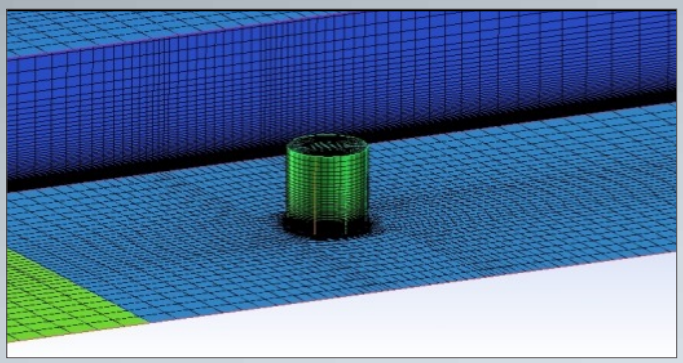
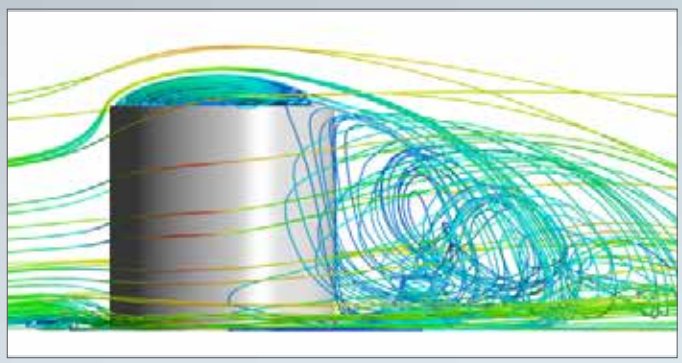
BUILDING AERODYNAMICS: ANALYSIS OF COMPLEX WAKE STRUCTURES

Case Study

Plymouth based Pipex PX Ltd, working in partnership with the UK's MET Office, commissioned DesignFlow to assist in the design and analysis of a replacement weather balloon release shelter. The major requirement was for a calm 'wake' region downstream of the building in which balloons and the sensitive telemetry equipment they carry, can gain altitude quickly without exposure to high winds and unpredictable gusts.



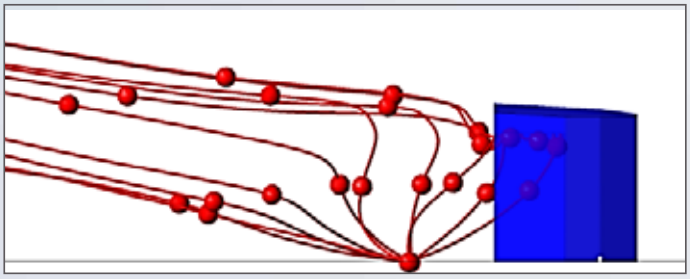
Hexadhedral meshing of validation geometry



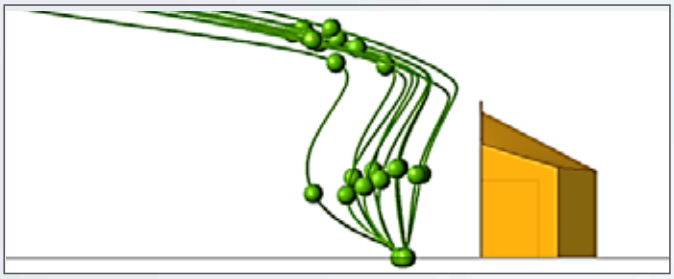
Downwash in wake of simple validation structure

Appropriate validation work is fundamental in generating a reliable computational model. This initial work focussed on replicating known experimental results and ensuring that wake flow characteristics could be reliably modelled. Alongside this, particle tracking models were validated to allow the prediction of balloon trajectories after release.

Through a combination of extensive validation, expert modelling work and a structured, iterative design process, a significantly improved shelter design was developed and the visual assessment of balloon trajectories gave both Pipex and the MET Office the assurance of a 'fit for purpose' design.



Balloon trajectories downstream of original structure



Improved Balloon trajectories downstream of new structure

> DesignFlow effectively integrated computational tools into the shelter design process. Crucially, this gave us the ability to base engineering decisions on the most important element of the entire project; the trajectories of weather balloons after the point of release. This corrected our initial assumptions and steered us down the right path, allowing us to make fully justified design choices. This gave us a confidence in our proposed structure that would not have been possible without advanced numerical modelling techniques."
>
> **Matt Hewstone**
> **Director**
> **Pipex PX Ltd.**

UNIVERSITY OF PLYMOUTH

DesignFlow is a specialist consultancy and research group operating within Plymouth University. We offer a range of CFD, engineering analysis and product development services to industrial clients and research partners.

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