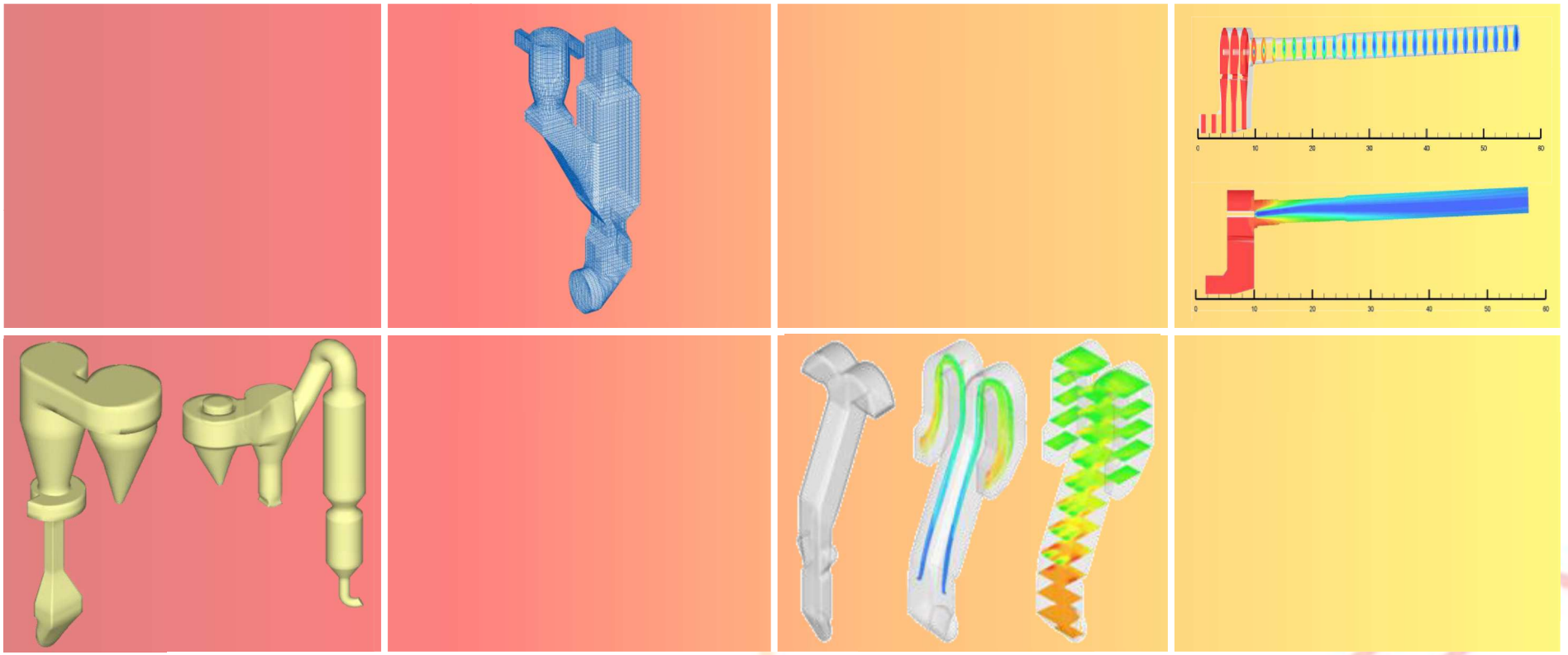

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Solving Industry's Combustion Problems - Worldwide

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Meal Drop - through

Joana Bretz de Souza

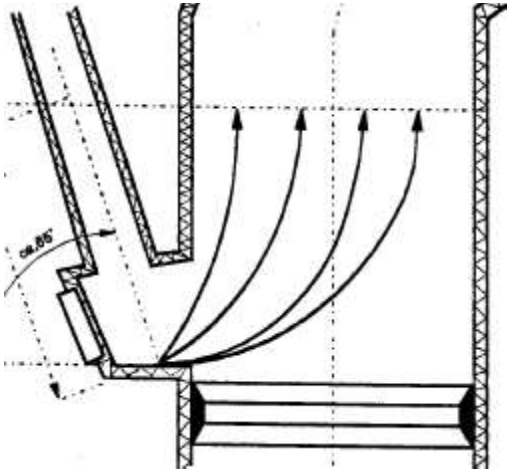
Meal Drop-through???

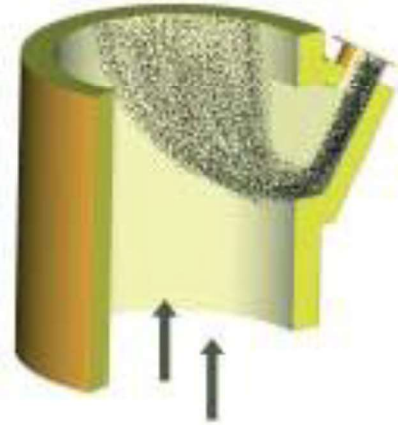
What is it?

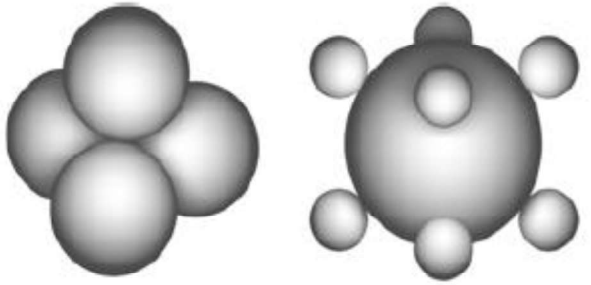
“ Meal short circuit a preheat stage and drop straight into the kiln.”

