

Designed with Dlubal Software...

Industrial Filter Device

The project for designing a filter/dryer device including agitator required a complete stress and deformation analysis in RFEM. A special design challenge represented the complex modeling of the structure having 1,424 surfaces, 158 solids and 425 members.

Model Input

The filter was modeled with linear elastic shell and solid elements. It consists of the following main structural components:

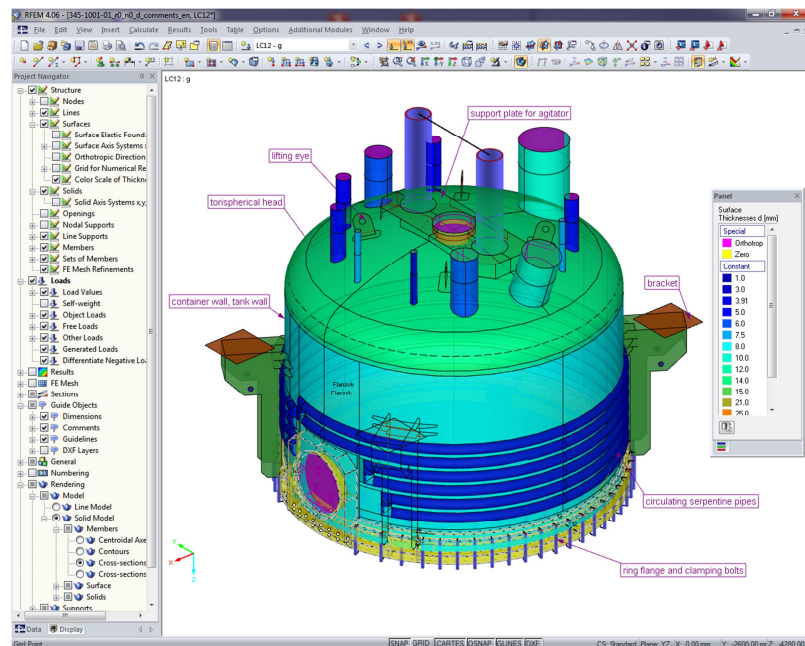
- floor slab
- filter bottom
- container wall with torispherical head and ring flange applied at bottom
- brackets on container wall
- support plate for agitator
- pipe connection and lifting eyes on torispherical head
- circulating serpentine pipes

The connection of container and floor slab has been especially interesting for the modeling process. The ring flange was applied in the form of a solid element to the bottom of the tank plate.

It was fixed to the floor slab with 53 clamping bolts M 27 which were uniformly distributed around the circumference to ensure a constant prestressing force. In order to anchor the ring flange against the floor slab with defined prestress forces, a circulating counter element was modeled as solid element on the tank wall. Thus, it was possible to clamp the container flange against the conical floor slab.

To reproduce this conical fastening in RFEM, it was necessary to define the contact property between these structural components in the analysis model.

Contact solid elements defining an elastic spring were distributed uniformly around the circumference.



Analysis model in RFEM

Loads

The following loads were applied to the construction:

- design pressure for container -1/6 bar, heating for flat bottom -1/10 bar, heating coil -1/10 bar
- vertical loads due to self-weight and equipment
- design temperature -20/200 °C
- internal positive and negative pressure with design of pressure fluctuations from 0.0 to 3.0 bar for 28,000 cycles of load according to AD-S1 and S2
- agitator loads for 2 millions stress cycles

Calculation in RFEM

Five load groups were created from the single load cases and the FE-mesh was generated. Then the inter-

nal forces, stresses and deformations were determined in RFEM. In addition to the general stress analysis, fatigue designs due to pressure fluctuations and agitator loading were performed.

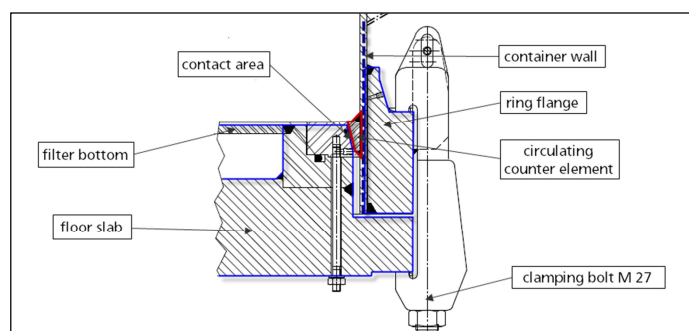
Companies involved:

Structural planning

Peter & Partner
Ingenieur- und Sachverständigen-gesellschaft für Strukturmechanik
Am Sonnenhang 13
D-53804 Much
www.ifs-peter-partner.de

Software

Dlubal Ing.-Software
www.dlubal.com



Details: connection between container wall and floor slab