PROFITank
The Static Design Software
for vertically installed thermoplastic tanks

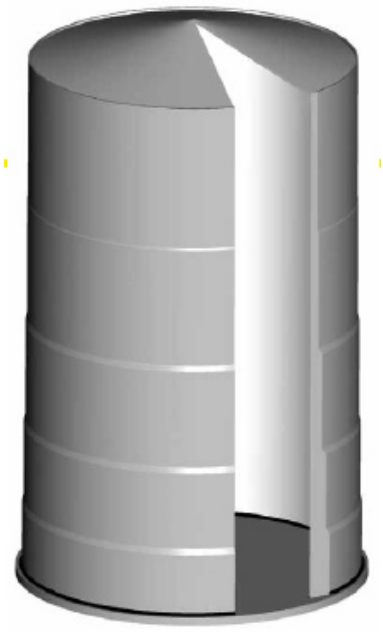
General
For the static calculation and design of cylindrical plastic tanks a software solution should be used.
Only with software-solutions an optimization of the needed wall thicknesses, diameters and design solutions can be done. Also the weight and the costs can be optimized and minimized without losing safety!

Especially if external loads have to be considered like wind, snow, earthquake or static loads by attachments, the manual design becomes very complex and needs a lot of time.

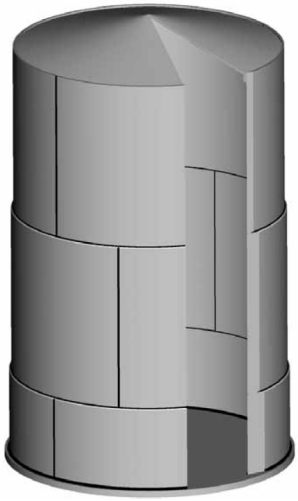
It is important that the software is under a continuous update process and follows the latest knowledge!

Requirements for Tank Design Software

- Providing all needed data for construction
- Consideration of internationally accepted standards for design of plastic tanks (e.g. by EN, DVS)
- A database for the common thermoplastic materials PEHD, PP, PVC and PVDF has to be included
- Consideration of international standards for external loads (wind, snow, earthquake etc.)
- The user has to be able to optimize the wall thicknesses and the weights
- Operation should be simple and self-explanatory as much as possible
- The software must be quick in installation, in data input and in providing the results !
- The print-out of the construction-data-sheet must be clearly laid-out
- The print-out of the static proof must be documented and comprehensible, including all equations, formulae and explanations for the results
- A database for most common chemical fluids has to be included in the software
- Possibility for calculation of helical extruded tanks and collection tanks as well as for tanks made of fused and bent sheets



Tiered cylindrical tank made of helically extruded pipe



cylindrical tank made of fused and bent sheets

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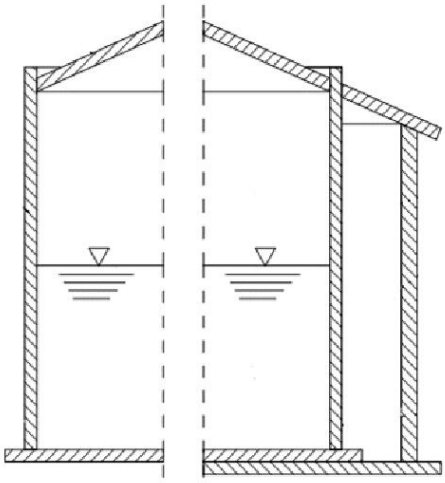
Preparation for optimal tank design

For a professional static calculation by using professional software several pieces of information are needed. Typically questionnaires are used to clarify the requirements for the tank-project. So, all necessary information can be compiled.

PROFITTank – Questionaire:

PROFITank - Questionaire
For Vertical Cylindric Plastic Tanks

without collecting device



with collecting device

schematic sketch

Company Name	
Contact Person	
Telephone	
E-Mail Adress	

Inner Diameter:		[mm]
Cylindrical height:		[mm]
Fill Volume		[Liter]
Medium		[-]
Density Medium:		[kg/m³]
Temperature Medium		[°C]
Temperature Environment		[°C]
Pressure:	(vertical tanks for hydrostatical pressure only)	[bar]

requested Material

PE 80	PE 100	PPH	PPR	Others

1/2

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PROFITTank – Questionaire:

Installation:

Inside Building	☐ Yes	☐ No	
Collecting device (tank/pan) existing	☐ Yes	☐ No	Height: _____ [mm]
Collecting device (tank) requested	☐ Yes	☐ No	

External Loads:

