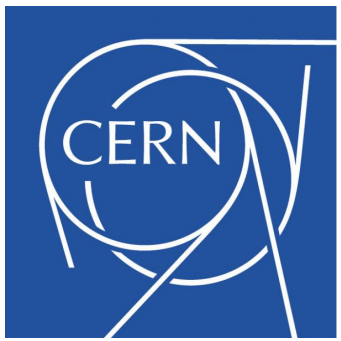
HVAC investigation of building 311 ventilation system

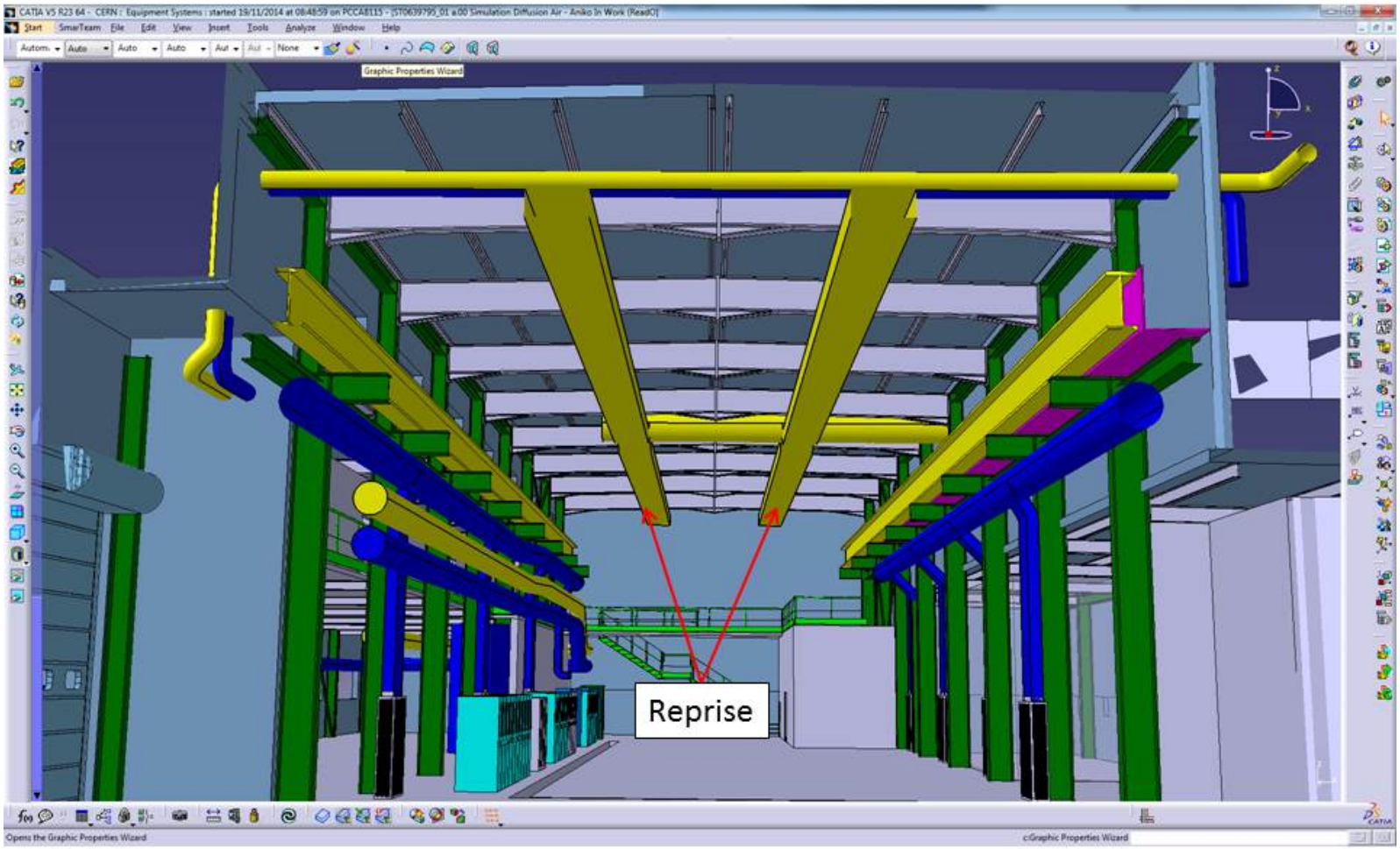
Rakai, Pacholek

