

## Vacuum Tower with TBP Assay (VACUUM)

### DESCRIPTION:

The atmospheric residue enters the bottom of the vacuum tower at 338 deg C. The tower is equipped with two pumparounds, which generate internal reflux. The bottom of the tower is additionally heated. There is top product (crude fuel oil), two side products (vacuum gas oils), and the bottoms (vacuum residue).

### NOTES:

1. The vacuum tower icon has been drawn with the Flsht / Graphics / Unit\_Op's / Unit\_Icons / New\_Icon option. The distillation model is the Tower Plus (TPLS), formerly known as CRUD. It is essential that the inlet/outlet arrows be drawn in proper order. For rigorous distillation models (TPLS, TOWR, and SCDS), the inlets have to be drawn in the top-down order, the top product must be drawn as the outlet #1, the bottom product must be the outlet #2, and the rest of outlets must be placed in top-down order between distillate and the bottoms.
2. The oil pseudo-components as well as composition of the feed stream have been generated with the Comp / Distillation\_Curves option. Firstly, the program asks for the stream number for assay. Then, the program gives user the option to select correlation methods. After that, the user defines how many "cuts" or "pseudo-components" he would like to have in specified temperature ranges. Then, the user selects the assay type, enters bulk gravity of the stream, specifies total flow rate of the stream(s), and the flowrate of free water (if any). In the same screen the user can select flow unit for light ends (if any), and the distillation curve unit. Afterwards, the distillation curve spreadsheet appears (it must be filled in), and then the specific gravity curve (can be left empty, if the bulk gravity has been specified). If any light ends are present, a spreadsheet for light ends analysis displays. Finally, the pseudo-components are generated, and the composition of the analyzed stream is determined. ADDITIONAL NOTE: If any light ends are present, then these components must be selected to the component list BEFORE editing the distillation curve.
3. The assay determines the composition of the selected stream(s), but it does not specify thermal state of the stream(s). In this example, we had to enter the temperature and pressure of the feed stream 1.
4. The recommended K-Value option for the petroleum vacuum tower is Maxwell-Bonnel correlation (ESSO), and the Enthalpy option is Lee-Kesler (LEEK).
5. Selecting the Equip/Select\_Units option for the Tower Plus launches the data input screens' sequence for the first time the TPLS has been selected. For given configuration of the tower, certain number of variables must be specified to fulfill the number of degrees of freedom for that model. As TPLS is a flexible model, the specifications can be made at various locations of the column. In the example, there exist two pumparounds, two side products, and a side exchanger. We have defined: the main column; one specification at each of pumparounds; one specification at each of side products; location of side exchanger (at the column bottom); and three tray specifications.