SIMONA

SIMONA® SmartTank 2.0

Efficient calculation of rectangular and cylindrical tanks

GLOBAL THERMOPLASTIC SOLUTIONS

Discover SIMONA® SmartTank 2.0

Version 2.0 of our SIMONA® SmartTank computation program unlocks new possibilities for the calculation of rectangular and cylindrical thermoplastic tanks. State-of-the-art methods of computation, verifiable output and many new features to support you in the design of your tanks – our next-generation SIMONA® SmartTank 2.0 offers maximum efficiency and exceptional reliability.

The following pages provide a detailed overview of the new features of SmartTank 2.0. Further information about this software is also available online in the form of our SmartTank videos or directly from the SIMONA Technical Service Centre.

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SIMONA® SmartTank 2.0 - Setting new standards in tank calculation

Our latest tank calculation program is the result of state-of-the-art software engineering, with an emphasis on delivering customer value. Key benefits:

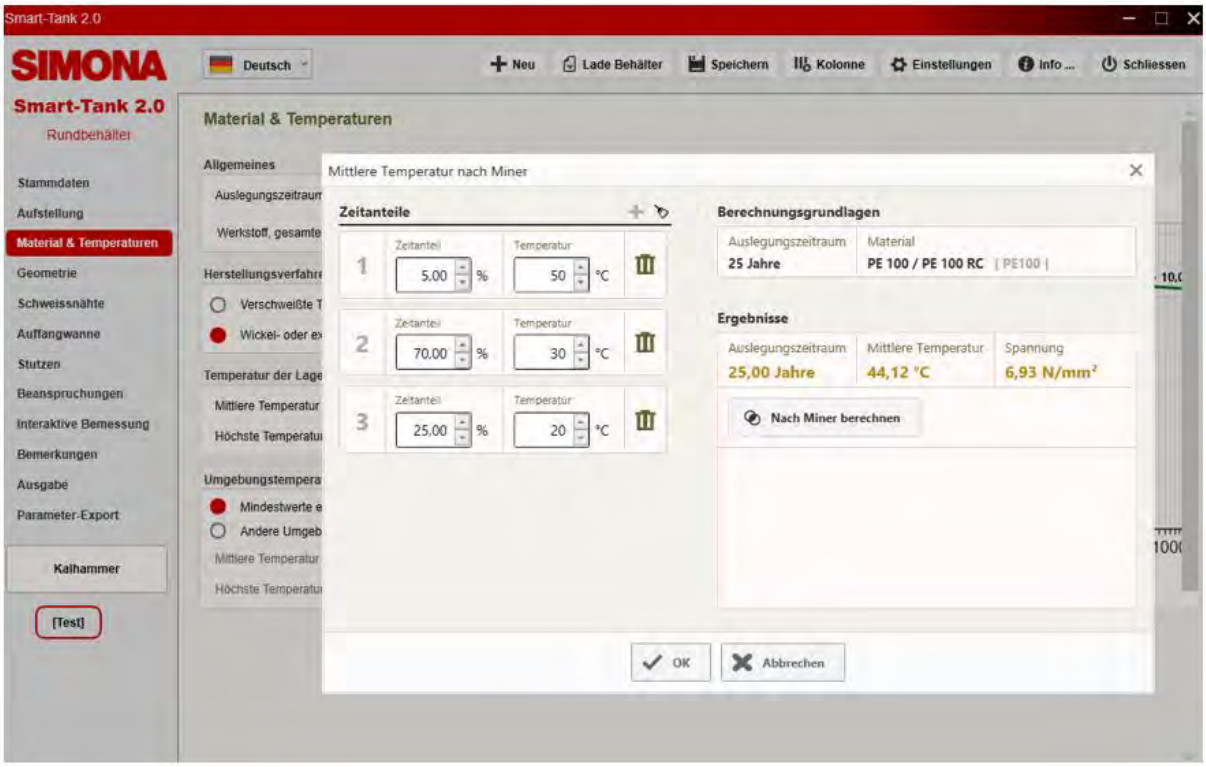
- Maximum efficiency in tank design
- Most advanced, future-proof programming
- Network-compatible application and management of the software
- Simple and convenient project management for all tanks calculated
- Intuitive use of software
- Plausibility check and validation of all data entered
- High-quality and verifiable output as well as full print-out
- Best-in-class service and support via hotline with rapid response

Summary of SIMONA® SmartTank 2.0 features

Miner tool	**Tank column calculation**	**Integration of PE-EL**
Option of selecting SIMCHEM database or DIBt list of substances	**FEM calculation for flat roofs of rectangular and cylindrical tanks**	**SIMONA® TWS calculation for flat roofs of rectangular and cylindrical tanks**
Upgrade for rectangular tanks	**User-defined profile layout for circumferentially reinforced tanks**	**Profile maker**
Material manager	**Improved graphical output and stress analyses**	

