



Release Notes

Version: 5.11

Prepared by: Dr. Scott R. Runnels
Southern Rockies Consulting

For: The RSI-AAR Railroad Tank Car Safety Research & Test Project

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1 New Capabilities since AFFTAC 4.00

1.1 AFFTAC Advisor and Help Bubbles

AFFTAC Advisor is a new built-in help facility that allows the user to see graphics-based, context-sensitive help and advice for nearly every window in AFFTAC. It is accessed through a blue button that appears in the window being accessed by the user; the user's context is therefore known by virtue of that window when AFFTAC Advisor is launched. AFFTAC Advisor also includes context-sensitive links to the on-line User's Manual. When one of those links is clicked by the user, the appropriate section of the on-line User's Manual PDF file is opened and displayed on the screen. AFFTAC 5.11 also comes with "help bubbles" over nearly every entry. These help bubbles appear when the user hovers their mouse over any text/numerical entry, list, or selection ("radio") buttons.

1.2 PDF and CSV Output

AFFTAC 5.11 includes the ability to export the output of a simulation to a PDF file. High-level inputs and the bottom-line results of the simulation are presented on the first page. Plots of the results follow on subsequent pages, and after that, more details of the input, including graphical representations of property data. The numerical results are included at the end of the document. AFFTAC 5.11 also includes the ability to export the numerical output of a simulation to a "CSV" (comma-separated values) file, a human-readable file that can be read directly into Excel.

1.3 Improved Advanced TPS Interface

This new version of AFFTAC has a completely redesigned user interface for the Advanced TPS Model setup, formerly called the "Generalized TPS Model". The old interface was counterintuitive and difficult to use. The new interface draws semicircles on the screen, one for each layer of the thermal protection system, and allows the user to interact with those semicircles through right-clicks of the mouse (Figure 1, top). The new interface also allows the user to drag demarcation symbols (the blue circles in the bottom of Figure 1) around the tank to denote different regions of coverage. As a result, TPS defects can now be clearly specified and seen by the user.

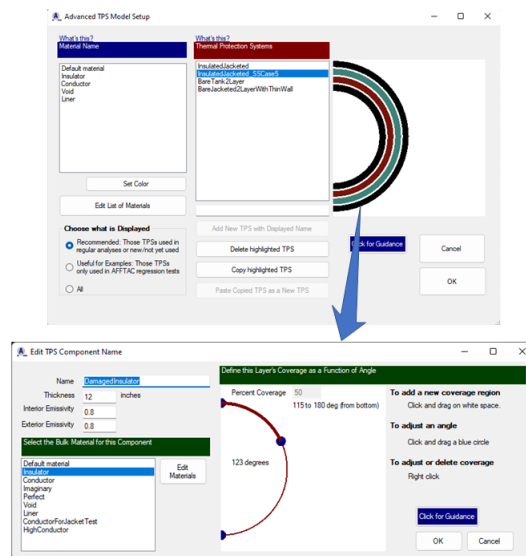


Figure 1: Screenshot of the new Advanced TPS Model setup window in AFFTAC 5.11.

1.4 Improved Property Entry Window

The “Property Entry” window in AFFTAC is used repeatedly when the user needs to enter a property that is a function of something else, for example, thermal conductivity as a function of temperature. The Property Entry window prior to AFFTAC 5.11 was counterintuitive and difficult to use. These specific changes were made to it:

- Enabled standard cut, copy, paste, and delete capabilities on multiple cells containing the tabular values.
- Added the ability to paste $x - y$ data that is copied from Microsoft Excel.
- Continuous update of the plot as data is entered or altered.
- Added `Ctrl-Z` (undo) capability, which allows the user to quickly undo mistakes.

1.5 Improved Error Reporting

AFFTAC’s error handling and reporting has been upgraded. The need for this upgrade was identified through difficulties encountered while diagnosing user issues of AFFTAC 5.10 Alpha 01 through 04. The error handling is more hierarchical and always provides a recommended action. Moreover, the user can save the detailed version of the error messages to a file. These detailed messages contain information that helps the developer more quickly pinpoint the problem, whether it be a user error or internal code error.

1.6 Single Input File Format

AFFTAC 5.11 reads and writes a single input file, called a “unified database file” or “udb” file, instead of working with multiple database files. In other words, files such as `Ladings.db`, `TPS.db`, `Insulations.db`, `Strength.db`, and `PRD.db`, which have resided in a user’s `Documents` folder, will be replaced by a single input file. Moreover, multiple versions of that single input file may exist. In other words, AFFTAC 5.11 adopts a single-file input methodology similar to other standard MS-Windows applications, with standard File-Open, File-Save, File-Save As, File-Close capabilities. Users moving from previous versions of AFFTAC can make use of AFFTAC 5.11’s conversion capability, which is included in the Main Window menu, to convert their db files into a single udb file (more in next sub-section).