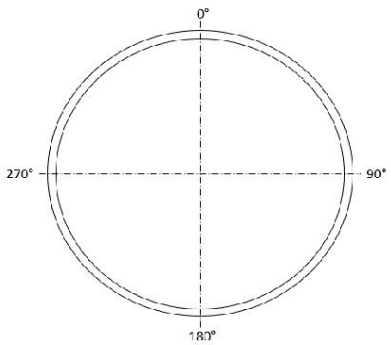
Wind Load	☐ Yes	☐ No	_____ [kN/m²]
Snow Load	☐ Yes	☐ No	_____ [kN/m²]
Eartquake Load	☐ Yes	☐ No	horizontal _____ [m/s²]
reference peak ground acceleration			vertical _____ [m/s²]
Sun radiation	☐ Yes	☐ No	
Loads on top	☐ Yes	☐ No	_____ [kN/m²]
Others	☐ Yes	☐ No	_____ [Pa/m²]

Roof	☐ Yes	☐ No	
Roof shape	☐ flat		
	☐ conical		angle: _____ [°]

Noozles	N1	N2	N3	N4	N5
Size/diameter					
wall thickness					
Position (C=Cylinder, R=Roof)					
Position: Height [mm]					
Position: Degree [°]					

Tank ventilation ☐ by Nozzle ☐ by pipe-system

Noozle Position:



2/2

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Overview of Software tools

Professional Software Solution
for static calculation and static proof
of vertical installed cylindrical tanks,
made of thermoplastic materials:

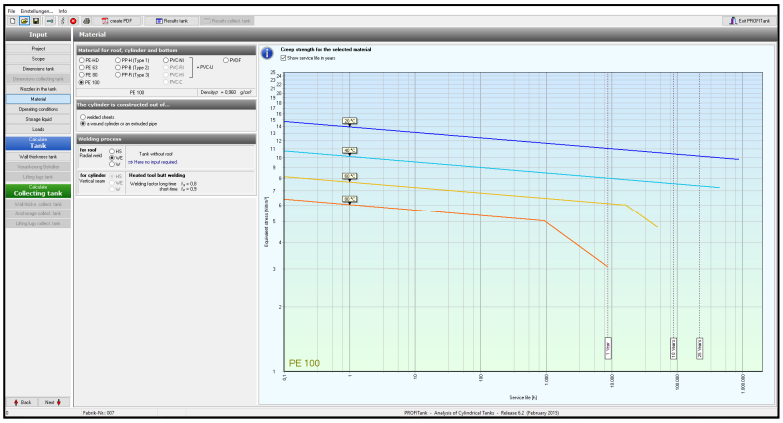
- Polyethylene (PEHD, PE80, PE100)
- Polypropylene (PP-R, PP-B, PP-H)
- Polyvinyl chloride (PVC-U)
- Polyvinylidene fluoride (PVDF)

Following DVS rules for the static design
resp. the static calculation.
Distributed by Plaspitec GmbH:

Visualized material characteristics for
strength in relation of temperature and
time.

Consideration of welding procedure and
welding factor for tank, bottom and
roof construction:

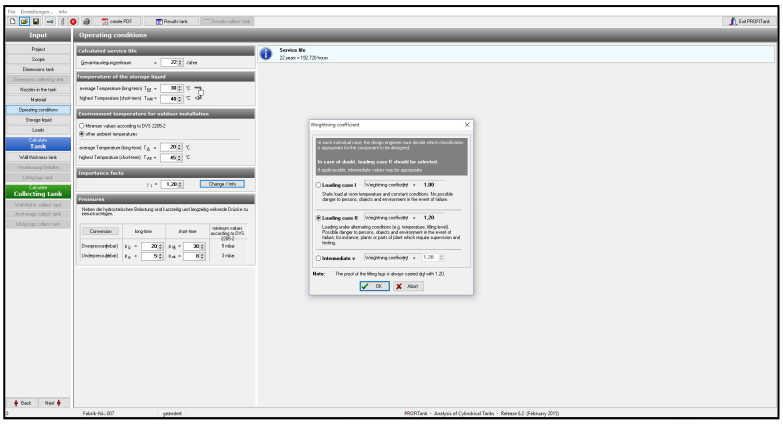
- Hot-Gas-Welding (W)
- Extrusion Welding (WE)
- Butt Fusion (HS)



Free input of:

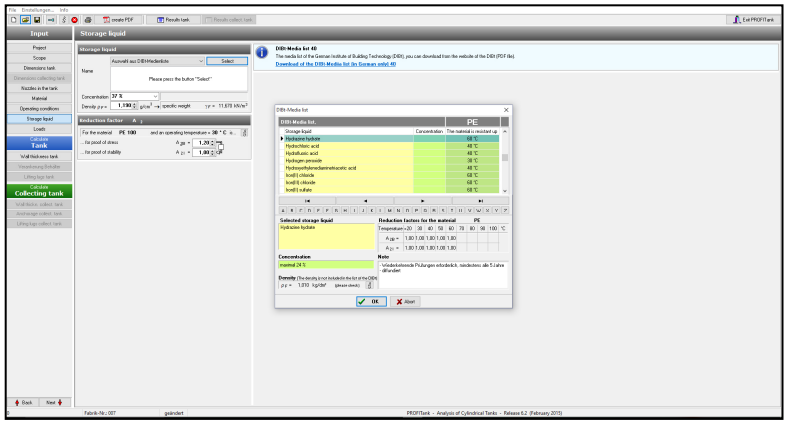
- design-time
  (e.g. 1…37…43…max 50years)
- design temperature for medium
  and environment (winter, summer)

Further consideration of static or
changing operating conditions



Input of medium/fluid characteristics:
Either by following the included
chemical database for chemical fluids
acc. German DIBt-listing
or free input of fluid characteristics:

- density
- concentration
- reduction-factors etc.



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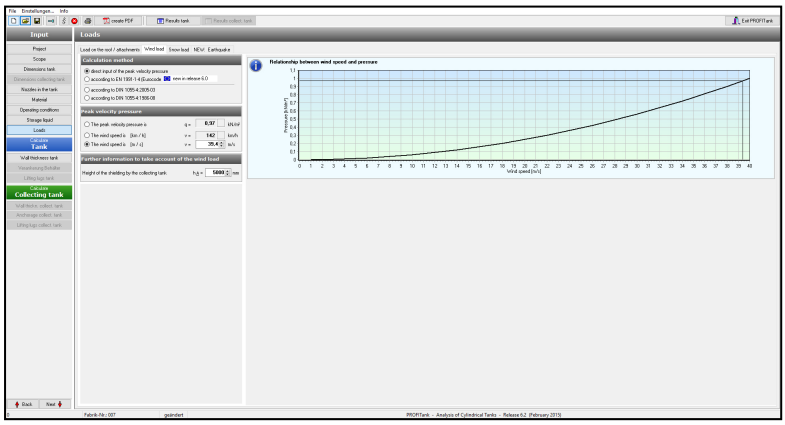
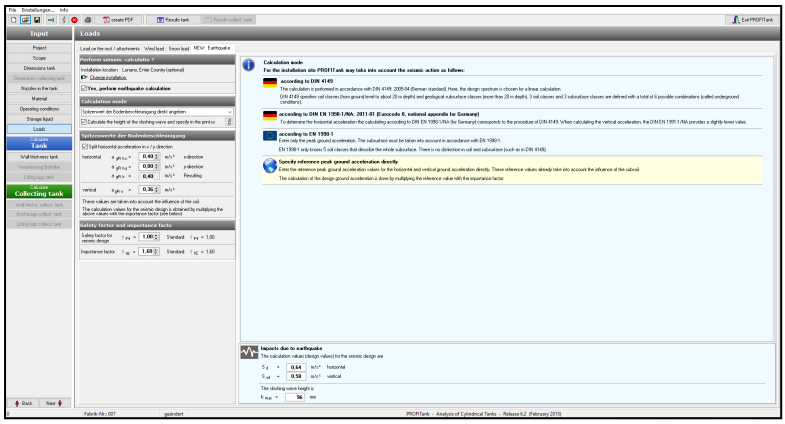
Possibility for consideration of wind-load acc. International standards (e.g. EN 1991-1) or by free input of max wind-speed