Cause:

- Low upwards velocites of gas near to the meal inlet;
- Meal agglomeration due to inefficient heat transfer or high alkali –Cl and SO_3;







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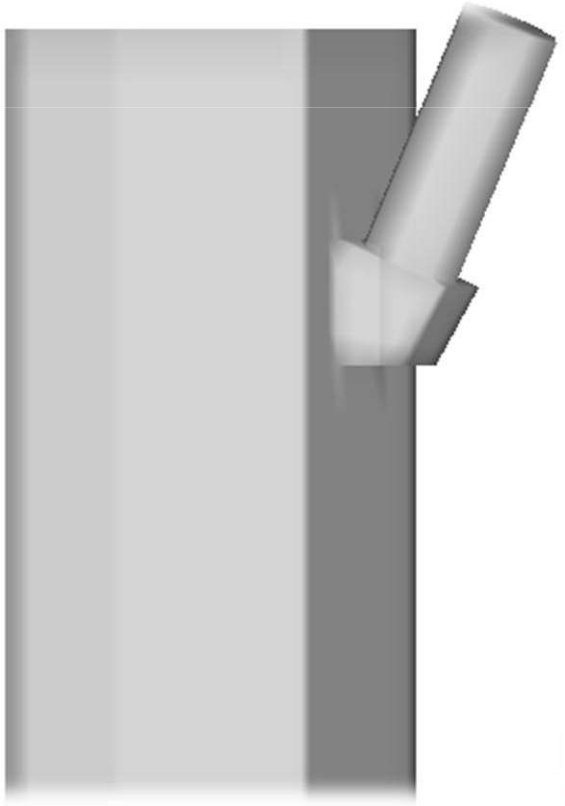
Meal Drop-through???

Consequences:

- Increase on kiln system thermal consumption;
- Increase on cyclones / gas riser temperatures and hence potential for build up formation;
- Reduction of kiln output;
- Meal spillage in the kiln back end;



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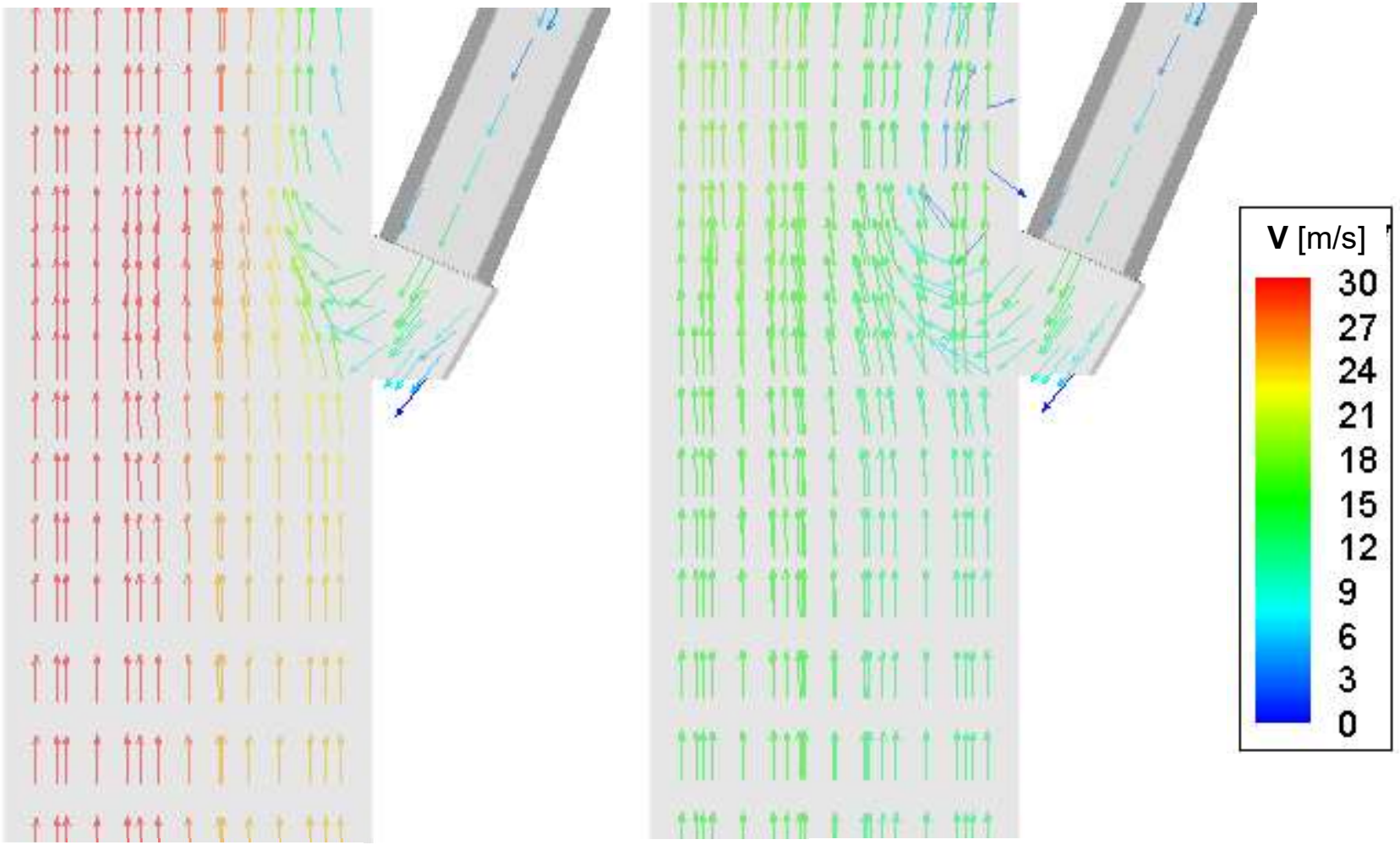
Velocity field - Gas riser