December 12, 2014



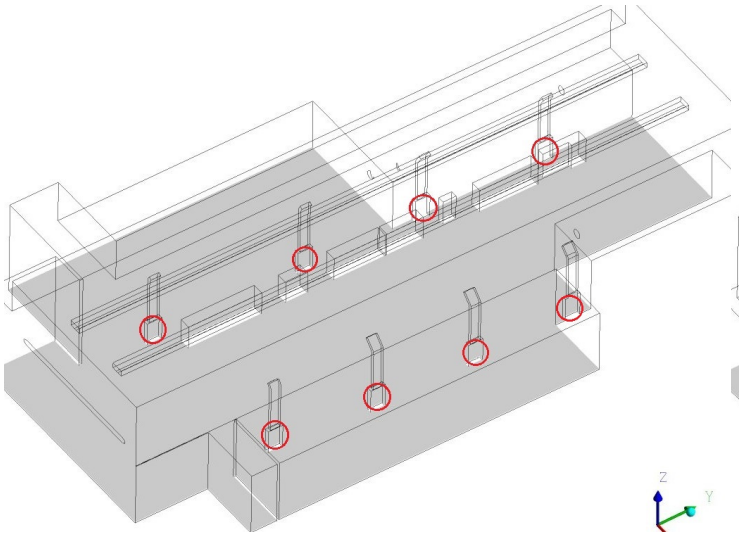
Engineering Department

Original CAD geometry

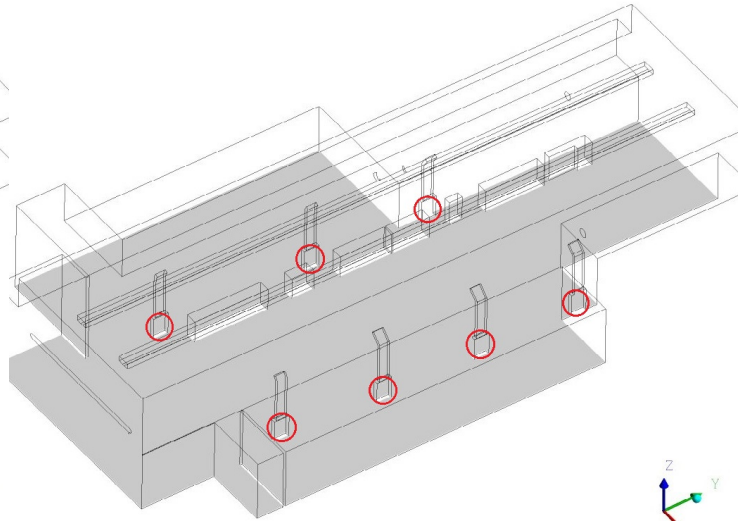