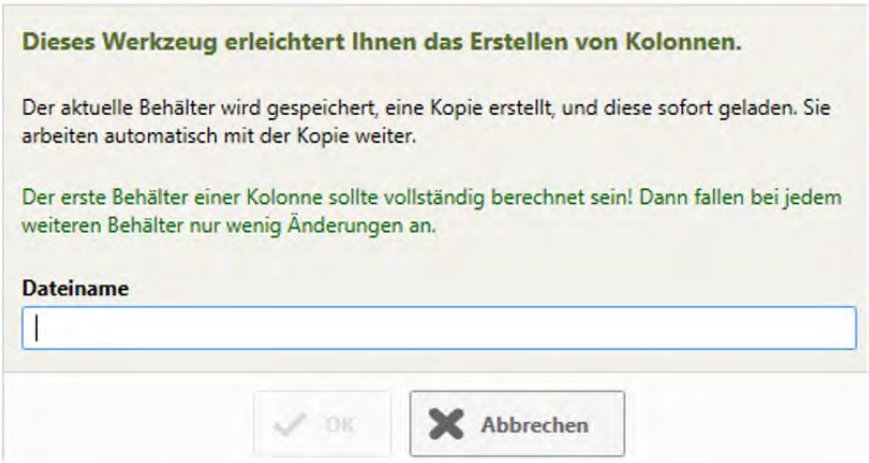
1. Miner tool

With the help of the new miner tool integrated into SIMONA® SmartTank 2.0 users can record various temperatures and their duration of action when determining an average operating temperature over the service life of the tank.

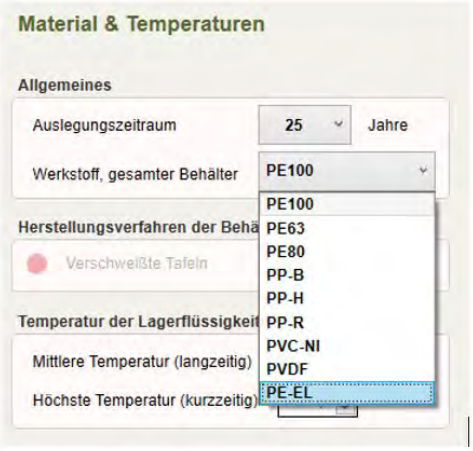


2. Tank column calculation

Within the SIMONA® SmartTank 2.0 user interface, a copy can be created from an existing tank and adapted with just a few mouse clicks in order to process series of tanks in no time at all.

