The product data needs to get smarter, much smarter

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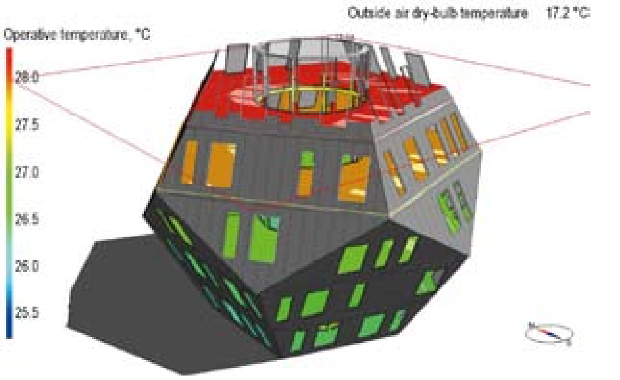
The most obvious and also the traditional place for HVAC component data is the product catalogue. Today, this data is often digitally presented, but it is still designed for human eyes. However, a significant amount of actual product selection also takes place in CAD systems, where the operator picks products from menus that are populated by the manufacturers themselves. The primary focus of this data lies on physical appearance and dimensions, but the graphical information is often complemented by certain behavioral parameters to enable calculations that are supported by the CAD system, such as pressure-flow or sound calculations at design points.

Some CAD systems can even hold data for more advanced computations such as whole-building simulation. The design can then be evaluated in terms of energy use and for some systems indoor climate properties. When such key properties of a design are easily evaluated, the number of what-if questions can be large and the final building is likely to be more optimal. Looking at the trend from other industries, there is reason to believe that even more complex simulations will be supported in the not too distant future. In modern simulation tools, the actual mathematical models of components are treated as data. This opens a scenario where a manufacturer not only provides the parameters for some fixed built-in model, but ships a plug-in component model of their own design, that represents the dynamic behavior of their product. This is still a bit out of range for most of the widely used building simulators that presently offer only a fixed repertoire of component models. But some tools, such as IDA Indoor Climate and Energy, already support this.



The graphical output of temperature simulation with the IDA ICE simulation for a complex geometry building.

Two de-facto standards have emerged for such plug-in dynamical models: Modelica (www.modelica.org) and FMI (www.fmi-standard.org). There is every reason for the HVAC industry to follow the progress of these two standards.

Modelica enables the component modeler to write down equations directly. There is no need to worry about the solution process, which is handled automatically by the simulation environment using a combination of numerical and computer algebra methods. Over the last few years, impressive Modelica component libraries have been developed for a number of industrial domains. It is no longer an issue to prove that this type of modeling is efficient even for the most complex dynamical systems.

Modelica states the individual equations (and parameters) of a model in an open textual format accessible for both human and computer reading. This can be undesirable from a disclosure point of view. Manufacturers may not wish to reveal all details about their models.

On the other hand, FMI is a binary representation of a model with a security level comparable to any of today´s product selection tools. The soon to be released version 2.0 of FMI does not yet fully support the same type of physical component connections that are supported by Modelica. However, work is already under way to improve this, and then FMI should provide an excellent format for HVAC component manufacturers to publish plug-in simulation models.

In this scenario, the need for industry standardization shifts from the precise form and definition of component parameters into the connectors that allow a model to interact with its neighbors. Similar to the irritating variation in electrical plugs between countries, trivial variations in connectors and other key definitions must be avoided by early action of the key standardization bodies.