

# Durability and Buckling Analysis of Storage Tanks



Teknokon Group is a multi-disciplinary organization headquartered in Istanbul, Turkey. Its holding, Teknokon Machinery, founded in 1993, is an engineering and manufacturing company with wide international experience. They provide mechanical design and production of various process equipments used in sectors such as chemical, petrochemical, energy, mining, food, beverage and cosmetics, in accordance to the certification of quality, environmental and occupational health and safety management systems regulated by the respective standards (ISO 9001, ISO 14001 and OHSAS 18001).

## Project Objectives

Teknokon Machinery has developed its know-how in design and manufacturing of various types of storage tanks during the years and they have become among the leader in this field. By taking advantage of EnginSoft experience in Simulation Based Engineering, by means of the FEM analysis, the Durability, Structural Integrity and Buckling behavior of a new group of toxic liquid and fuel storage tanks have been investigated..

## FEM analysis to investigate and improve the durability of products

In this project, thirteen different kinds of storage tanks have been modeled using ANSYS Mechanical. Three dimensional geometry and the finite element models have been generated from 2D technical drawings in order to investigate the mechanical behavior of the tanks when filled with liquid and to predict the buckling behavior when they are empty. Two of the storage tanks had a



mixer located at the top of the roof with an installation platform. The mixer has been considered as a lumped mass rigidly connected to the platform.

Quadratic shell elements with full integration option have been used to mesh the model. Converged mesh has been used in critical

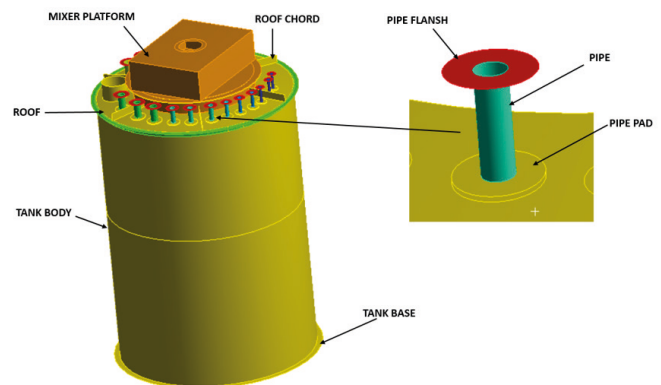


Figure 1 - 3D geometry and parts of HX62-CM002 tank

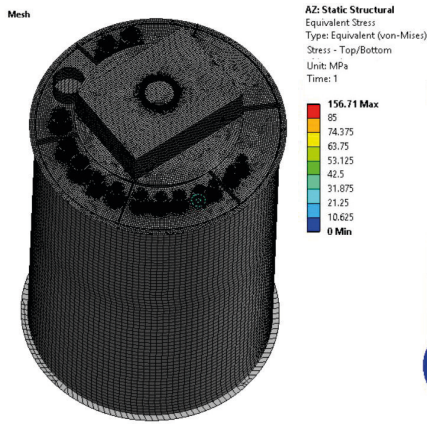


Figure 2 - Mesh



Figure 3 - Results

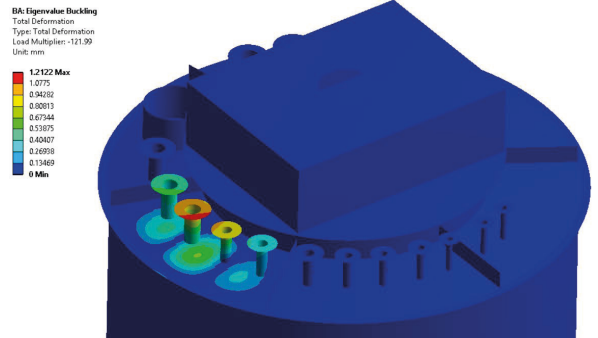


Figure 4 - Detailed Results

areas where the stress gradients higher to be able to capture the right mechanical response . Loads acting on the system have been provided by Teknokon. Forces and moments have been applied to the flanges and hydrostatic pressure has been applied to the inner surfaces of the tanks. The effect of gravity has been considered: snow loads, presence of the weight of people and the wind forces have been taken into account in the finite element analysis. Fixed supports have been introduced through the baseline of the models.

## Conclusion

FEM analysis has allowed us to better understand the mechanical and buckling behavior of the structures. In this way, we could define the proper geometrical modifications necessary to guarantee the structural integrity of the storage tanks.

For more information:

Tahir Soyugüzel, EnginSoft Turkey– [t.soyuguzel@enginsoft.com](mailto:t.soyuguzel@enginsoft.com)



## EnginSoft Turkey: the business is growing

EnginSoft Turkey started the activities in February 2015. The offices are located in Teknopark Istanbul and Ankara. In less than a year, the subsidiary has been growing its business with important projects and partnerships. One of these projects, reported in this newsletter, is about the activity with Teknokon, an key Turkish player in the field of oil&gas.

The company provides mechanical design, residence engineering, advanced engineering analyses, software sales and technical support services and carries out co-funded R&D projects. EnginSoft Turkey is currently providing solutions in aerospace & defence (A&D), automotive and appliances sectors. Their aim to be a solution partner of the main players in these sectors.

EnginSoft Turkey has introduced and is helping many companies adopt modeFRONTIER optimization and Cetol 6σ tolerance technologies. EnginSoft Turkey is the sole distributor of modeFRONTIER (optimization platform) and Cetol 6σ (tolerance analysis) in Turkey. Furthermore, EnginSoft Turkey distributes Flowmaster, Recordyn and LS-DYNA and provides for these softwares technical support. Our expert staff has worked intensively in our first year and has recently organized modeFRONTIER and CETOL 6σ seminars to introduce softwares with a high number of participants from leading companies in a wide range of sectors in Istanbul and Ankara, also, EnginSoft Turkey regularly arranges webinars, software trainings and special trainings about the usage.

We are extremely please with the reception from Turkey and look forward to future collaborations especially in R&D and upcoming A&D projects.

For more information: Sadi Kopuz, CEO EnginSoft Turkey

[s.kopuz@enginsoft.com](mailto:s.kopuz@enginsoft.com)