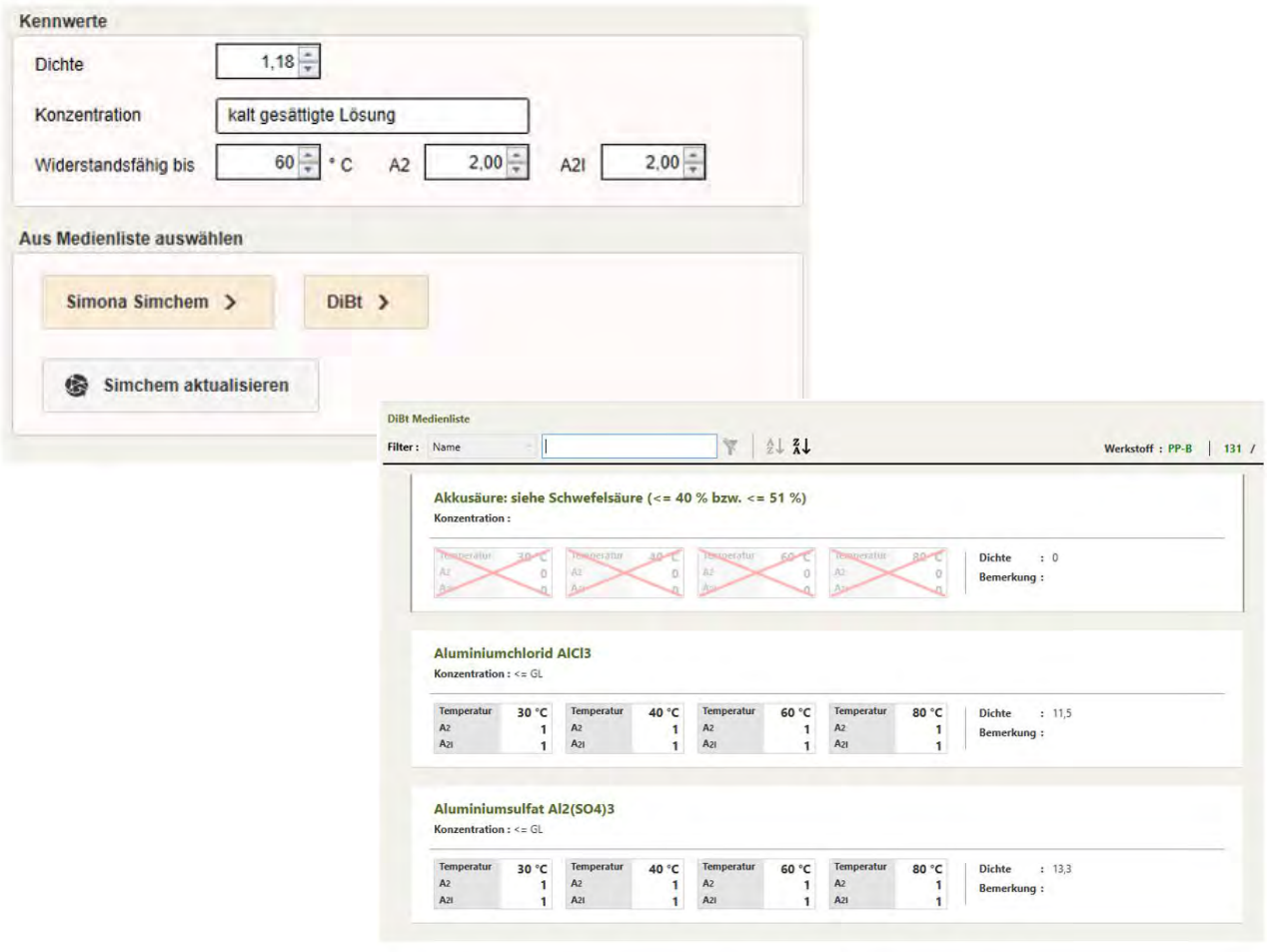


3. Integration of PE-EL (electrically conductive)



4. Option of selecting current DIBt list of substances or, alternatively, SIMONA® SIMCHEM database

In addition to the SIMONA® SIMCHEM database, SIMONA® SmartTank 2.0 includes the alternative option of a DIBt list of substances. Both components are maintained by us on a regular basis and can be updated at the click of a button.



5. FEM calculation for flat roofs of rectangular and cylindrical tanks

When classifying a structure as a walkable flat roof, in particular, relatively conservative calculation assumptions must be made due to the analytical methods applied within DVS 2205. Not only does this lead to considerable wall thicknesses, the roof itself also requires stiffening. This is no longer necessary in the new version of SIMONA® SmartTank 2.0, which includes FEM calculation methods. The wall thickness of the tank roof can be reduced by a significant margin.

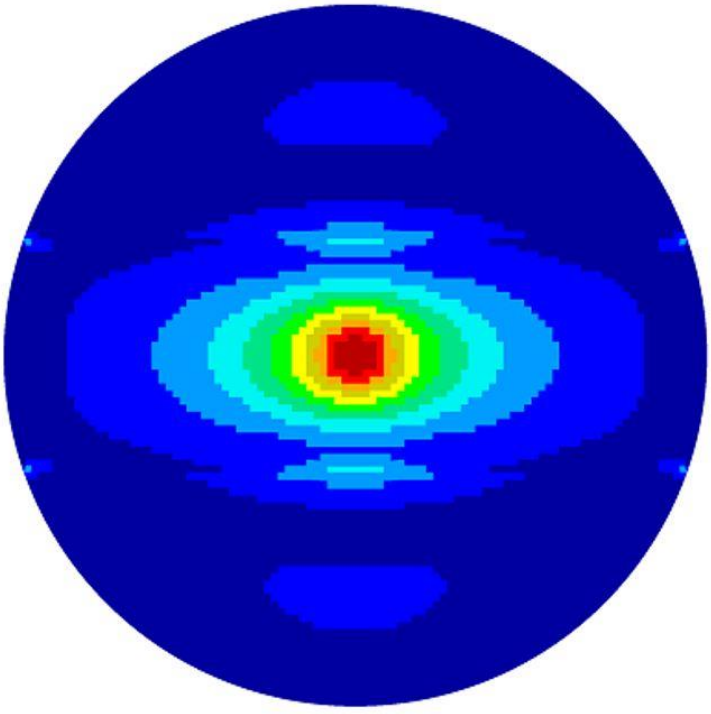
Example of a flat roof classified as walkable

Tank with D = 2500 mm, PE 100, operating temperature T = 30° C:

Calculation based on DVS 2205: Roof thickness t = 35 mm, 2 stiffeners with hS/Ss = 105/35. The stress check of the sheet under a man load is of relevance to dimensioning.

Calculation with FEM SIMONA® SmartTank 2.0: Roof thickness t = 25 mm, 2 stiffeners with hS/Ss = 135/25

The much more favourable design provided by SIMONA® SmartTank, with a mass reduction of more than 26 per cent in this case, is based on a realistic assessment of the load application widths under a single load of 1.50 kN.