100% Load
Gas riser velocity: 30 – 25 m/s

50% Load
Gas riser velocity: 15 – 12 m/s

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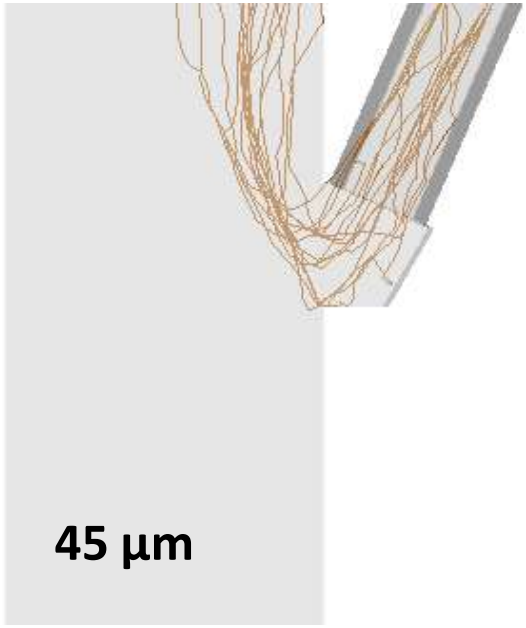
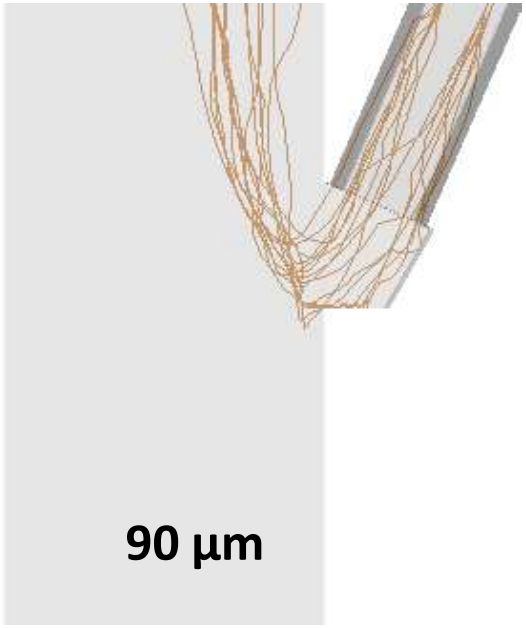
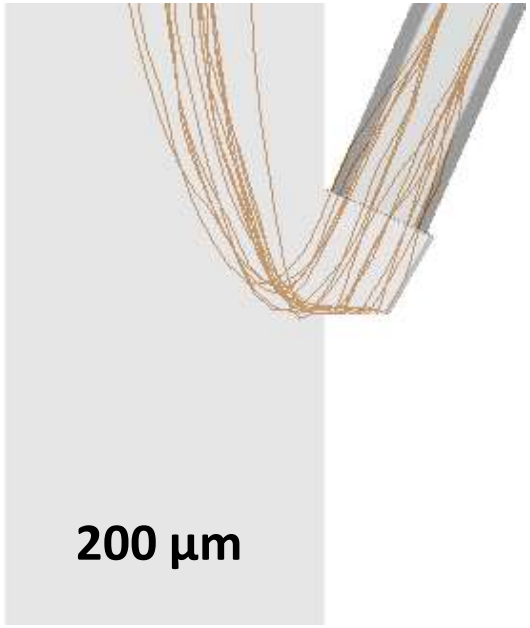
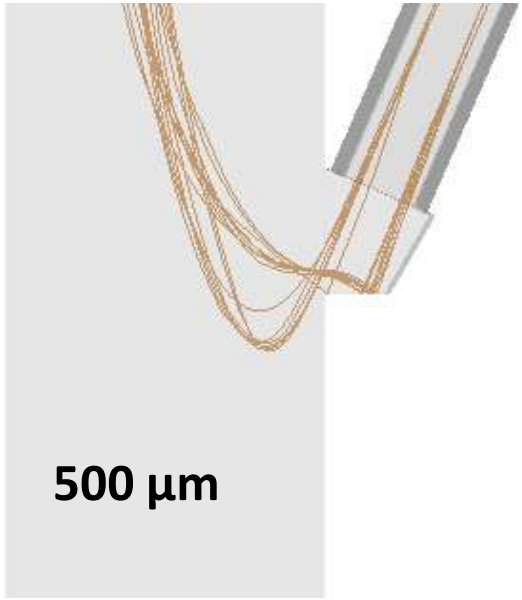
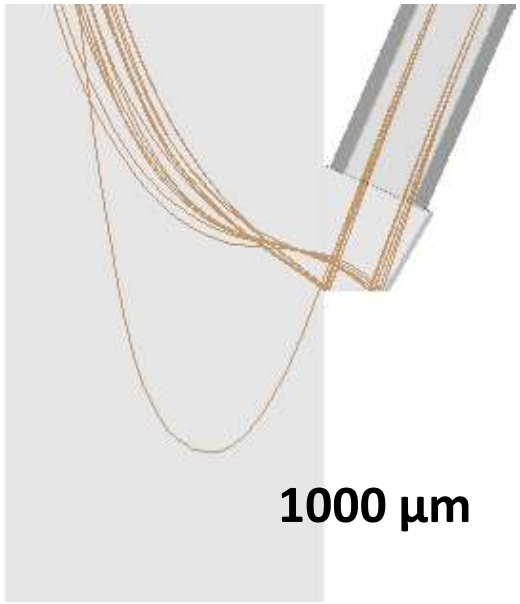
Meal Particles Tracking : 100% Load

