



Published on *CD-adapco* (<http://www.cd-adapco.com>)

[Home](#) > World Cup Fever

World Cup Fever



Sabine Goodwin

June 30, 2014, 10:50 pm

[Share This Post](#)

I am not a soccer fan, but all the men in my life are fanatics and thus World Cup fever has taken over the Goodwin household. You might be surprised at what happens when an uninterested CFD engineer is forced to watch soccer.

{[Editor's Note](#) ^[1]: *Readers from outside of the USA might want to mentally substitute the word "football" for "soccer" in the remainder of this Blog post.*}

Take the goal for example. The only thing I see when it shows up in HD on the big flat-screen TV is the net and the perfect polyhedral mesh I strive to create for all my simulations. It actually gives me joy to see it, even while my husband is swearing at the TV because Belgium beat the USA in overtime {[Editor's Note](#) ^[1]: *extra time.*}

There is also Brazil's iconic "Cristo Redentor", proudly shown at the beginning of every game and welcoming World Cup fans with open arms. Perched atop the Corcovado Mountain overlooking Rio, the larger-than-life statue of Jesus is essentially a giant flat plate standing in the wind and, to this bored simulation engineer, a true aerodynamics nightmare.

Stick your hand out the car window, palm facing forward, while driving at highway speeds, and you will feel the strong force of your hand getting pushed back. My "hand" calculations (pun intended), assuming a low aspect ratio flat plate with a drag coefficient of 1.28, predicted a force of only ~7 N. Compare this to the force on the statue's hand: with a frontal area of about 5 sq m, I estimated it to be 1,920 N. I also calculated the total force on the statue to be a whopping 101,700 N!

With my DVR full of soccer, I had plenty of spare time to perform the Cristo Redentor simulation using STAR-CCM+[®]. My polyhedral mesh was nowhere near as perfect as what I will see on TV for the next few weeks, but I am happy to report that my calculations on paper and numerical simulations compare well, with STAR-CCM+[®] predicting a total load on the statue of 98,268 N.

What's next? Simulating the aerodynamics of the Adidas Brazuca! Oops, I guess [Prashanth](#) ^[2] already has that covered. Look for his blog in the next few days!

CD-adapco is the world's largest independent CFD focused provider of engineering simulation software, support and services. We have over 30 years of experience in delivering industrial strength engineering simulation.

Source URL: <http://www.cd-adapco.com/blog/sabine-goodwin/world-cup-fever>

Links:

[1] <http://www.cd-adapco.com/blog/author/Stephen%20Ferguson>

[2] <http://www.cd-adapco.com/blog/author/Prashanth%20Shankara>