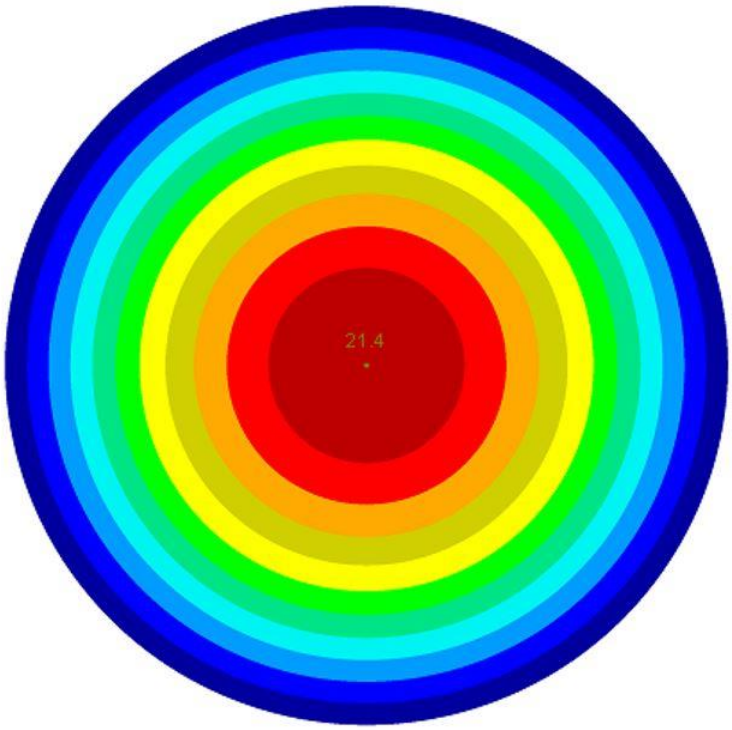
FEM equivalent tensile stresses of the sheet with realistic load propagation

6. SIMONA® Twin-Wall Sheet calculation for flat roofs of rectangular and cylindrical tanks

SIMONA® Twin-Wall Sheets have considerable flexural load capabilities. Thanks to the calculation concept developed by LU Engineering Software GmbH, this product can be used for the purpose of conventional tank construction. Due to the FEM calculation method integrated into SIMONA® SmartTank 2.0, the number of stiffeners or their cross-section can be reduced or the arrangement of stiffeners can even be omitted altogether, leading to a considerable reduction in the dead weight of the roof.

When applied to the previous example, the roofing sheet can be designed without stiffeners, thereby reducing the dead weight by 50 per cent compared to the DVS design.

In the majority of cases, it is the deformations of the ceiling sheet rather than the stresses that are of relevance to the design. SIMONA® SmartTank 2.0 limits the deflection of the sheet to D/100 in the case of a load dead weight, while applying the short-term modulus of elasticity of the sheet. Applying this method, non-reinforced flat roofs can be dimensioned and verified for tank diameters of 2500 mm.



Deformations under own weight, tank D = 2200, TM = 30° C

7. Upgrade for rectangular tanks

Design calculations for rectangular tanks are based on DVS 2205-05. The draft version of the new 2205-05 bulletin is scheduled for the end of the year, but no later than spring 2020. The new bulletin guides users through the calculation in much more detail, corrects overly conservative calculation approaches, but also prohibits procedures that are deemed incorrect in mechanical terms, e.g. with regard to the gradation of profiles used in circumferentially reinforced tanks. An essential point of change is the possibility to use FEM calculations in accordance with the provisions set out in the bulletin.

Therefore, the following approaches are possible:

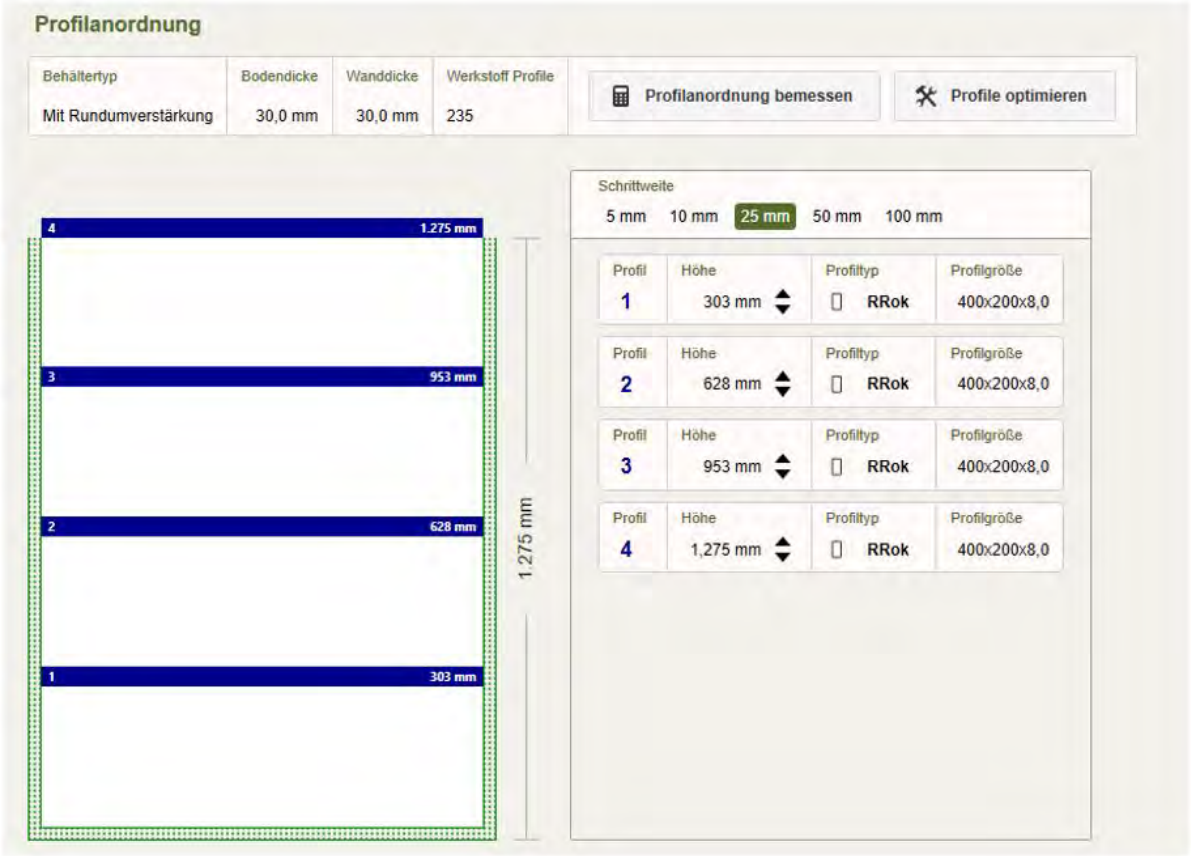
- Consideration of the coupling of tanks and stiffening profiles: If the analytical relationships are used for dimensioning according to DVS 2205-05, the reinforcement profiles must be designed by applying the following conditions.
  Permissible profile deformation of the reinforcing profiles in circumferentially reinforced and cross-ribbed tanks:
  $w_{p,1} \leq 0{,}01 * b_1$ Field height of first field
  $w_{p,i} \leq 0{,}0 * b_i$ Field height below the profile considered in the ith field
  When dimensioning with the aid of FEM, this specification is omitted, as the ratio of the stiffnesses and their effect on the design parameters is directly recorded and the steel quantities are considerably reduced.
- Detection of the actual stress distributions within a tank: if the actual stress distributions within the tank are known, potential material reserves can be exploited to the largest extent possible.
- Independent thicknesses of floor and wall: the analytical calculation specifications of DVS 2205-05 assume full clamping between floor and wall and thus at least identical wall thicknesses of both components. When applying FEM, different wall thicknesses can be used for the design of the tank and both components can be designed with sufficient stability.
- Tank roof dimensioning with the aid of FEM

The SIMONA® SmartTank 2.0 rectangular tank module calculates all tank types defined within DVS 2205-05 using FEM, thus optimising the dimensioning of rectangular tanks. The program handles all tasks for the user and discretises, optimises and evaluates the data in the background. Therefore, knowledge usually needed for the application of FEM is not required.

Please look here for details of comparative calculations with regard to all types of tank defined in DVS 2205-05.

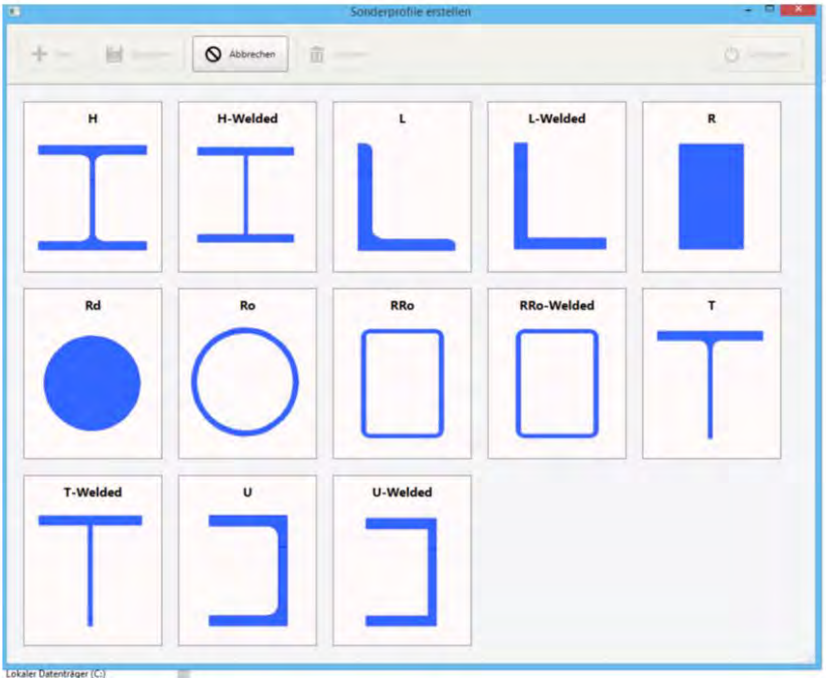
8. User-defined profile layout for circumferentially reinforced tanks