Cleaned up CFD geometry

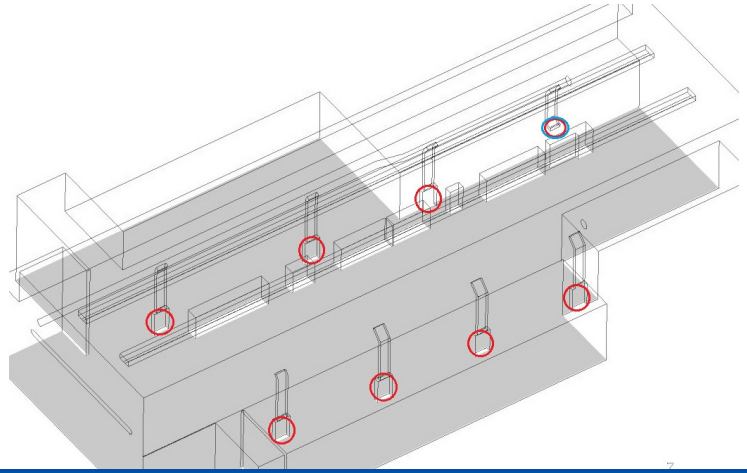
Option 1 (8 diffusers)



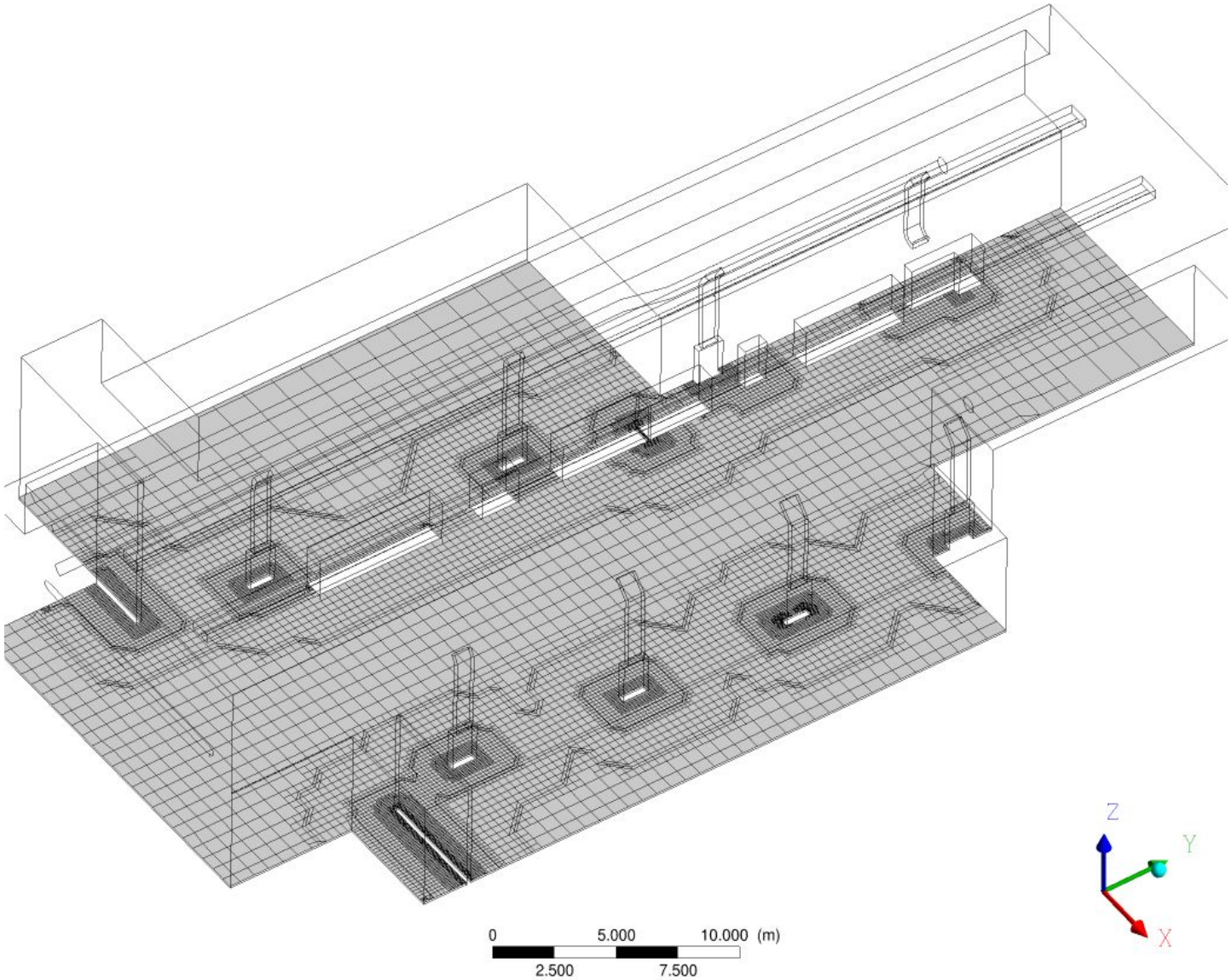
Option 2 (7 diffusers)