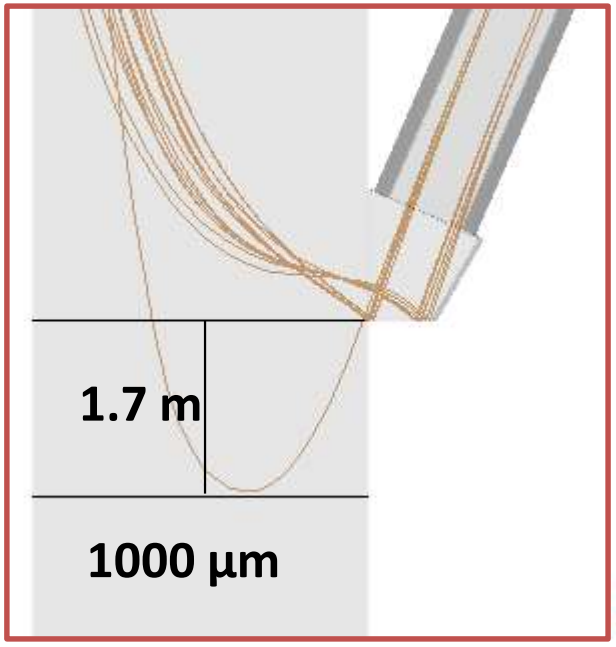












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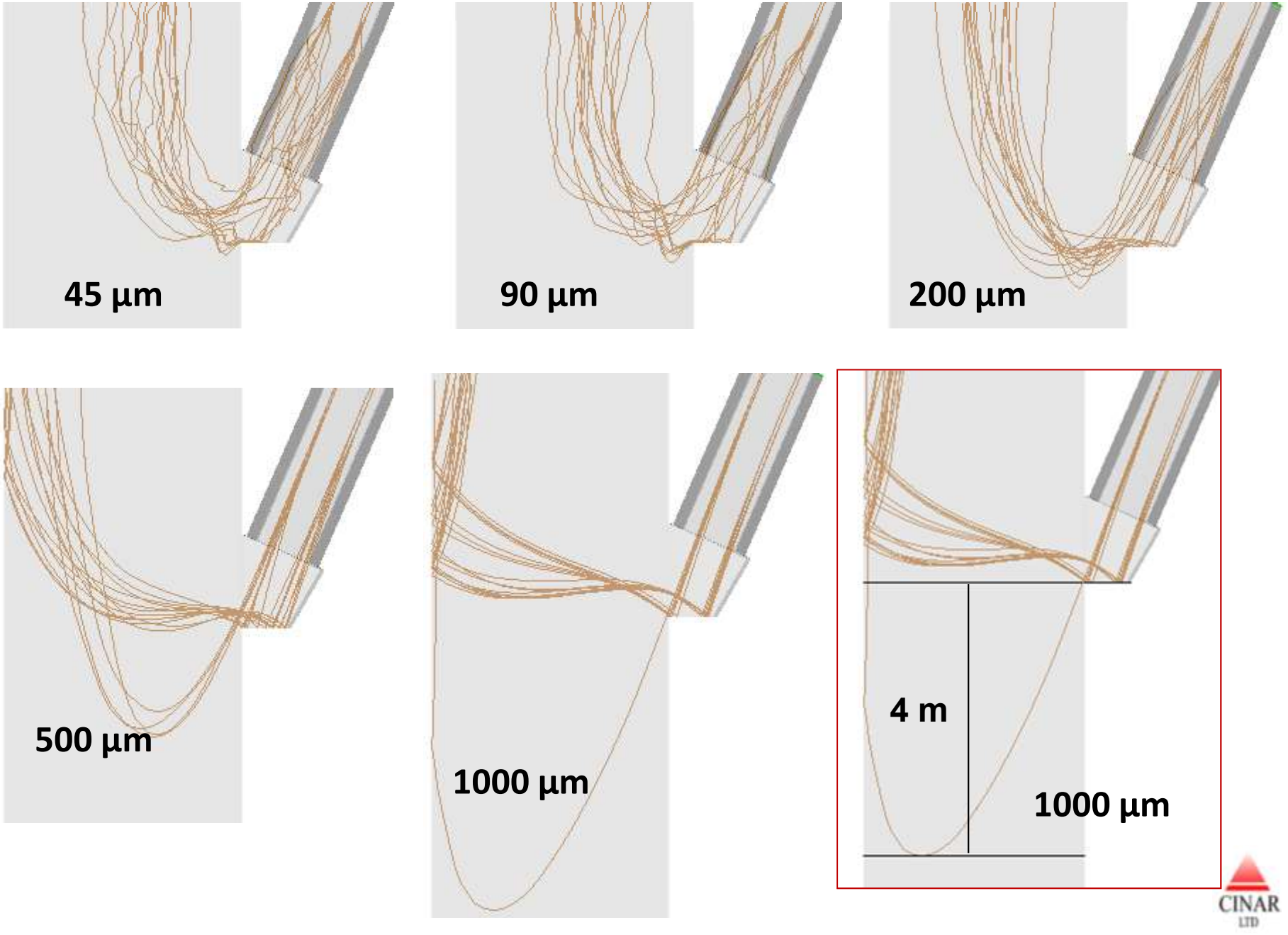
Meal Particles Tracking : 50% Load



Meal Spillage Study

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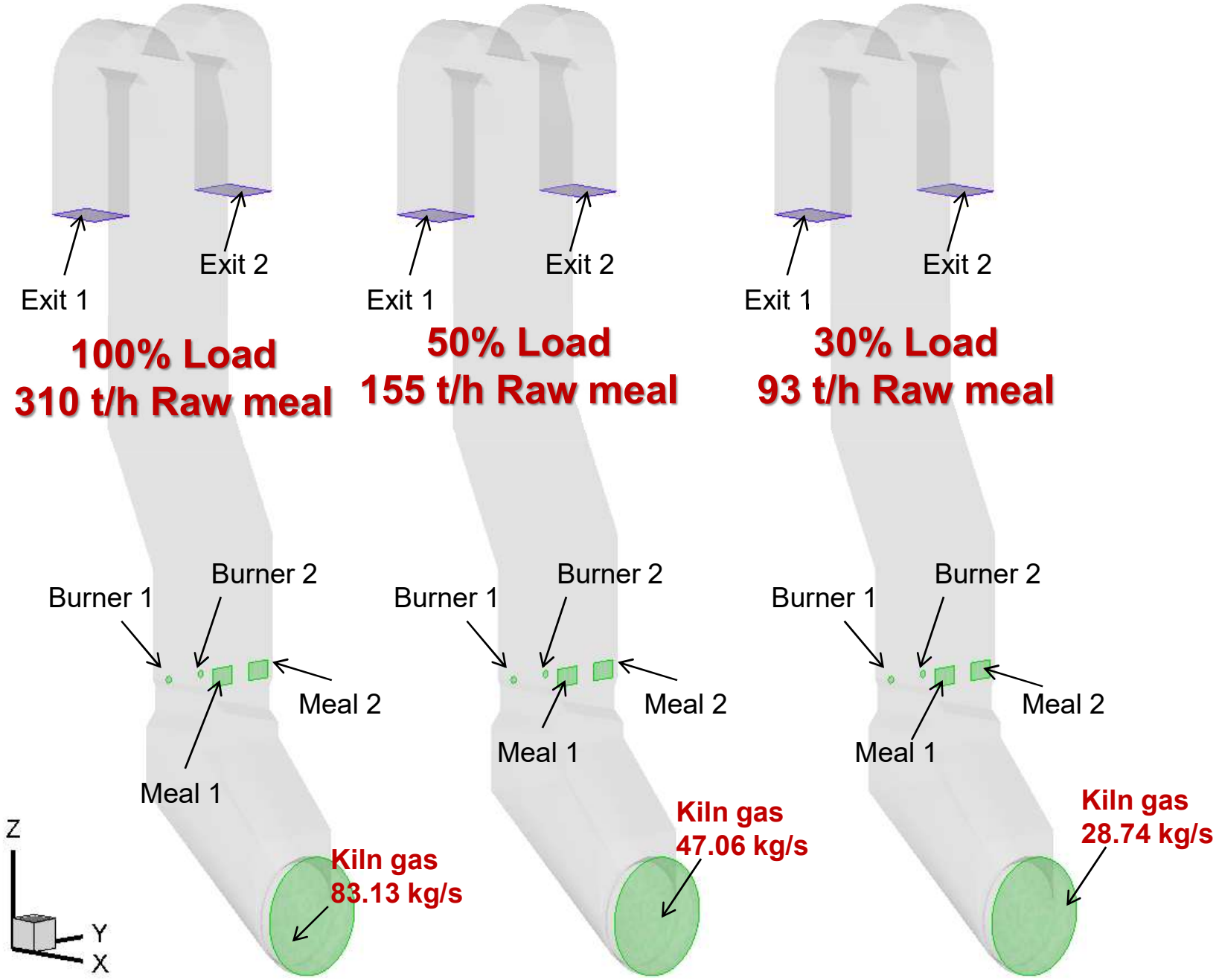
Simulation Data



