

TrayHeart – professional hydraulic column design



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Hydraulic design of tray or packed columns and liquid distributors is a daily task in process engineering. Reliable models for predicting fluid dynamics in columns already exist in a great variety. Nowadays they are commonly used in form of individual, stand alone, often self-developed, software programs.


Why haven't these models been collected in an up-to-date software package up to now?

Based on this idea an advanced computer program – named TrayHeart - has been developed for vendor-independent rating and debottlenecking of columns by detailed fluid dynamic calculations.

The program offers fluid dynamic calculations on

 Sieve trays


 Bubble cap trays

 Classic, caged and fixed valve trays

 Shower decks

 Dual-flow trays

 Structured packings

 Random packings

 Liquid distributors

and entire column setups based on these elements.

More than 40 published, documented and proved models ensure a high result quality. Also FRI models are implemented - for FRI members only. Due to its professional standard, even special designs such as multipass trays, notched weirs, sloped downcomers, recessed seal pans or calming zones are part of the program's functions.

Figure 1 shows the specification dialog of a 2-pass sieve tray. The user may choose between multiple ways to specify the tray and its active area – depending on the data available. This enables both: easy sizing of new and detailed calculation of existing columns. And units aren't a problem anymore: They are simply entered with the value – and are automatically transformed without nasty trouble.

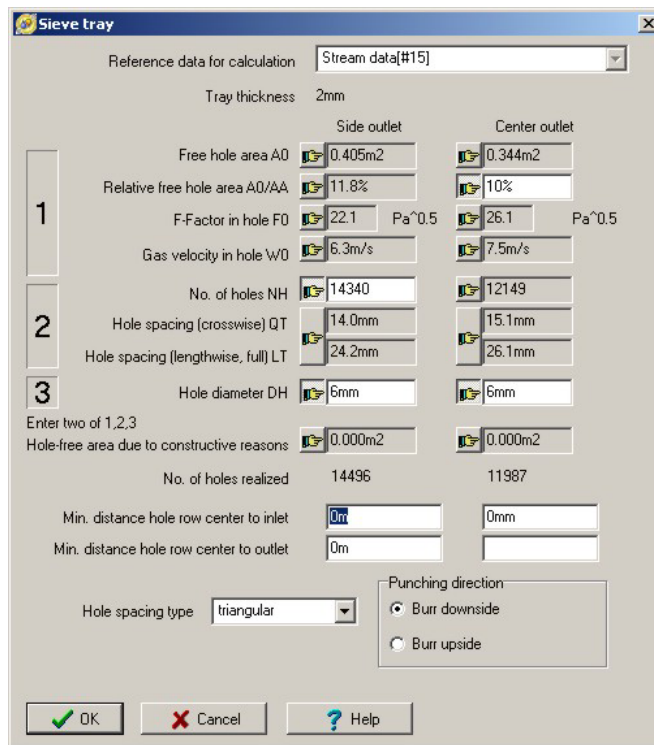


Figure 1: Sieve tray specification

Additionally construction details (e.g. support rings, assembly aspects and resulting inactive areas) are taken into account during all calculations. This includes mechanic stress calculation, bending shapes, manways and many more features. Figure 2 shows the tray sketch of a sieve tray. These constructive background routines ensure, that one can realize e.g. the number of holes / valves designed during the manufacturing process.

