

SULCOL™ design program for mass transfer columns



Sulzer had already developed a program for hydraulic design to support customers in column rating and design in the late 1980s. Sulzer's expertise is available to customers with the SULCOL™ program.

The SULCOL program has helped many customers find the right column design for their applications quickly and accurately — regardless whether they are new or existing columns (Fig. 1). With SULCOL, users can rate or design their fractionating or absorption columns with Sulzer proprietary mass transfer products. Whether you are a process engineer in a design institute or a technologist working for a production plant, SULCOL will help you to:

- design a new column and compare the column sizes with different mass transfer components
- calculate the maximum capacity of existing columns
- determine the bottlenecks in the column operation, e.g. high pressure drop
- plan a revamp and explore the use of internals with higher performance, or
- simply learn about mass transfer and column design

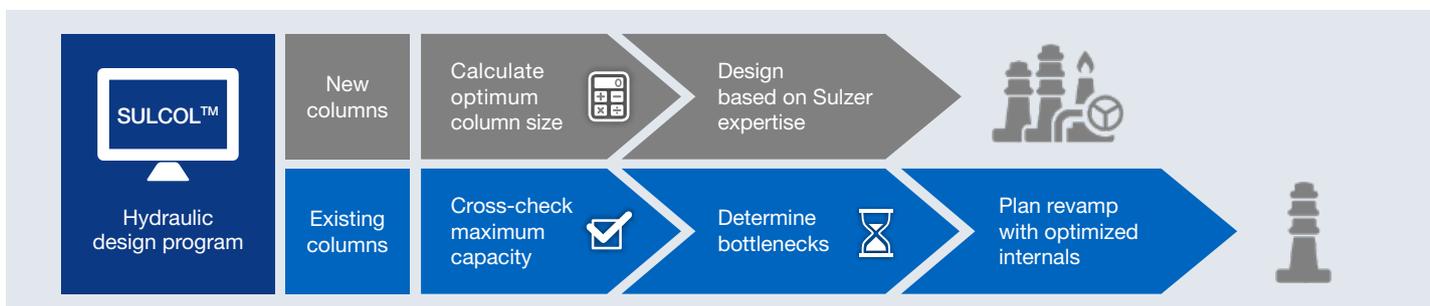


Fig. 1 Practical use of SULCOL program for hydraulic design.

“ For more than 50 years, Sulzer has been bringing state-of-the-art mass transfer technology to the columns of our customers. SULCOL helped many clients to design new columns with just a few clicks. It also helps to identify hydraulic bottlenecks and determine the columns' full potential.

Dr. Marc Wehri, Director R&D and IP Management, Winterthur, Switzerland

Required input data for SULCOL

The minimal input to the program is the fluid data — mainly the vapor and liquid mass flows with their respective densities (see Fig. 2). SULCOL also supports the direct import of data from hydraulic loading of simulation programs (e.g. Aspen Plus® or PRO/II Process Engineering). Because packings and trays require different specifications for design, the data to be entered is different. Therefore, their graphic user interface (GUI) in SULCOL is also different. Upon selection of the mass transfer component, SULCOL calculates the predicted hydraulic performance of the column. A good hydraulic design ensures that the desired efficiency of the tray or packing is achieved.