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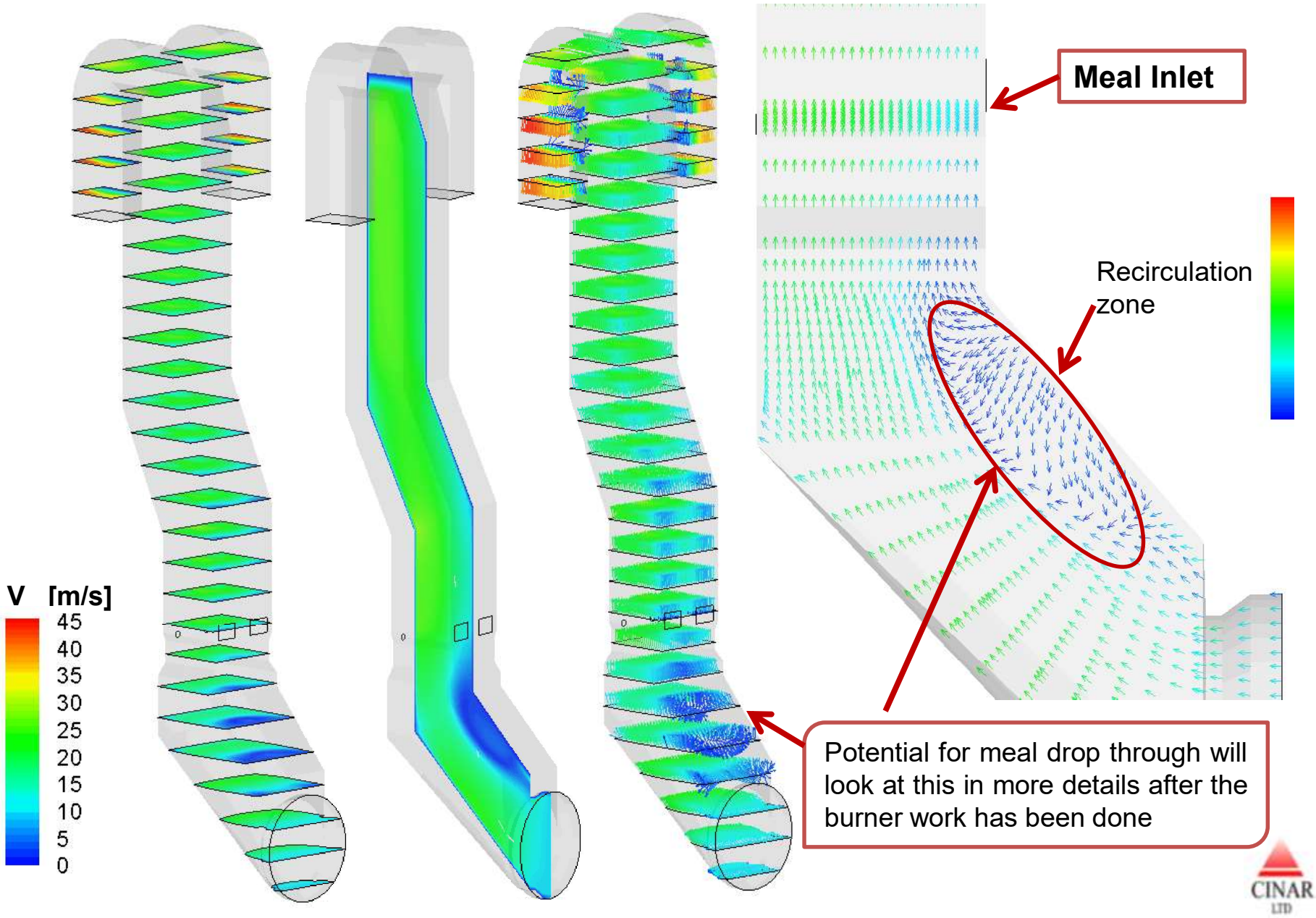
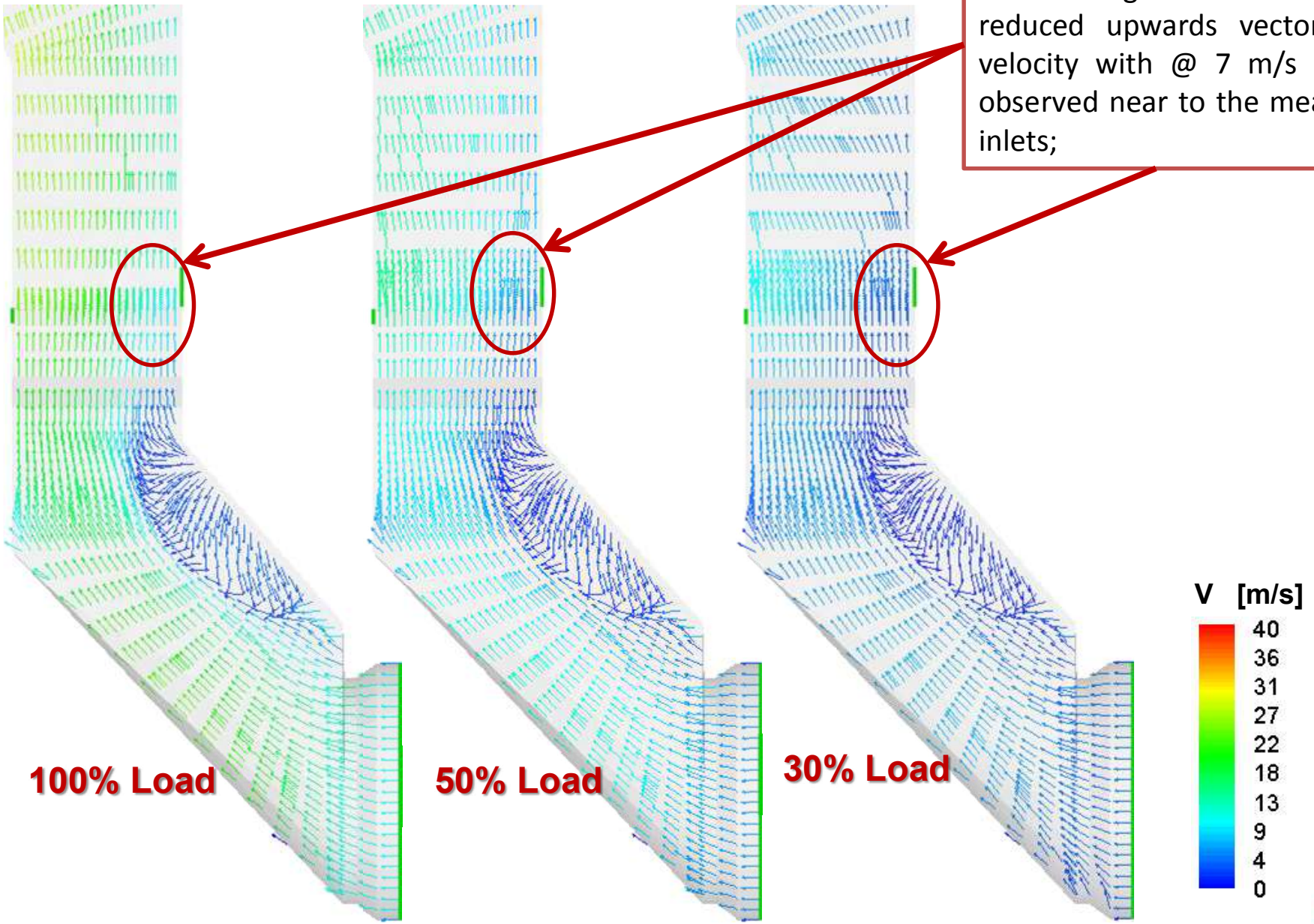
Velocity Field



