Autodesk Sustainability Solutions Brief: Data Center Energy Efficiency (Q3 2013)

The Industry Imperative
Despite growing concerns of a global economic slowdown, the companies that construct and operate data centers that run the Internet and store vast amounts of corporate and government data expect growth next year to match level last seen in the world economy's boom year: about 19 percent. Officials responsible for about 100,000 data centers cited cost and availability of energy for their power hungry computers as their top concern in planning future operations[1]. As data center traffic grows at unprecedented rates (is expected to quadruple by 2016), design/build RFPs will increase, and designing for energy efficiency will move from a competitive differentiator to a necessary competency for design firms.

A picture can be worth hundreds of thousands of dollars
Over the last 10 years, computational fluid dynamics (CFD) modeling has proven to be a highly reliable and valuable method for simulating and optimizing the energy efficiency of a data center or server room as well as accurately predicting the failure-mode conditions associated with cooling system failure. Despite CFD-led design having been a best practice for years, most teams relied on educated assumptions instead because the simulation software and expertise were costly, difficult to source and completely disjointed from the design process. "Rules of thumb" leave money on the table, however. CFD simulations empower design teams to reduce inefficiencies, maximize "free-cooling" and achieve the lowest possible PUE.

Keep pace with best practices in server room and data center operational management
Autodesk Building Design Suite and Autodesk Simulation CFD together break down the barriers and empower more designers to apply best practices such as those championed by the global leaders in data center design and operation. By integrating Revit with powerful and intuitive simulation, Autodesk Simulation CFD enables your firm to compete more effectively by demonstrating innovation and core competency in the bidding process. The results are higher-performing designs, reduced liability, and enhanced reputation.

Simulation-led Design
How do you both increase server density and decrease power consumption? Autodesk Revit and Simulation CFD model and characterize airflow precisely enough to make best use of available air resources and nearly eliminate wasted energy. This integrated workflow facilitates experimentation with multiple layouts to optimize air flow, try turning up the thermostat to reduce CRAC use as well as predetermine failure-abatement scenarios. Test out the effectiveness of your plans to block and redirect air, utilize "free-cooling" from outside air, optimize and rearrange air vent tiles, establish critical monitoring points (CMPs), increase temperature and relative humidity settings to make the most of air and water side economization, and identify and eliminate hot spots. Make your case confidently by quantifying the results of a recommended course of action.

Results
Autodesk CFD Simulation has enabled designers to start reviewing results in less than 24 hours where other tools took 2-3 months to build, mesh and solve. Minimal efficiency measures conservatively save $1-$2/sqft/yr. Expanded measures such as moving or upgrading CRACs can save $3-$5/SF/yr. Knowing when and which CRAC units to turn off or avoiding buying new units saves tens of thousands of dollars. Millions of dollars can be saved if one can prove out a retrofit strategy instead of building new. Data Center Energy Efficiency, precisely informed by CFD analysis, is a great example of where smart business and environmental stewardship coexist.

1- "Survey See Major Expansion of World's Data Centers", New York Times, September 27, 2011