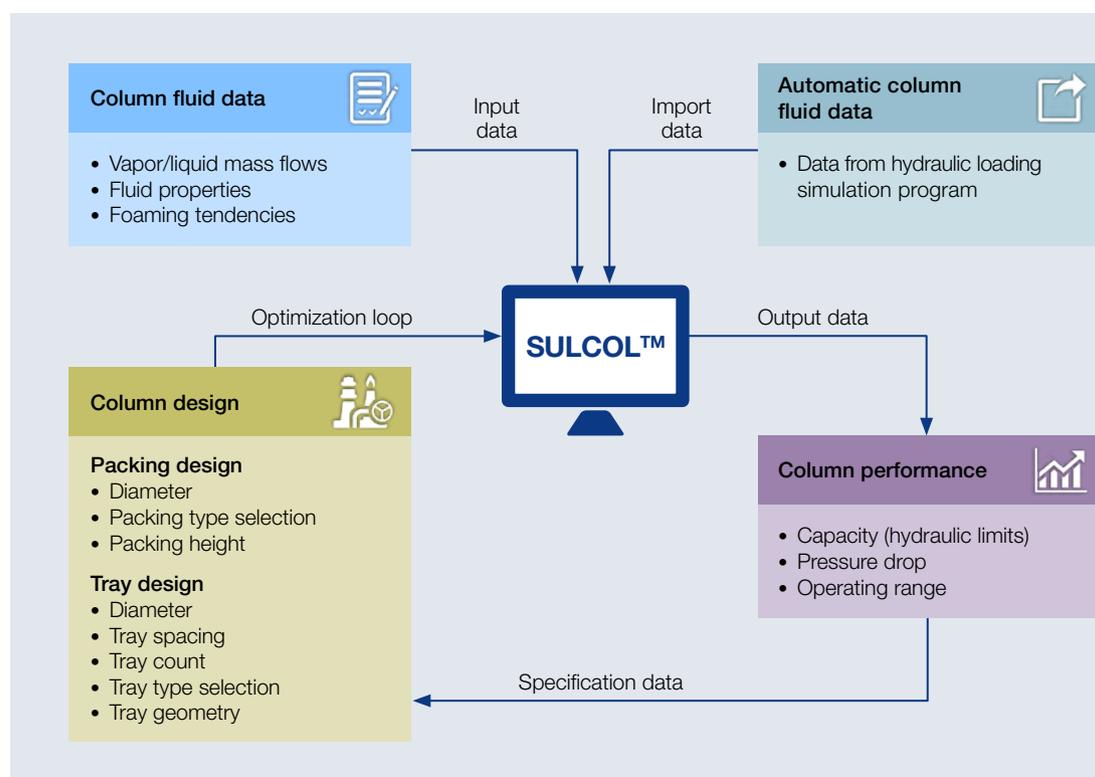


Fig. 2 How the SULCOL program works.

Use SULCOL results to select packing types

During packing design, users can choose the most suitable packing type for their process from Sulzer's wide range of packing products. If Sulzer Mellapak™ or MellapakPlus™ structured packing is selected, the default packing efficiency represented as height equivalent to theoretical plate (HETP, see Fig. 3) is shown. This reference value will help engineers in determining the packing height required for the separation.

The same fluid data processed with a different type of packing will show different HETP and capacity factors, which lead to different column designs. This information allows users to decide on the type of packing to be applied for their process.

Knowing how far you could go

Some users prefer a visual representation of the operating boundaries of the selected packing type. SULCOL has a built-in function to generate a capacity diagram with just one click. These diagrams, known in the industry as performance charts, display the design point as a red dot alongside the maximum flood curve and maximum capacity curve. Like a “you-are-here-dot” on a city map, you know where your column capacity level is, and you see clearly how far it could go. The diagram gives users an idea of how much more capacity they could achieve with the specified column diameter and the selected structured packing (see blue line in Fig. 4).

In addition to structured packing, generic rings, as well as the entire range of Sulzer proprietary NexRing™ random packings, are available in SULCOL. Sulzer NexRing is available in various sizes to meet different separation and capacity requirements.

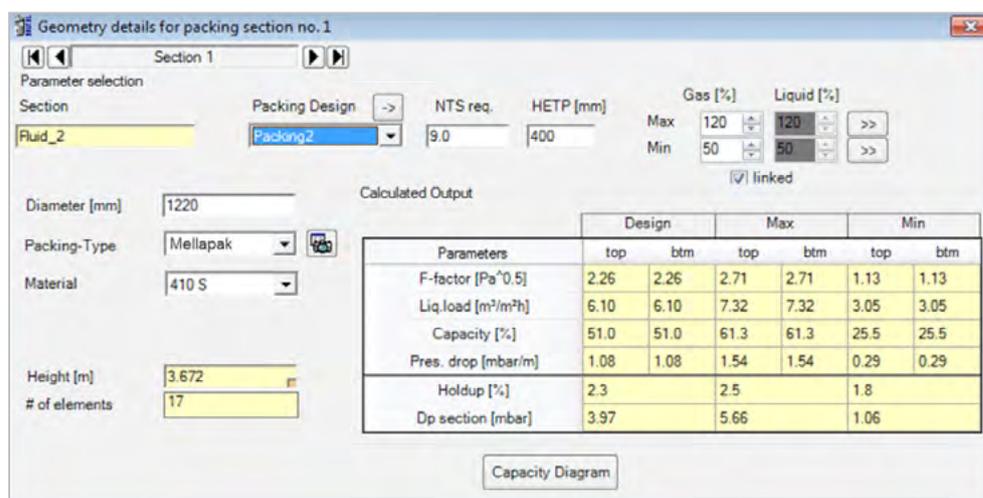


Fig. 3 Packing design section in SULCOL program.

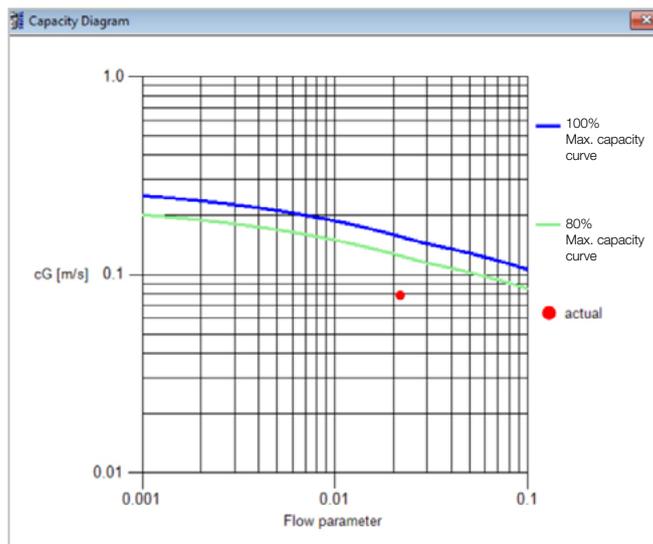


Fig. 4 Capacity diagram in the packing section.