Velocity Field

Even when kiln production and hence gas mass flow is reduced upwards vectors velocity with @ 7 m/s is observed near to the meal inlets;



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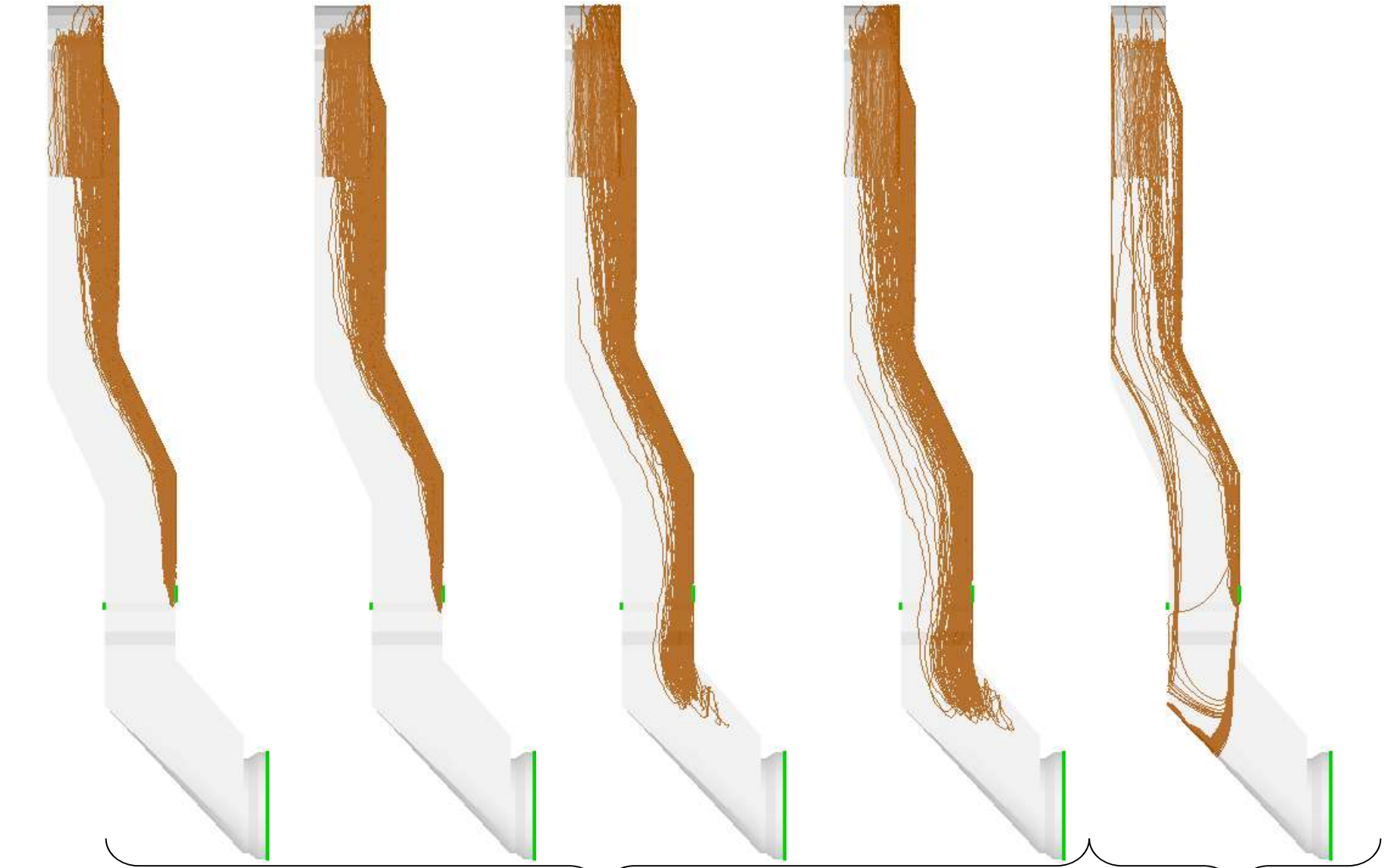
Meal Particles and DFS Trajectories at 50% Load