Option 3 (7 + 1 special diffusers)



Mesh

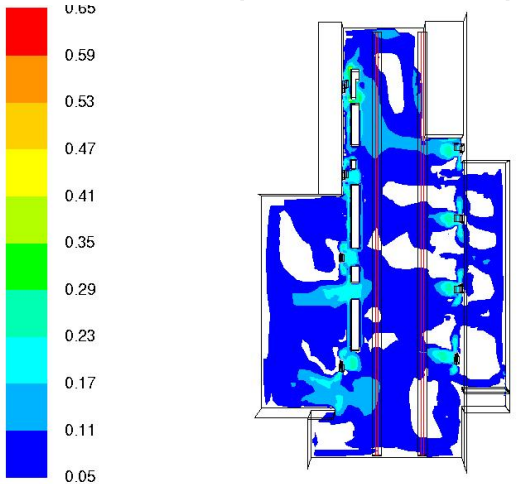


Numerical model

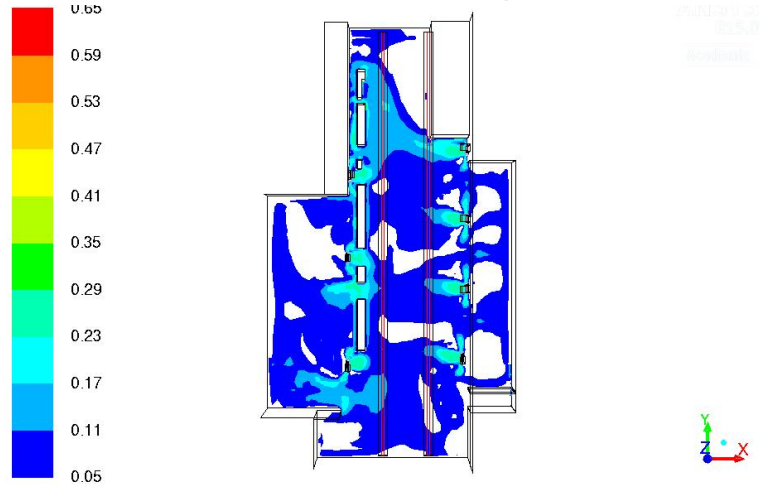
- 25000 $\frac{m^3}{h}$ 18 °Ccooling air ventilated
- 20 kW heat from equipment (boxes)
- 30 kW heat from environment
- 0.23-0.26 $\frac{m}{s}$ inlet velocity depending on diffuser design
- Steady state solver with SIMPLE pressure velocity coupling
- Natural convection with Boussinesq approximation