1.7 Flexible db to udb File Conversion

AFFTAC 5.11 automatically detects the presence of pre-AFFTAC 5.11 db files and prompts the user to convert those files to a single input (udb) file (see previous section). If the user accepts that prompt, those db files are moved to a backup location. If the user does not accept the prompt, they can still operate on the db files, but cannot save their changes to those db files.

In addition, AFFTAC 5.11 provides a menu option in the Main Window that allows the user to navigate to any set of db files, move them to a backup location, and convert them to a udb file in one step. And the user can execute that procedure as many times as necessary.

1.8 Multi-User Capability

New in AFFTAC 5.11 is the ability to accommodate the possibility that multiple users might try to run in the same shared network directory and also might desire to use the same input file. Various issues arise with that scenario. For example, AFFTAC writes multiple intermediate files during simulations, usually unseen by the user, that could be corrupted when multiple users are running in the same directory. And, of course, two users trying to open, modify, and save the same udb input file could result in work being overwritten.

To accommodate this new scenario, a “lock-out” technology has been introduced in AFFTAC 5.11 that creates “lock files”, which tell AFFTAC that another user is either trying to access the same file or that they are working in the same directory. AFFTAC then uses that information to prevent the user from proceeding until the situation is rectified.

Issues with the lock-out technology could arise when AFFTAC exits ungracefully, for example if the network goes down while AFFTAC has a file open across that network, a laptop battery dies, or AFFTAC itself crashes. In these cases, lock-out files might be left behind, disabling a user from either opening their input file or running a simulation. To handle this possibility, AFFTAC provides guidance for the user, which includes ignoring the problem, contacting the other user, terminating other AFFTAC sessions, or navigating to a new Main Menu item where they can see and remove the lock-out files that are preventing their progress.

Note that this is a new capability that was not present in the AFFTAC 5.11 Alpha versions or Alpha testing. The need for it was identified during Alpha testing, and is associated with the new flexibility that has arisen through AFFTAC’s single (udb) file input approach.

1.9 Customizable PRV Open-Close Model

A new PRV model is included in AFFTAC 5.11 that allows users to construct customized open-close paths, with multiple segments.¹

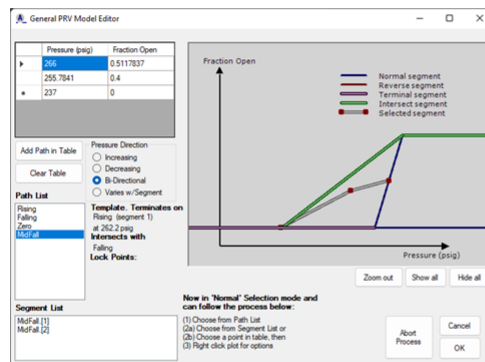


Figure 2: Screenshot of the new customizable PRV Open-Close Model setup window in AFFTAC 5.11.

1.10 Adjustable Solver Parameters

The user is now allowed to adjust two nonlinear solver parameters that are used in the Generalized TPS Model. These parameters are adjusted in the same window used to change the name of the particular TPS setup in the Generalized TPS Model editing window.

2 Documentation Changes

2.1 Improved Guidance in the User’s Manual

The AFFTAC 5.11 User’s Manual includes new text that provides advice to the user regarding high-level modeling choices, e.g., which approach they should use for strength modeling, or whether or not they should use the Advanced PRV Open-Close model. Among other parts of the User’s Manual, these sections are hot-linked to the user’s context through AFFTAC Advisor, which also provides advice on these and other topics. The User’s Manual also provides

¹This capability was introduced in the Beta versions of 5.00.

new guidance on how to compute the percent coverage of defective insulation as a function of angle, and the impact of defects on the end caps. The impact of certain modeling assumptions are also provided, including the thermal implications of venting and of non-circumferential heat conduction.

2.2 Terminology Change

Starting with AFFTAC 5.11, the terms “Legacy Model” and “Generalized Model”, are replaced with “Basic Model” and “Advanced Model” to more properly account for the passage of time and the implications of those terms. Thus, for example, what was once called the “Legacy TPS Model” is now called the “Basic TPS Model” and what was once called the “Generalized TPS Model” is now called the “Advanced TPS Model”.

All inputs for a simulation that are not individual in nature but are, instead, representing collections of individual inputs are referred to as a “Resource”. For example, each lading is a collection of tables that represent quantities such as specific heat as a function of temperature. Typically, the user does not enter their own individual values in those tables. Rather, they select a lading, e.g., “Propane”, that contains multiple tables. The same is true for the Advanced Strength Model and the Advanced PRD Model. These types of inputs are all referred to as “Resources” in AFFTAC 5.11.

3 Installation Notes

At the time of this release, it had been found that some new computers come with a fresh Windows 10 installation that includes software called “.NET 5.0”, which skipped all the service packages previous to that version. Programs such as AFFTAC that are created and compiled for previous versions, such as “.Net 3.0”, may be incompatible with “.NET 5.0”. To remedy this situation, the user must reinstall the previous .NET version, version 3.5.²

²Thanks to Tony Sisto for working through this.