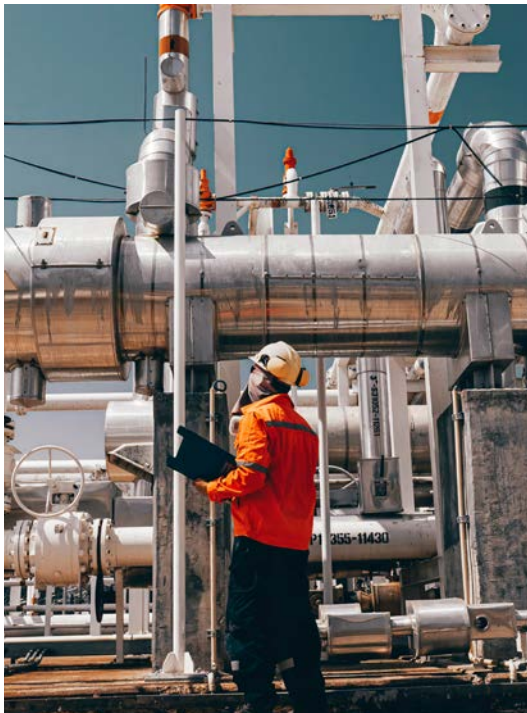


PROTEGO® Engineering Service – Tank Modeling Solutions beyond the scope of International Standards



PROTEGO® Engineering Service is the engineering consulting branch within the PROTEGO® Group. We assist our customers with detailed tank modeling and safety analyses beyond the scope of PROTEGO® device application

Our areas of expertise are:

- Tank protection against ordinary and intense weather conditions, including advanced in- and outbreathing calculations.
- Prevention of tank implosion caused by vapor collapse in tanks during routine, maintenance and cleaning operations
- Safe and cost effective product loss minimization from fixed roof and floating roof tanks, which includes VOC emission calculation and determination of inertization requirements
- Optimized relief system setting and chatter-free installation of breather vents as independent protection layers (IPL) in complex vent header systems, which includes assessment of noise levels and reaction forces of PROTEGO® devices

PROTEGO® Engineering Service – Advanced Tank Modeling Solutions beyond the scope of International Standards



EXAMPLES OF PROTEGO® ENGINEERING SUCCESS STORIES

HOT ASPHALT TANKS

A client wants to increase the operating temperature of its asphalt and vacuum residue tanks to beyond 200°C.

ISO 28300 and API 2000 thermal inbreathing models do not cover headspace temperatures exceeding 55°C and suggest detailed engineering studies for such applications.

PROTEGO® ENGINEERING SERVICE was commissioned to reevaluate the breathing requirements for these tanks.

PRESSURE RISE IN A HOT TANK

A client plans to remove the foam insulant from a propylene oxide (PO) tank and provide the tank with a white coating. Removing the foam panels allows operators to address water-driven corrosion that develops under the insulation. However, removal of the insulant exposes the tank contents to higher temperatures due to solar radiation.

PROTEGO® ENGINEERING SERVICE was commissioned to evaluate the risk of fugitive emissions from the tank, when the temperature in the uninsulated tank rises due to solar exposure and the safety device opens.

VAPOR CONDENSATION AND STEAM COLLAPSE

Since its foundation PROTEGO® ENGINEERING SERVICE has helped numerous clients in evaluating the impact of vapor condensation and steam collapse on the breathing requirements of their storage tanks and low-pressure process vessels. ISO 28300 and API 2000 do not cover condensation within headspace. Several clients experience rapid steam collapse due to the introduction of a cold liquid or inert gas into a hot headspace during or soon after tank cleaning operations. Practical solutions were provided for the calculated inbreathing requirements.

PROTEGO® ENGINEERING SERVICE offered practical solutions and calculated the inbreathing requirements.



INTERNAL FLOATING ROOF TANKS

Internal floating roof tanks have a floating roof or cover on the liquid surface.

Correct operation and regular maintenance of the internal floating roof help minimize VOC emissions.

Failures of internal floating roofs like overweight or burping lead to fugitive emissions into the headspace and increase the risk of tank fires and explosion.

PROTEGO® ENGINEERING SERVICE was commissioned to evaluate the breathing requirements for several floating roof tanks under normal operation and for failure modes.

PROTECTION OF VENT HEADER SYSTEMS

Several clients connect multiple storage tanks for the same or similar products using vent header systems.

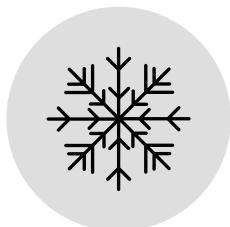
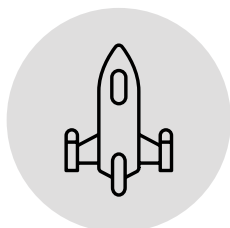
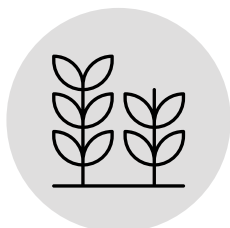
Vent header systems allow some degree of overpressure and vacuum compensation by enabling VOC to move between the tanks during liquid filling or removal.

However, vent header systems alone do not suffice to completely prevent external in- and out-breathing completely, such as during filling operation, thermal breathing when all tanks in the vent system are exposed to solar radiation or rain showers.

Few large breather vents on a header may be more economical than installing a smaller valve on each connected tank. However, this solution may not work when pressure losses are too large or travel time to the furthest tank is too long.

PROTEGO® ENGINEERING SERVICE was commissioned by various clients to evaluate the safety of breather vents on vent headers versus individual storage tank protection and recommend a safe and economically viable solution.

PROTEGO® Engineering Service



OUR CUSTOMERS ARE THE GLOBAL PLAYERS IN:

- Oil & Gas
- Chemical and Petrochemical
- Agrochemical
- Distillery
- Cryogenic (LIN, LOX, LNG, LPG)
- Food and beverages
- Pharmaceuticals & Cosmetics
- Aviation and Space
- Marine and Offshore
- Renewable Fuels
- Decarbonisation

IN CASE OF QUESTIONS FEEL FREE TO CONTACT US!
OUR PROTEGO® TEAM IS HAPPY TO ADVISE YOU!

PROTEGO® HEAD OFFICE

Braunschweiger Flammenfilter GmbH
Industriestraße 11, 38110 Braunschweig, Germany

Phone: +49 (0) 5307 / 809-0

Email: office@protego.com

WWW.PROTEGO.COM