Velocity magnitude at 1 m height

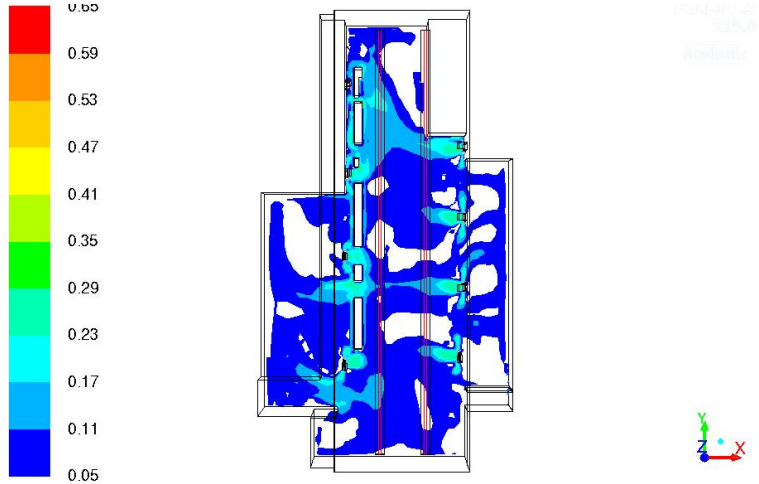
Option 1 (8 diffusers)



Option 2 (7 diffusers)

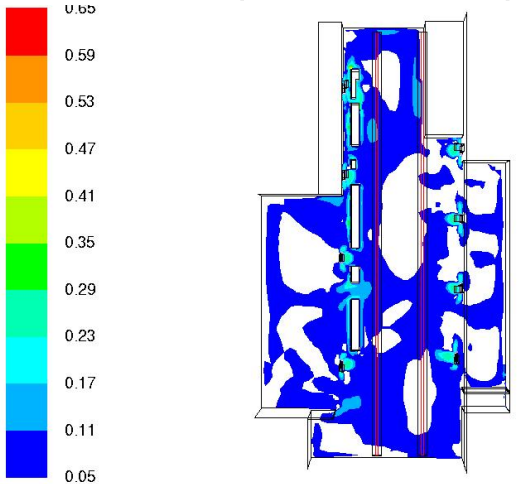


Option 3 (7 + 1 special diffusers)

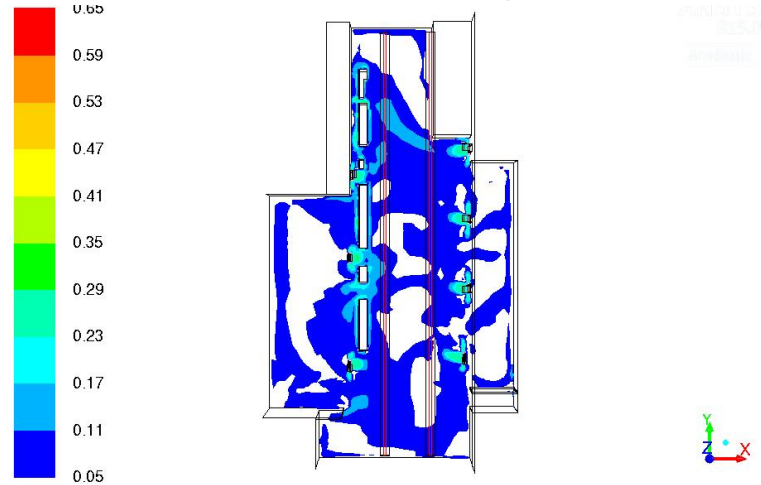


Velocity magnitude at 1.5 m height

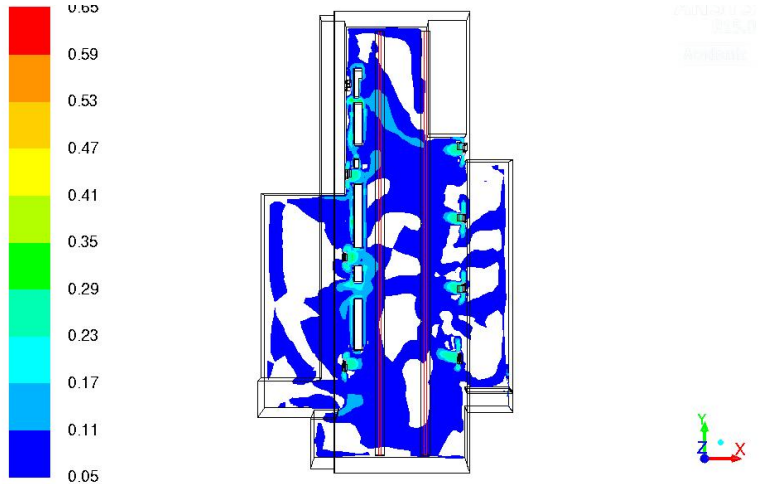
Option 1 (8 diffusers)



