Application note 0014

PipeCAD support of Fire Dynamics Simulator

PipeCAD is a modeling program distributed by AirSense Technology Ltd for the calculation of pipe transit times and sampling point sensitivities for the Stratos range of aspirating smoke detectors. This application note describes its interface to the National Institute of Standards and Technology (NIST) Fire Dynamics Simulator (FDS).

FDS allows the simulation of smoke and heat transport from fires within a defined area and has its own simulation viewer program named Smokeview. The use of PipeCAD with FDS allows modeling of the complete system response time from ignition source to detection by the aspirating smoke detector.

Simulation process

This section describes step-by-step how a PipeCAD pipe layout may exported to FDS and modeled with a test fire. It assumes that PipeCAD revision 2.2 or later and FDS 4.0.7 or later are installed.

1. Enter the pipe layout as usual in PipeCAD. It is recommended the Fast Setup is used to allow quick entry of the protected area dimensions as these are used during the export of the pipe layout to FDS.

2. Calculate the flow rates and hole sensitivities and then save the completed layout.

3. From PipeCAD select ‘Save Fire Dynamics Simulator file…’ from the file menu. The FDS input file will be saved and a prompt will be displayed allowing a simulation to be run. Run the simulation.

4. The simulation name is taken from the pipe layout so that, for instance, if the pipe layout is TEST.PL the simulation file names will all start with TEST. PipeCAD generates a batch file, TEST.BAT in this case, that can be run to re-calculate the simulation.

5. When the simulation is complete the file TEST.SMV can be double-clicked on (assuming that the original layout name was TEST.PL) to view the simulation. See the Smokeview users guide for further details about the viewer.

Simulation details

A default burner is included in the FDS input file by PipeCAD in the bottom left corner and this must be set to an appropriate value and position for the application. Normally this information would be specified in the project specification.

PipeCAD outlines are automatically exported to FDS as obstructions allowing walls and other features to be entered into the pipe layout directly.

File TEST_SMKDT.CSV contains the obscuration levels of each sampling point during the simulation. Add the time at which the detected obscuration exceeds the sampling sensitivity (in Smokeview the point changes colour to green) to the PipeCAD calculated sampling point transit time to obtain the system response time.

References

PipeCAD
http://www.airsense.us/Products/Software/PipeCADsoftware

FDS web site
http://www.fire.nist.gov/fds/