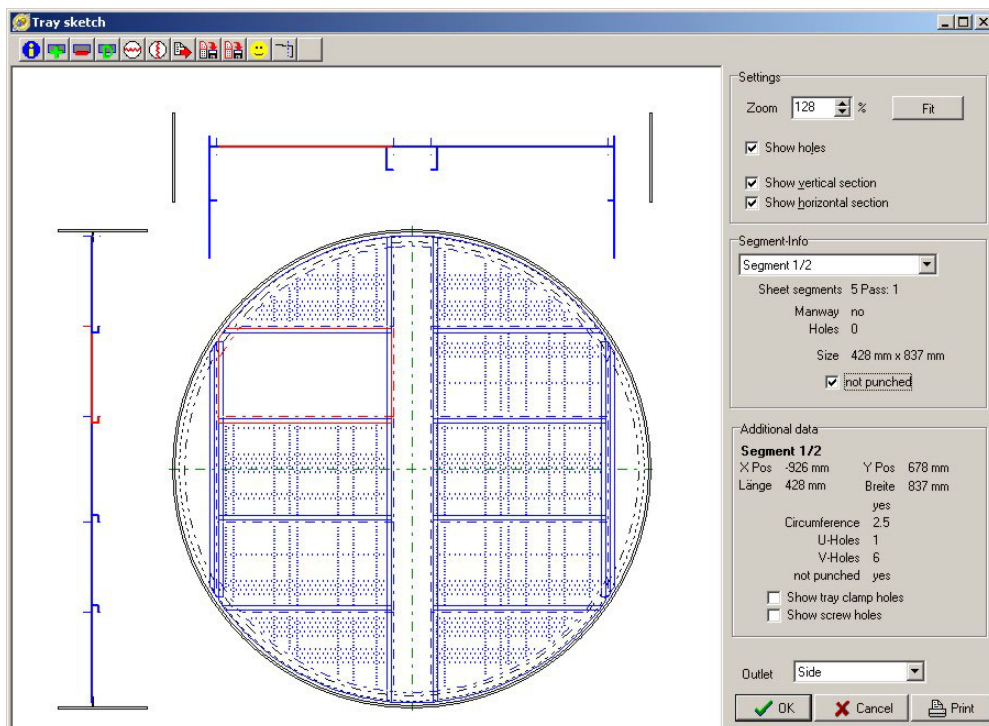


Figure 2: Tray sketch of a 2-pass sieve tray

The liquid distributor module offers e.g. Moore&Rukovena distributor quality calculation and graphical output (figure 3), distributor performance and flowrates through different outlets like holes, pipes or slots.

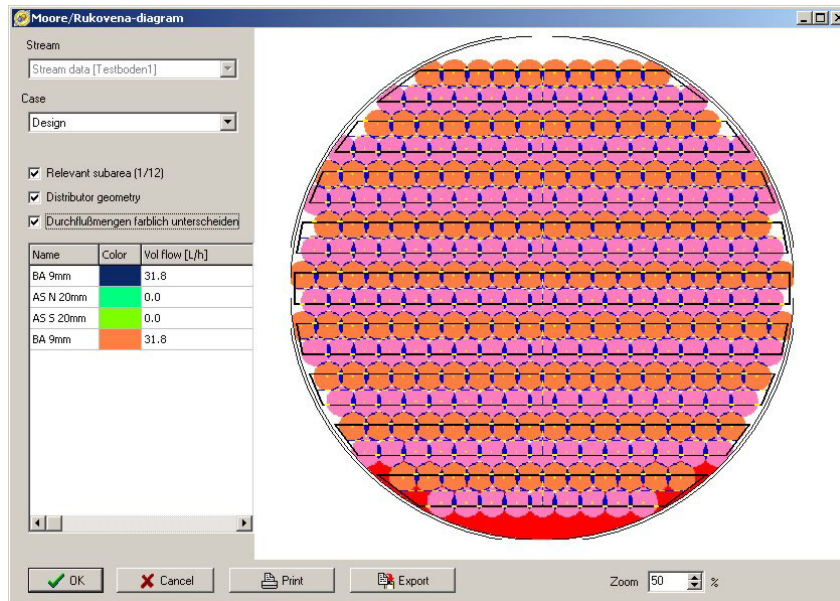


Figure 3: Moore & Rukovena diagram of distribution quality

The resulting detailed fluiddynamic calculations (main parameters like flooding factors, pressure drop, entrainment and up to 30 other values) are provided for each tray or column section in form of a well structured screen or paper output (see figure 4). Warnings, individual check-databases, colored values and other routines show which problems exist and how to avoid them.