Option 2 (7 diffusers)

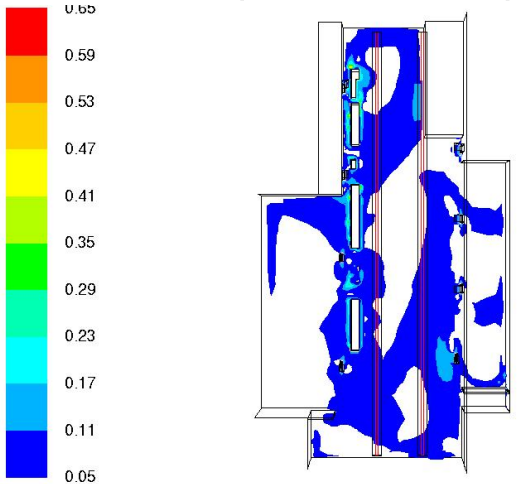


Option 3 (7 + 1 special diffusers)



Velocity magnitude at 2 m height

Option 1 (8 diffusers)



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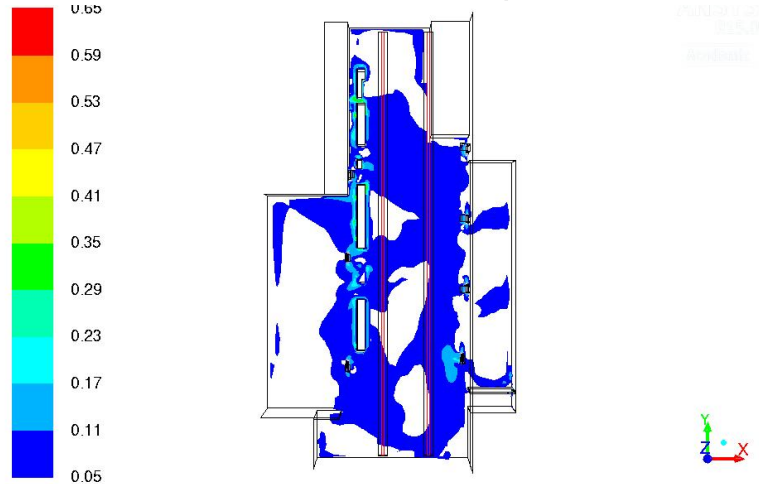
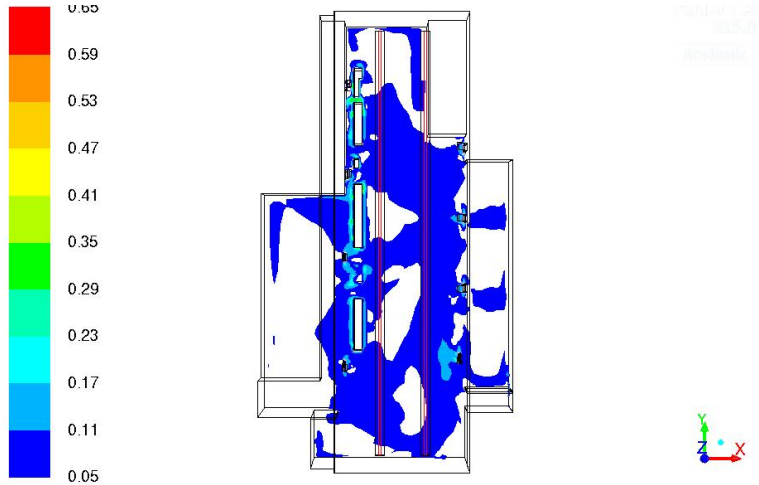
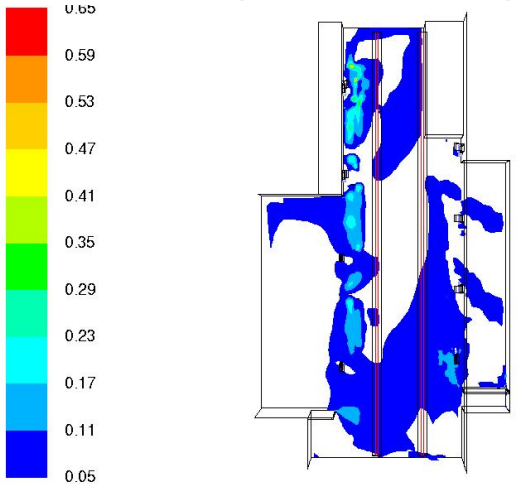


