ProTips ™

Column Improvements – Part I

ProTreat Version 6.5.1 is now available on our website. This expansive new offering is free to download for all licensed customers. This will be part I of a multi-part series outlining the many changes and improvements to column blocks.

The column has been greatly expanded to include several new features, two of which include allowing the column pressure to be set by one of the inlet streams and specifying how the streams leaving a column are calculated thermodynamically (as rate streams, as equilibrium streams, etc.).

In versions prior to 6.5.1, the column pressure specifications were made with no reference to the pressure of feed streams. This meant that the stream's pressure had no effect on the column's pressure. Now, in 6.5.1, the column operating pressure can be set to vary with the feed stream pressure. Figure 1 shows the updated pressure dialog box where a new option has been added.
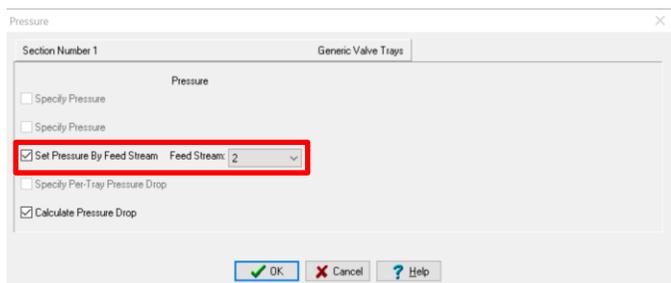

Figure 1. Updated Pressure Dialog Box in 6.5.1

The position of the stream in the column is where that pressure will be set. For example, in Figure 1, the absorber pressure is being set by feed stream 2 which is the raw gas entering the column below the internals section. So, the column pressure will be set at the bottom to stream 2's pressure.

Three new options have been added to allow you to specify the thermodynamic state of a product stream leaving a column. These options include a rate stream, equilibrium stream, and specifying some amount of vapor or liquid carryover. Since ProTreat columns are rate-based, the streams leaving a column are rate-based by default. These streams may or may not be supersaturated or undersaturated depending on the rate limiting component in the column and are <u>not</u> necessarily in thermodynamic equilibrium. This is how ProTreat has historically calculated product streams leaving a column and is still the default selection. This is the true condition of the stream at exactly the exiting point of the column; however, as the stream passes through the piping and downstream equipment in the plant, the conditions of the stream will approach equilibrium with respect to heat and mass transfer as heat is lost or gained through the pipe walls. Typically drops of liquid, or bubbles of vapor, will begin to form in outlet piping as supersaturation is removed via piping heat loss. Specifying an equilibrium stream will take the rate stream produced within the column and adiabatically re-flash that stream at the column pressure, simulating effects of piping heat transfer. Specifying an equilibrium stream with a carryover will allow the specified portion of either bottom vapor or top liquid to leave with the liquid or vapor stream respectively. Figure 2 shows the new specifications under the *Streams* tab in the column dialog.
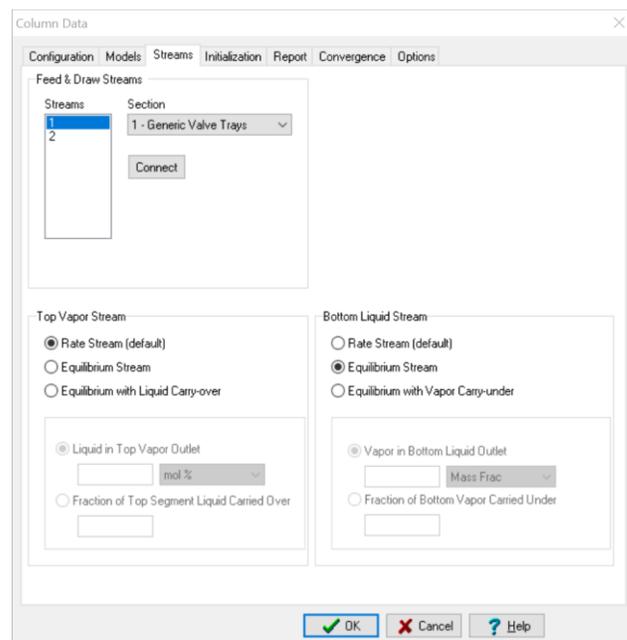

Figure 2. Top Vapor and Bottom Liquid Thermodynamic Specifications.

ProTip: The liquid and vapor carryover feature allows you to better model solvent loss through liquid carry over and vapor carry under scenarios and helps give a better idea as to how these may affect the downstream equipment.

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