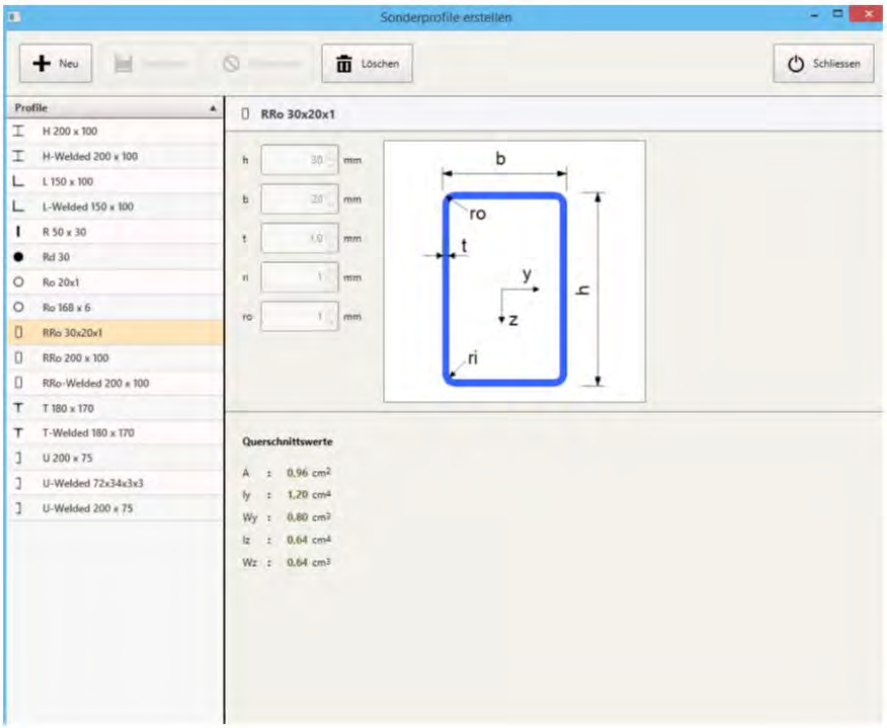
In addition to the optimised profile position provided by SIMONA® SmartTank for a given wall thickness in the case of circumferentially reinforced tanks, in future it is possible to specify a profile position graphically and interactively and to have SIMONA® SmartTank 2.0 calculate the associated wall thickness. In addition to the option of moving profiles, profiles can also be added or deleted.



9. Profile maker

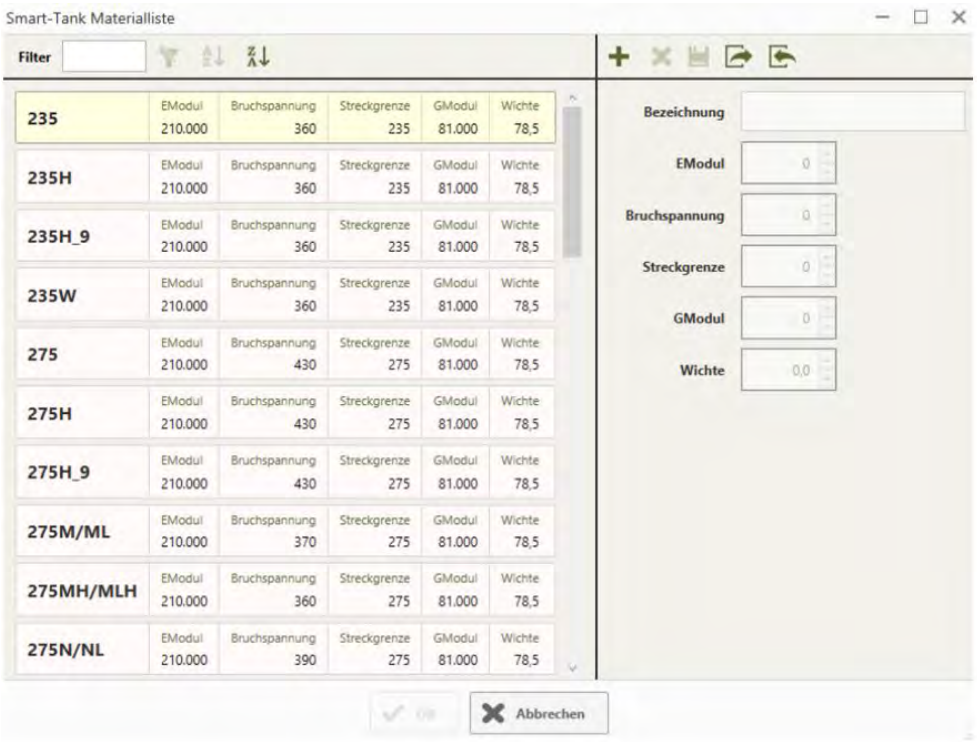
The rectangular tank module of SIMONA® SmartTank 2.0 includes a so-called profile maker as a new feature. After activating the profile maker, a dialogue window opens and displays all profiles that can be defined by the user. After selecting the profile type, all necessary cross-section data is queried and the required cross-section values are calculated by the SIMONA® SmartTank program and made available for dimensioning. Exotic profile series or self-created welding profiles can thus also be handled even in those cases in which users have little background knowledge with regard to structural engineering.