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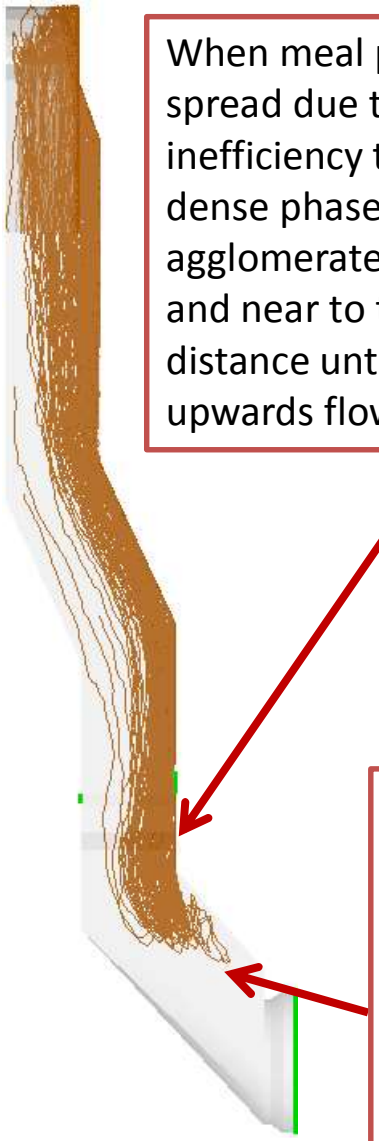
Meal Particles Trajectories at 50% Load



When meal particles does not spread due to splash box inefficiency they behaves like a dense phase of meal agglomerates which goes down and near to the wall for some distance until be spread by upwards flow.

While meal agglomerates keeps in micron scale size they can be captured by the recirculation zone but even in that case upward flow will be able to spread that small agglomerates and revert its trajectory to the upward direction.

But some bigger agglomerates in the millimeters scale can also be formed by meal particles. Those are heavier and more difficult to spread, specially at lower kiln production rates when upwards velocity is also low.
Hence some bigger agglomerates go down and reach back end wall then drop down and are carried by hot meal and causing spillage problems.

From that point meal agglomerated will drop and be carried by hot meal to kiln seal region.

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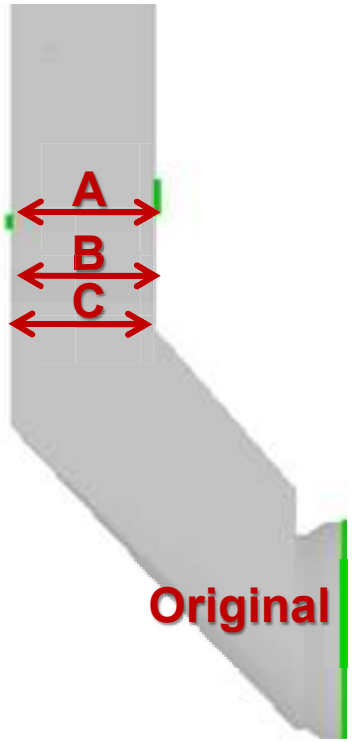
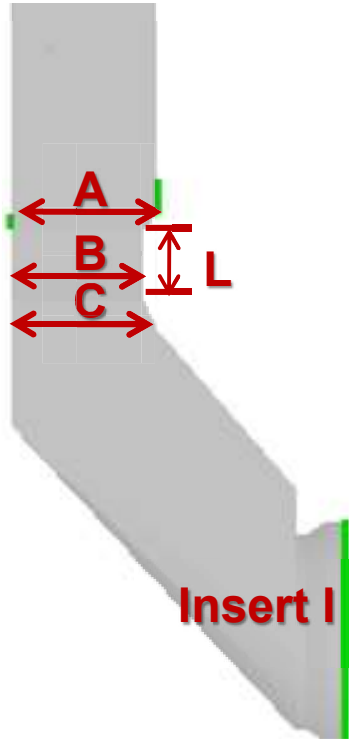
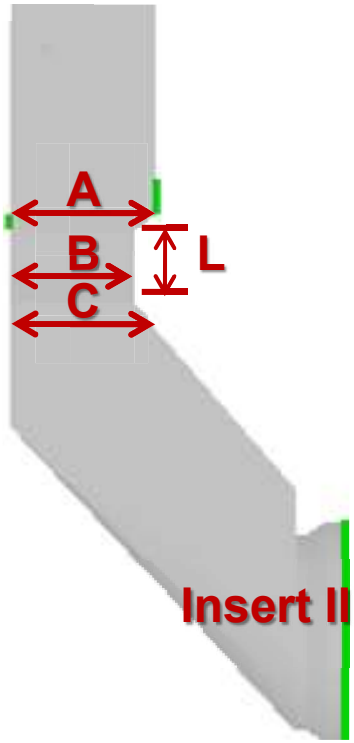
The Insert Design







Position	Original	Insert I	Insert II
A	3.65	3.65	3.65
B	3.65	3.35	3.07
C	3.65	3.65	3.65
L	-	1.78	1.78

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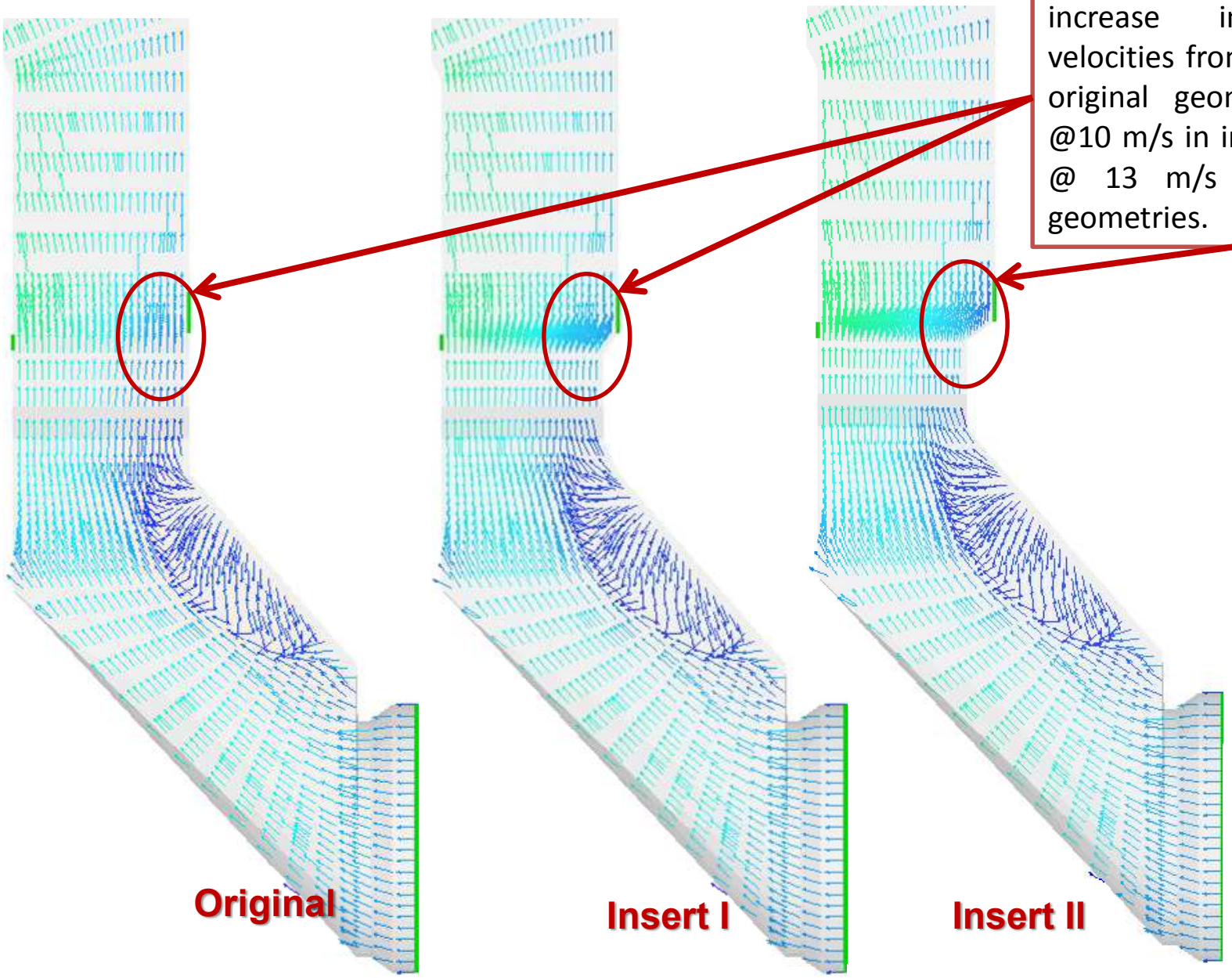
Velocity Field with the Insert at 50% Load

