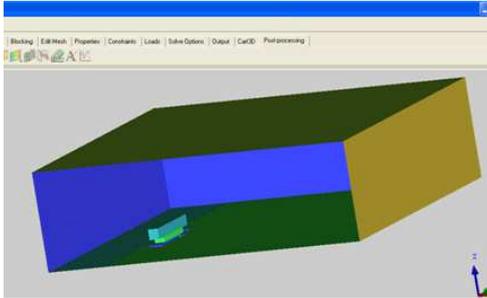


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Aerodynamic Shape Optimization of a Freight Train Subjected to a 30 °Side Wind with CFD



Background

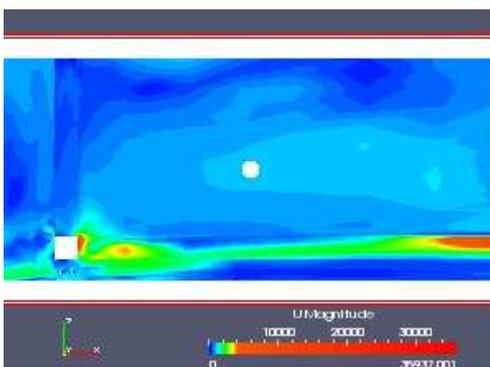
During the world wide there is a trend of increasing train speed, which brings series of associated problems. One of these is the increasing significance of aerodynamic forces which leads the trains' unsteady besides the drag force's increase. In that huge wind area especially in recent years the accidents which caused by side wind occurred frequently. A freight train, compared with passenger train, will not meet the serious safety problem. However it may be overturned by the side wind. The vehicle and rail track will be destroyed. It will need to pay time and money to be rebuilt. This is not good to the development of railway business.

Work Plan

The object in this project is a container train, composed of an upperbox, a lower box, a chaste and 4 wheels, which is subjected to 30 degree side wind at the speed of 20 meters per second. Hence the train will be loaded with drag, lift, and lateral pressure and rolling moment at the same time. To see which shape leads to which result to the train, two parameters are to be verified. R1 is the radius between roof and side wall. R2 is the radius between end wall and side wall. The R1 and R2 will have three values-- 0, a quarter and a half of width of end wall. The different nine combined geometries were to be simulated.

Conclusion

During the simulation, the system showed some cells had high aspect ratio and highly skew faces were detected which impaired the quality of the result. It is hoped that after the block of the model is modified, the flow field can be smoothly gotten.



Client Profile

Dr Li Li
The Birmingham Centre for Rail
Research and Education
School of Civil Engineering
The University of Birmingham
Edgbaston
Birmingham
B15 2TT

Contact Details

Email : l.li.1@bham.ac.uk
Email : lilee@tongji.edu.cn

Product Used

Ansys ICEM-CFD
Ansys CFX
OpenFOAM

Funding

The Birmingham Centre for Rail
Research and Education
China Scholarship Council

UNIVERSITY OF BIRMINGHAM

For more information:

BEAR, IT Services
Elms Road Computer Centre (G5)
Edgbaston
Birmingham B15 2TT
Tel: 0121 414 5877
Email: bearinfo@contacts.bham.ac.uk
Website: www.bear.bham.ac.uk