Option 3 (7 + 1 special diffusers)



Velocity magnitude at 2.5 m height

Option 1 (8 diffusers)



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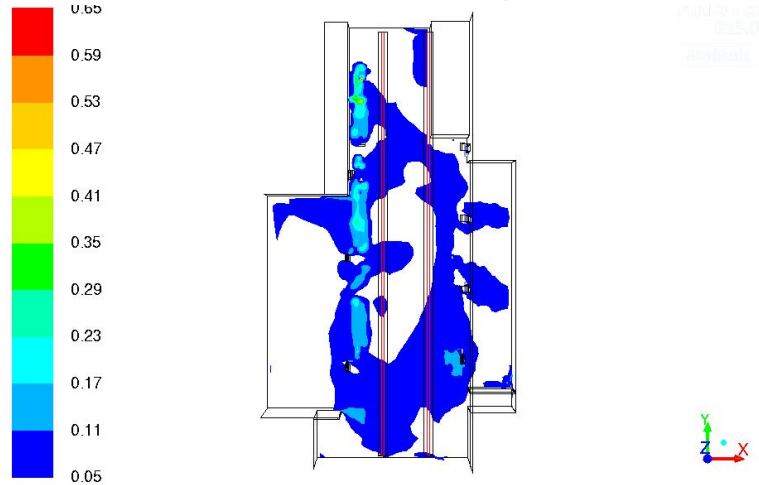
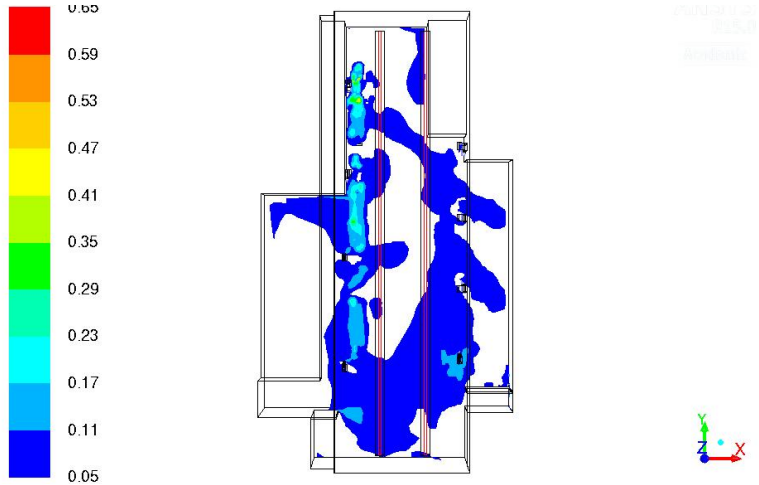
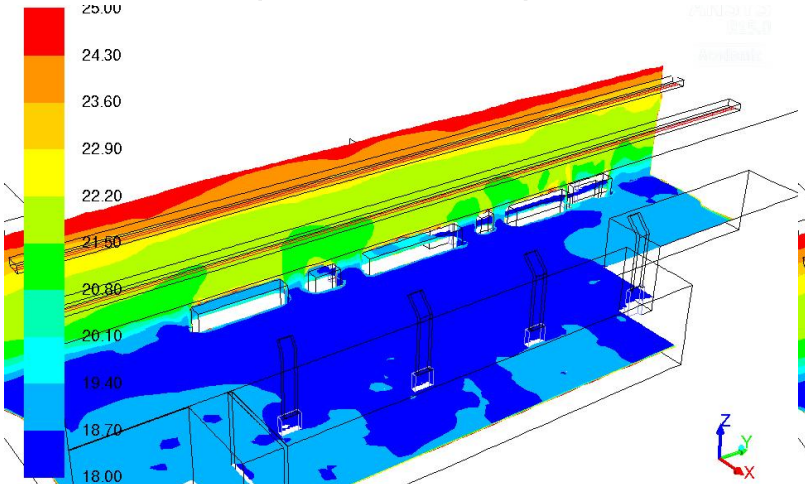


