



Aerothermal
Management

Aerothermal study of a train pipe leak

Objective

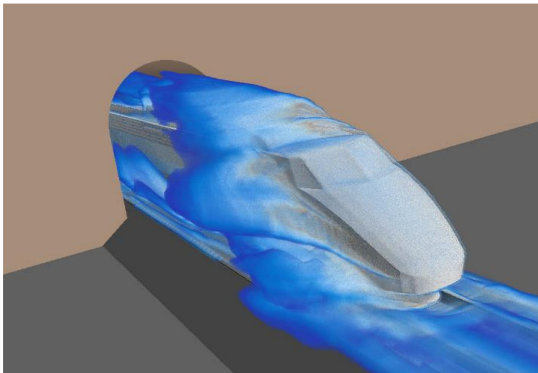
Today, the railway has established itself as one of the main modes of transport and the sector is constantly innovating for better technical performance and for the comfort and safety of passengers. There are various areas of study, including vehicle aerodynamics and thermodynamics. Certain parts of the train, which are more sensitive require greater attention. As such, flammable gas leaks may occur on some equipment. Digital simulation makes it possible to reproduce a leakage situation that is difficult to achieve during test campaigns with the aim of ensuring proper evacuation to avoid any risk of explosion.



Implementation

Zelin has set up a dedicated calculation process for modeling this type of flow:

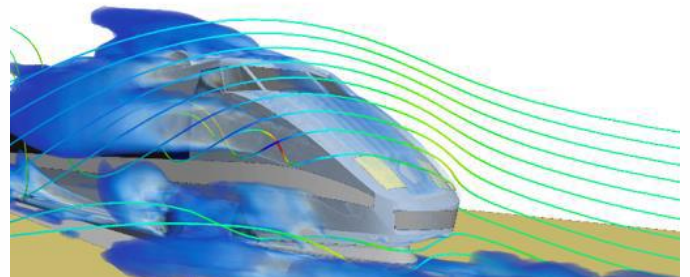
- 3D model of the train
- Material resources: HPC cluster (200 cores) & SIEMENS StarCCM + Software
- Some analytic examples:
 - o Advanced mesh sensitivity (up to 30 million cells)
 - o Results refinement, using different approaches: steady (RANS) & unsteady (URANS)
 - o Multi-species advection and diffusion modeling
 - o Analysis of local explosion risks



Result

This study made it possible to assess the volume of flammable gas released during the leak, as well as its spatial and temporal distribution within the train.

The configuration that's most exposed to the risk of explosion has been identified, and we have proposed conceptual approaches in order to limit these risks.



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