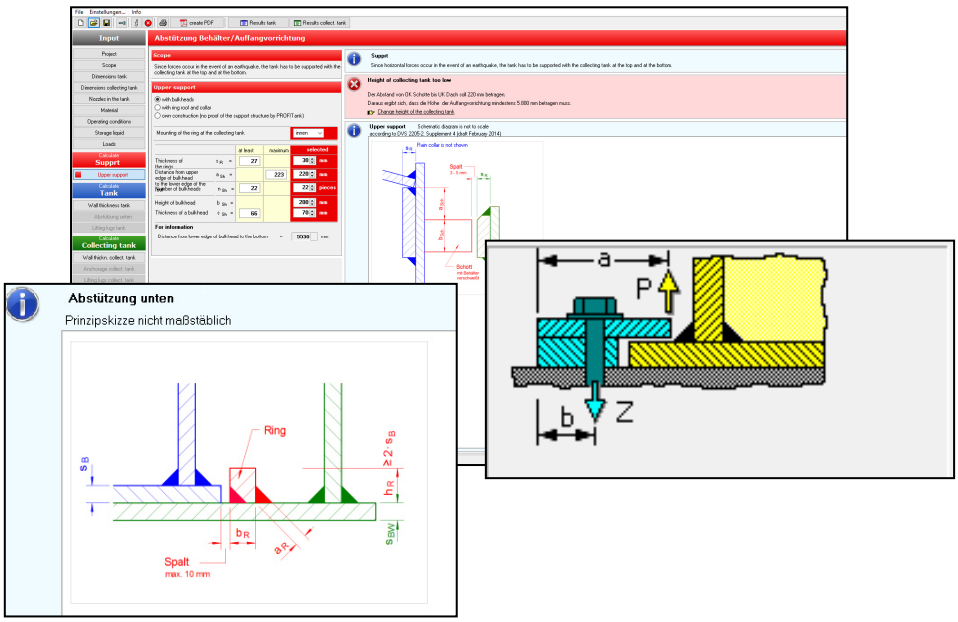


Possibility for consideration of earthquake load acc. International standards (e.g. EN 1998-1) or by free input of horizontal and vertical ground-acceleration



Separate design with visualized sample solutions of:

- Anchorages
- Lifting Lugs
- Reinforcements
- Rain-collar / ring-plate
- Bearing blocks (for horizontal Earthquake loads)



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Finally after finishing all steps of calculation a complete static proof or a data sheet for construction can be printed for the tank.

PROFITank Construction sheet for the tank *Page 1 of 1*

Cylindrical flat-bottomed tank made from PE 100 with conical roof

Order number: 1234
Tank number: 1 A
Customer: My customer
Operating company: Plaspitec GmbH
Installation location: My town
Installation: Outside of buildings at an altitude of 0 mm, with collecting tank.
Shielding of wind forces by collecting device: h_A = 4 664 mm
The tank is free ventilated.

Operation: Service life = 25 years; Weightning coefficient: γ_I = 1.20; Temperature long-term: T_M = 30 °C; Temperature short-term: T_{MK} = 40 °C

Filling: *not specified*; Filling volume: V_F = 20.20 m³; Filling height: h_F = 4 465 mm; Density: ρ_F = 1.20 g/cm³; Specific weight: γ_F = 11.77 kN/m³; A_2 = 1.00 A_{2I} = 1.00

Pressures: $p_{ü}$ = 0 mbar p_u = 0 mbar $p_{ük}$ = 5 mbar p_{uk} = 3 mbar

Loads: Wind impact pressure q_{max} = 0.59 kN/m²; Snow load on the roof: s_0 = 0.68 kN/m² g_A = 0.20 kN/m²; Wind load on attachments: F_A = 0.140 kN; Loads by mounted attachments: G_A = 2.000 kN total, G_{A1} = 0.500 kN per load bearing point; Earthquake calculation value: S_d = 1.07 m/s² S_{vd} = 0.96 m/s²

Internal diameter d = 2 400 mm
Cylindrical height h_Z = 4 700 mm (up to the lower edge of the conical roof)
Height of conical roof h_D = 322 mm (Roof slope α_D = 15°)
Total height h = 5 022 mm

Component	Wall thickness	Height of tier	manufactured from	Mass
Roof	s_D = 17.5 mm		Sheets, WE-seam	G_D = 171 kg
Tier 1	$s_{Z,1}$ = 12.0 mm	$h_{Z,1}$ = 1 600 mm	Helical Wound	$G_{Z,1}$ = 140 kg
Tier 2	$s_{Z,2}$ = 17.0 mm	$h_{Z,2}$ = 2 000 mm	Helical Wound	$G_{Z,2}$ = 248 kg
Tier 3	$s_{Z,3}$ = 22.0 mm	$h_{Z,3}$ = 1 100 mm	Helical Wound	$G_{Z,3}$ = 177 kg
Bottom	s_B = 15 mm		Sheets	G_B = 65 kg
		h_Z = 4 700 mm		G_E = 800 kg

Nozzles in the roof: d_A = 630 mm
Nozzles in the cylinder: d_A = 350 mm x = 700 mm

The tank requires no special anchorage.
The residual height of the filling level in the tank is at least: h_{RF} = 38 mm.
2 Lifting lugs: $s_Ö$ = 12 mm, $b_Ö$ = 140 mm, d_L = 33 mm, d_{Sch} = 30 mm

PROFITank - Version 6.2 *September 1, 2015*

Are you interested in PROFITank ?
Do you need any information or static calculation?

Please don't hesitate to contact us!

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