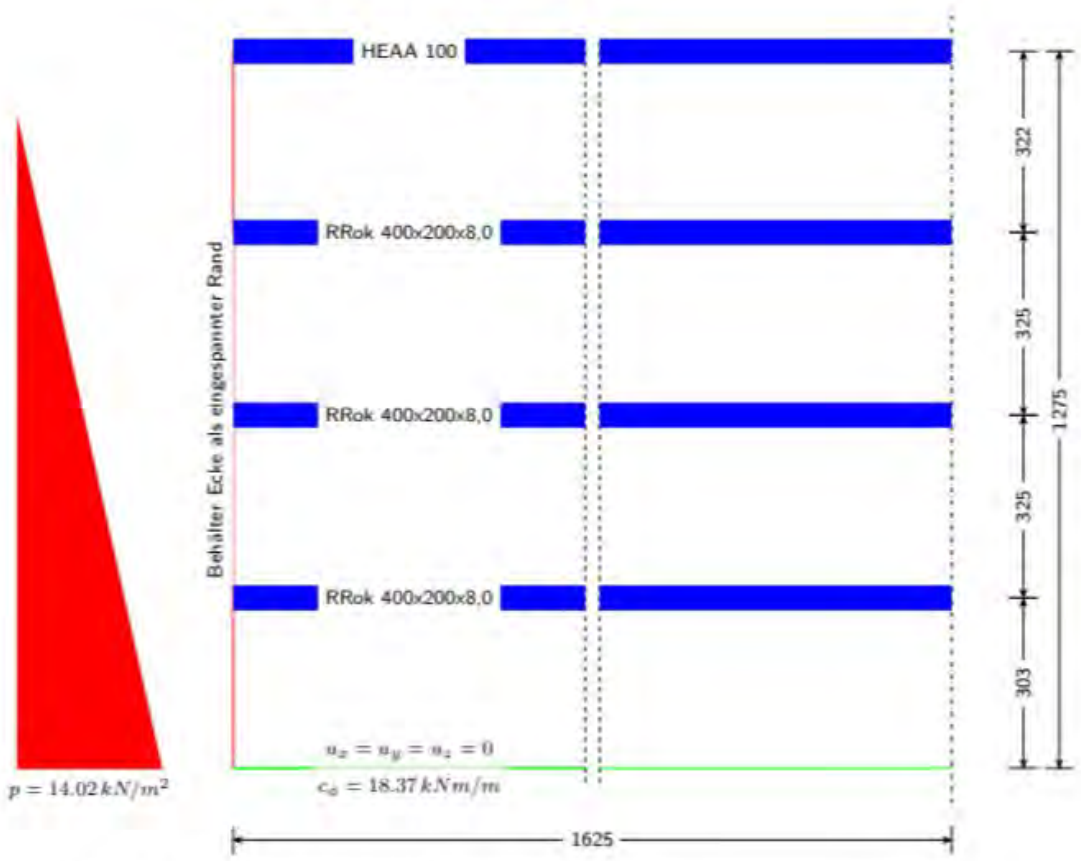
10. Material manager

Using the newly implemented material manager, the user can define any material and use it for the calculation of stiffening profiles. The application is very simple. After activating the material manager, the user is shown all existing materials in the program and he/she can add a new material by pressing the "+" button. A unique material name must then be assigned within the menu that opens and the specified material values must be entered accordingly. After saving, the material is available for all future dimensioning.