Due to the insert an increase in upwards velocities from @ 7 m/s in original geometry up to @10 m/s in insert I and to @ 13 m/s in insert II geometries.



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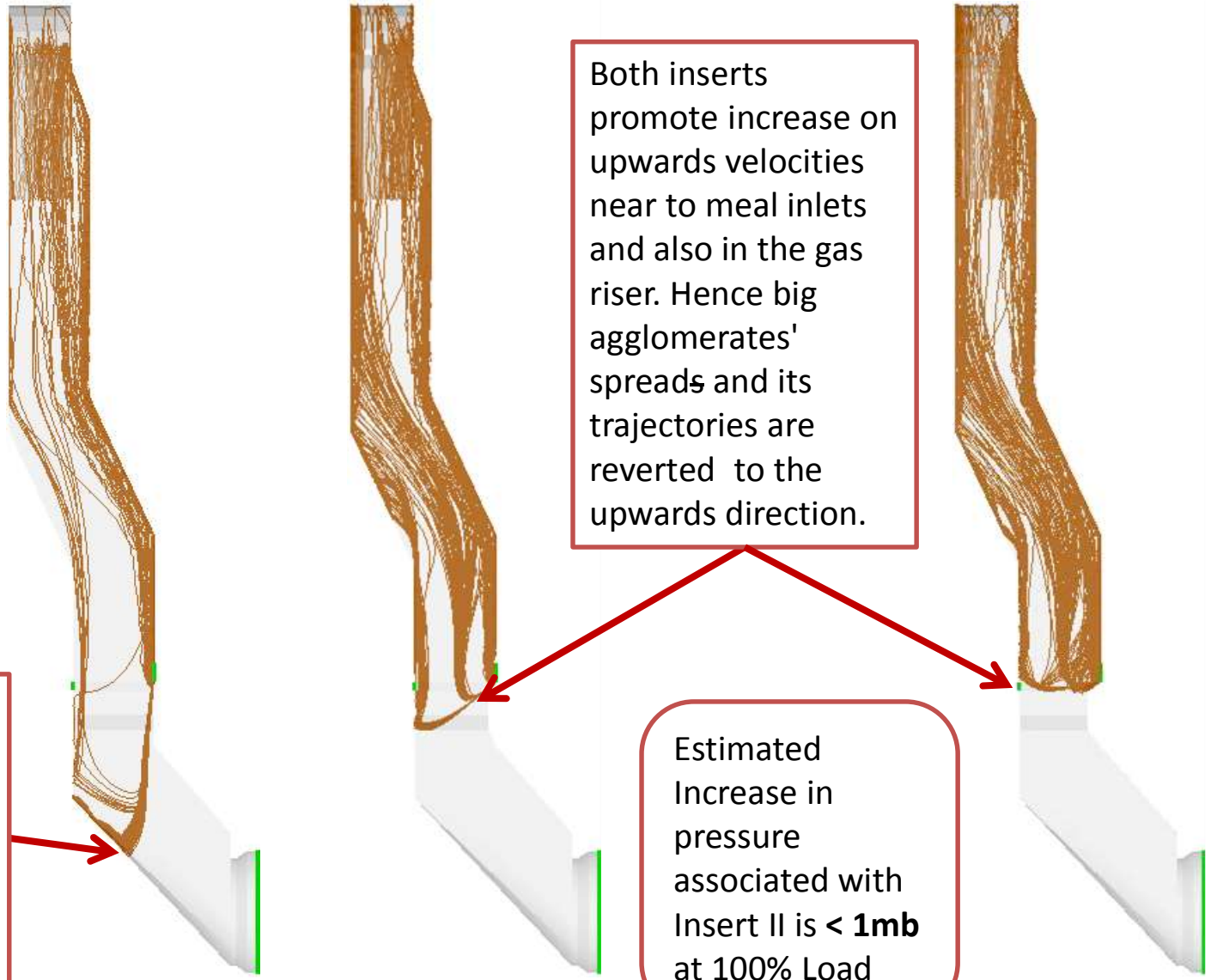
Meal Particles and DFS Trajectories at 50% Load



From this point meal agglomerated will be carried by hot meal to kiln seal region.

Both inserts promote increase on upwards velocities near to meal inlets and also in the gas riser. Hence big agglomerates' spreads and its trajectories are reverted to the upwards direction.

Estimated Increase in pressure associated with Insert II is **< 1mb** at 100% Load

Original **Insert I** **Insert II**

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Thank you!!!!

Please, do not forget to answer the “Feedback” Questinary…