“ Leading the internal tray technology and marketing task force, I am also responsible for ensuring that the SULCOL program is updated for our customers with the data of our latest tray products. These data, which form the basis of our hydraulic calculations, are the results from extensive testing in our Sulzer laboratories, led by our R&D Team.

ChewPeng Ang, Tray Product Manager, Technology Management and Process Innovation, Singapore

Let the SULCOL wizard help you with tray design

Tray design with SULCOL requires additional geometrical input such as the column diameter, tray spacing, number of passes and downcomer dimensions (Fig. 5).

If the users are designing a new tray section from scratch and are unsure how to start, SULCOL is the ideal tool. The “Initial Design” button automatically calculates an optimized column diameter based on the selected tray type. Pressing the “Optimize D.C.” button enables the user to calculate the downcomer size based on the liquid inlet velocity specified by users. These two wizards allow users to work up a preliminary tray design within minutes.

The screenshot displays the SULCOL software interface for tray design. It is divided into several sections:

- Parameter selection:** Includes fields for Tray Design (Trays #1-10), # Trays (12), Valve type, Perforation (3000), Tray Diameter (3000), No. of Passes (2), Material (304), Tray Thickness (2.00), Tray Spacing (610), Openings # (680), Open Area (%), Valve Lift (13.00), Valve Density (115.8), Side DC Weir Type (Normal), and Downcomer Type (STANDARD).
- Dimensions:** Lists Top Width (260.00), Bottom Width (200.00), Outlet Weir Hgt (50.0), Clearance Hgt (35), Outlet Weir Len (1688), Eff. Out. Weir Len (0), Clearance Len (1688), Eff. Clear Length (0), Inlet Weir Hgt (0), and Rec. Pan Depth (0).
- Load Data Table:**

Load	Design
Flow Multiplier Gas [%]	100
Flow Multiplier Liquid [%]	100
Gas Flow [kg/h]	204116.6
Liquid Flow [kg/h]	108862.2
Useful Capacity (L/V/c) [%]	78.7
Jet Flood (L-c) [%]	66
System Limit [%]	49.78
Weir Loading [m³/mh]	44.73
Dry Drop [mmH ₂ O]	33.84
Pressure Drop [mbar]	5.53
Flow Parameter	0.087
D.C. Froth Backup [%]	39
D.C. Head Loss [mm]	17.98
D.C. Flood [%]	46
D.C. Velocity [m/s]	0.070
VSF/VSF Min	2.54
Flow Path Length [mm]	1140
Spray Factor	4.07
- Downcomers Table:**

Downcomers	Side
D.C. Top Velocity [m/s]	0.084
D.C. Bottom Velocity [m/s]	0.084
D.C. Head Loss [mm]	25.89
D.C. Clear Liquid [mm]	174.76
D.C. Froth Backup [%]	49
D.C. Top Area [%]	4.217
D.C. Top Area [m²]	0.258
D.C. Btm/Top Area Ratio [%]	100.00
- Tray Panels Table:**

Tray Panels	A	B
Weir loading [m³/mh]	53.68	30.27
Flow Path length [mm]	1140.00	1140.00
Active area [m²]	2.936	2.936
Froth height [mm]	318.8	269.0
Pressure drop [mbar]	7.22	6.67
Clear liquid height [mm]	34.69	26.82
- Other:** Construction factor top (0.564) and btm (0.564).

Fig. 5 Data available in the tray section in SULCOL.

SULCOL helps users to design columns with the Sulzer proprietary tray types, such as Sulzer BDH™ valves, V-Grid valves such as MVG™ and our latest valve products — UFM™ and UFM™ AF. The UFM is a mini floating valve that offers a high capacity and broad operating flexibility. The UFM AF is a larger, fixed valve bearing the same special “umbrella” shape, which provides both high capacity and great fouling resistance.

Additional wizards are available for SULCOL users. With a single click, users can quickly assess the hydraulic performance of the two Sulzer high-performance trays VGPlus™ and UFMPlus™. The SULCOL program presents the extra throughput and operating range of these high-performance trays, which is achieved through the combination of enhanced downcomers and high-capacity valves.

Always at your service — the SULCOL help section

The comprehensive SULCOL help section contains a user guide to the program and product information on Sulzer’s mass transfer components. Thanks to SULCOL, many clients can easily design their new columns, identify hydraulic bottlenecks, and explore the potential of their columns.

SULCOL is updated regularly to provide our most advanced technology to our clients. For Sulzer customers the SULCOL program is complimentary. To apply for the SULCOL program, please visit <https://www.sulzer.com/sulcol> or contact your nearest Sulzer office for more information.



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