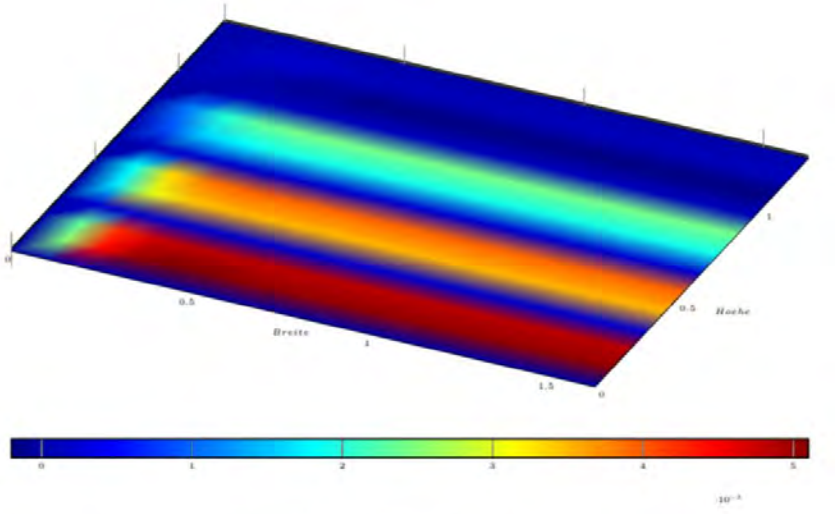


11. Improved graphical output and stress analyses for rectangular tanks

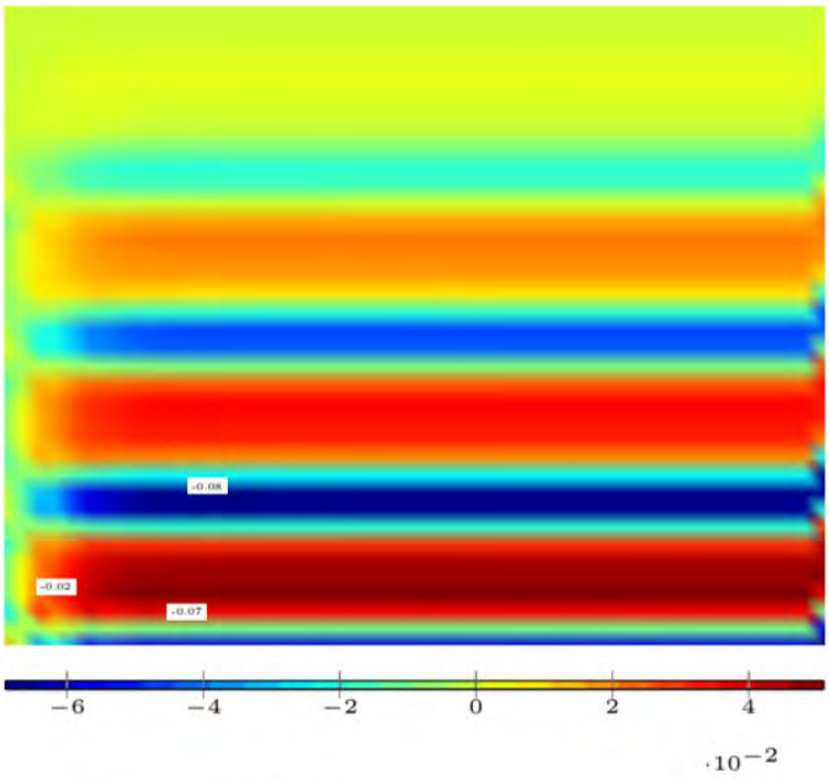
The output of rectangular tanks has been optimised in order to facilitate the testability of structural calculations and ensure a plausible explanation of dimensioning. Examples:



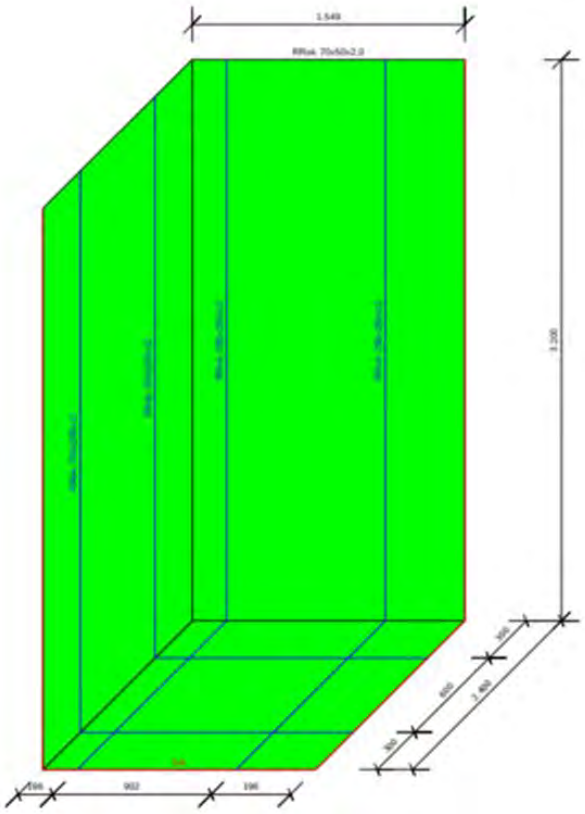
Structural system tank walls



Deformation of the sheet under characteristic load



Characteristic flexural moments my in kNm/m



Main dimensions and yoke arrangement

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