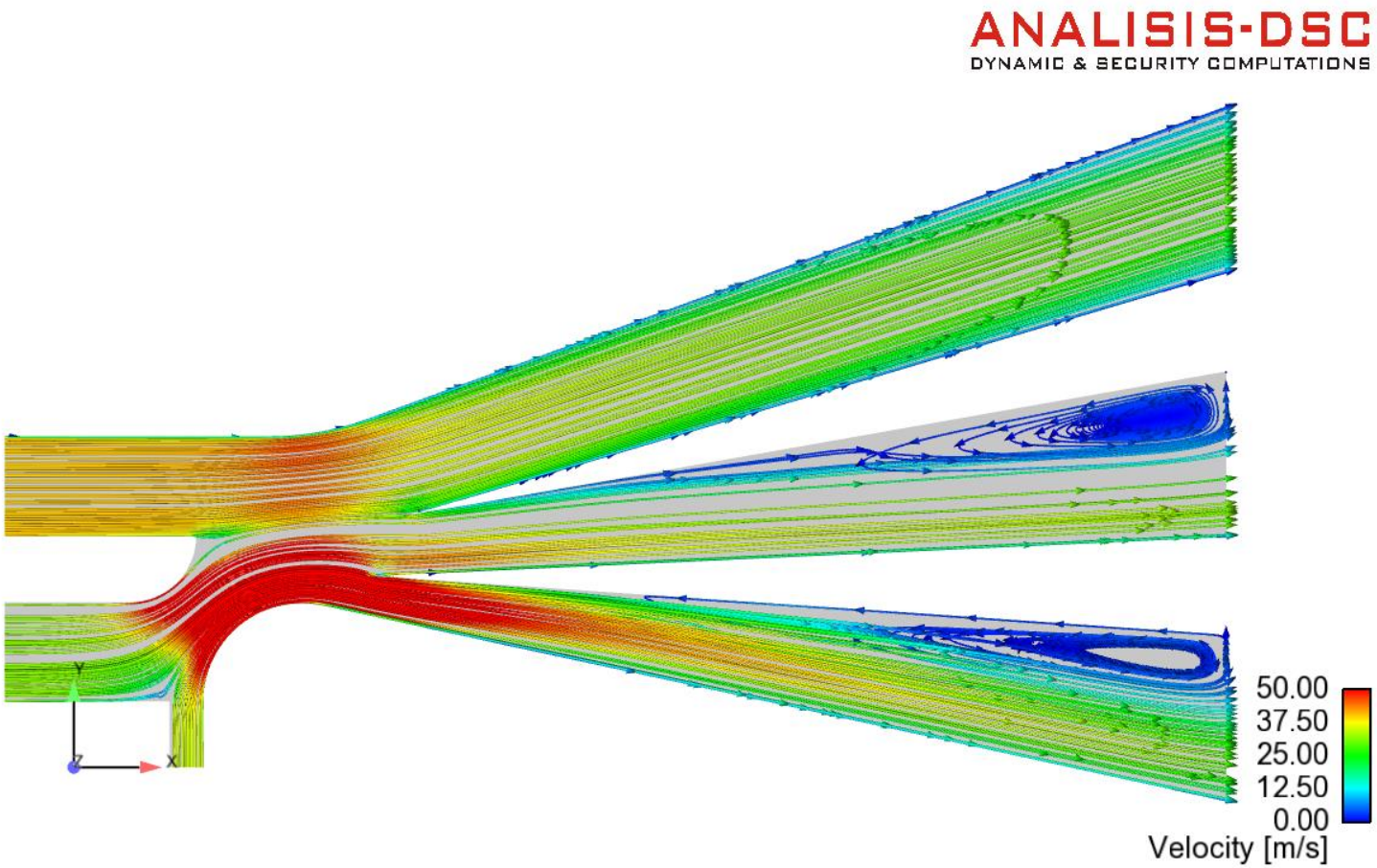
3.b. Velocity field (I)



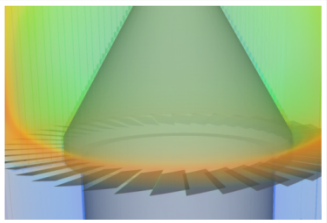
ELBOW JET CLASSIFIER:

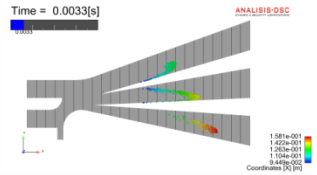
3.Results (VII)

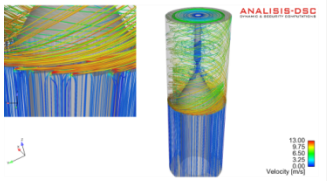
3.b. Velocity field (II)

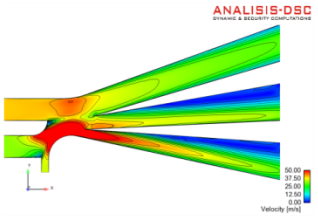


Thank you!









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