Option 3 (7 + 1 special diffusers)



Temperature: average outlet 24 °C

Option 1 (8 diffusers)



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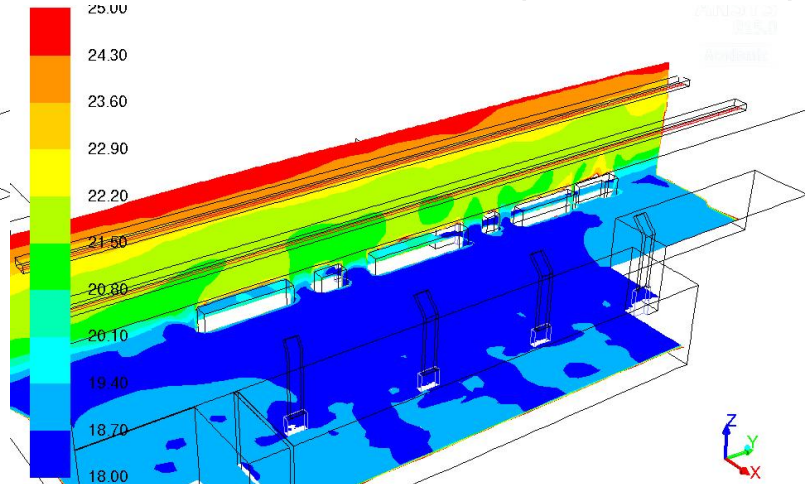

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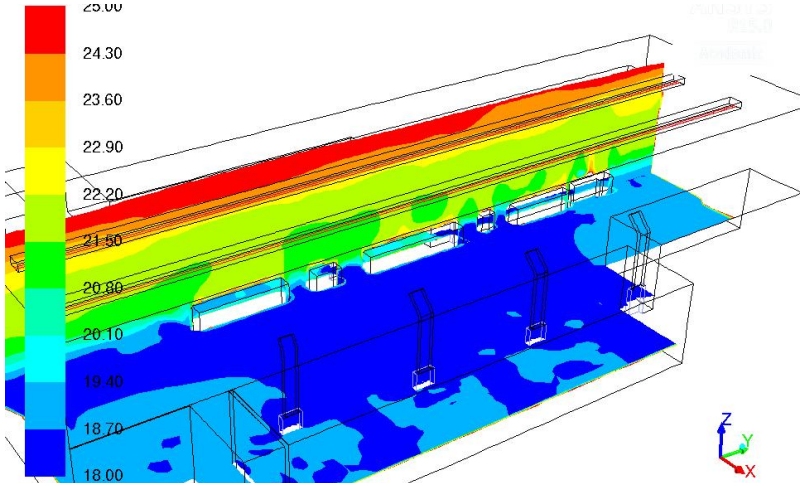

Thank you for your attention!