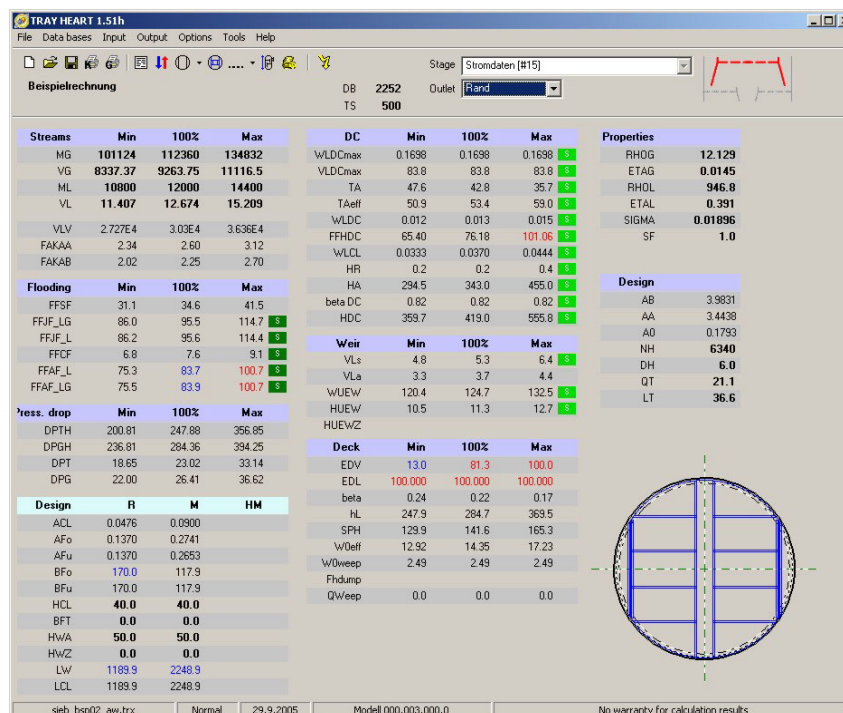


Figure 4: Results screen

Beside single trays (at three operating points) even entire column setups (e.g. a distributor, packings and several trays of different designs in one column) may be calculated all together in the profile mode. Stream profiles may be imported from Aspen or ChemCad files as well as from clipboard. Bottlenecks of a column (figure 5), pressure drop peaks or flooding zones can easily be detected.

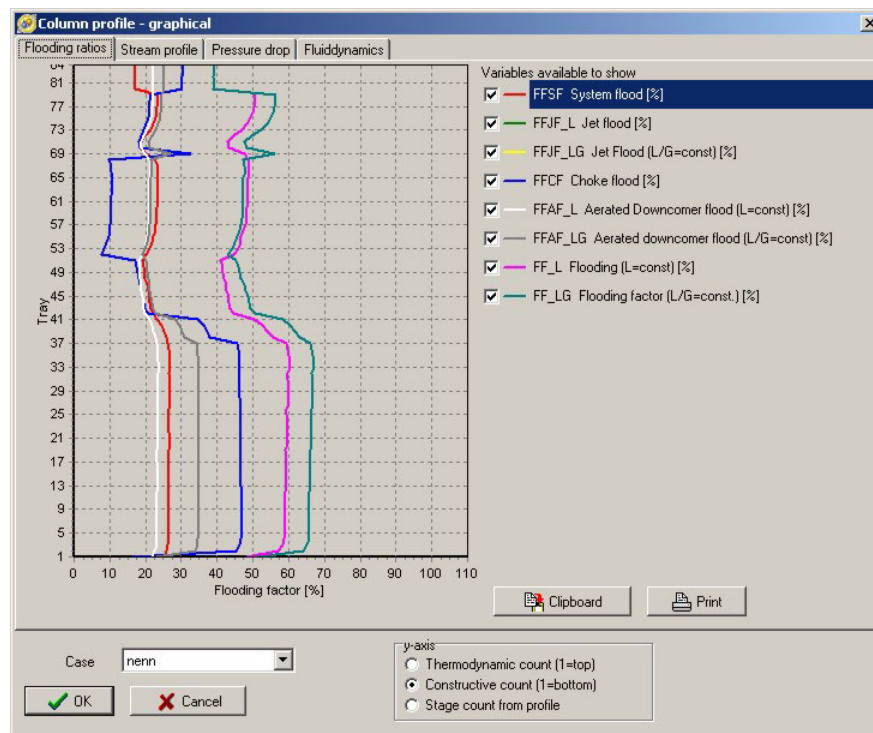


Figure 5: Column profile – flooding ratios (graphical)

Additionally operating diagrams, graphical comparisons of packings and column sketches (e.g. for inquiries) can be visualized graphically, printed or exported to pdf. Thus, the engineer takes advantage of a modern fast GUI and a unique software environment for all types of column internals and their calculations.