PRODUCT DATA SHEET

Bentley®
Advancing Infrastructure

PLAXIS® Monopile Designer

Drive Power with Efficient Offshore Foundations

PLAXIS Monopile Designer introduces an enhanced design method for monopile foundations. It transfers the results of the PISA Joint Industry Research Project to daily engineering practice. PLAXIS Monopile Designer enables dramatic reductions in the amount of steel of each monopile and, as such, in the overall costs of any wind farm. It can be used as a stand-alone tool for the rule-based design method and in connection with PLAXIS 3D for the numerical-based design method.

A Well-proven Finite Element Solution

The enhanced design method of PLAXIS Monopile Designer analyzes the ability of monopile foundations to resist lateral loads on the basis of a 1D Timoshenko beam finite element model, accurate even for large diameter monopiles, and realistic soil reaction curves, while retaining many of the assumptions of the more conventional p-y approach. Research has shown a potential reduction in the embedded length of the piles by up to 35%.[1]

PLAXIS Monopile Designer reaches its full potential when used with PLAXIS 3D, which enables the automatic calibration of the soil reaction curves to the specific design space and characteristics of the site. In addition, PLAXIS 3D offers a complete, well-proven and robust finite element solution for any type of offshore or onshore structure.

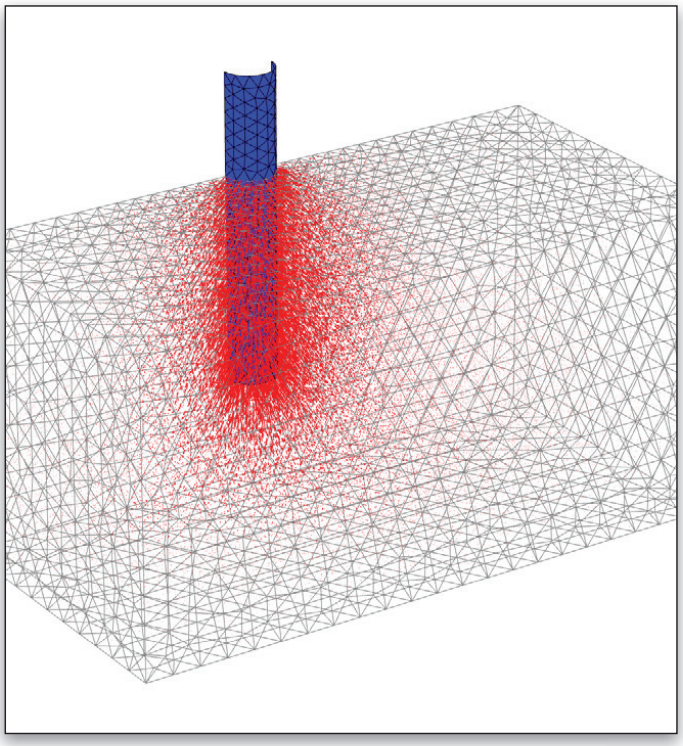
Efficient Design Translates to More Savings

In the very competitive offshore wind industry, less conservative dimensioning of each monopile of a wind farm will result in a significant reduction in the amount of steel and, therefore, in fabrication, transportation, and installation costs.

Seamless Integration with the PLAXIS Environment

PLAXIS Monopile Designer can be used as either a stand-alone application, if the user supplies the soil reaction curves, or with PLAXIS 3D, to calibrate the soil reaction curves numerically according to the design space and specific properties of the site.

In addition to the automatic calibration of soil reaction curves for PLAXIS Monopile Designer, PLAXIS 3D offers a complete solution for the offshore wind industry, whether bottom-fixed or floating. With its broad range of capabilities, multicore calculations and 64-bit architecture, PLAXIS 3D can deal with the largest and most complex geotechnical models, including jackets, tripods, and suction anchors.



Principal stress directions around a monopile foundation.

State-of-the-Art Research Brought to Engineering Practice

PLAXIS Monopile Designer has been developed in collaboration with Oxford University and Fugro. It transfers the enhanced design method established in PISA Phase 1 and 2 to current industry design practice. Future findings of PISA will be implemented as they become available.

Innovative, Robust, and Reliable

PLAXIS Monopile Designer is developed following the PLAXIS engineering process, which has consistently delivered stable, robust, and well-defined geotechnical finite element software for decades. The underlying procedure has been validated via large-scale testing of monopile foundations at the two PISA test sites, the Dunkirk sand site, and the Cowden clay site.

[1] Byrne, B. et al. (2017). PISA: New Design Methods for Offshore Wind Turbine Monopiles. 8th International Conference for Offshore Site Investigation and Geotechnics, London.

System Requirements

Operating System
Windows 10 is now recommended. Up-to-date requirements can be checked at www.bentley.com

Graphics Card
Required: GPU with 256 MB OpenGL 1.3

Bentley recommends avoiding simple onboard graphics chips in favor of a discrete GPU from the nVidia GeForce or Quadro range with at least 128-bit bus and 1 GB of RAM, or equivalent solution from ATI/AMD.

Processor
Required: Dual Core CPU

Recommended: Quad Core CPU

Memory
Recommended: minimum 8 GB. Large projects may require more.

Hard Disk
Minimum 2 GB free space on the partition where the Windows TEMP directory resides, and 2 GB free space on the partition where projects are saved. Large projects may require significantly more space on both partitions.

For best performance, ensure that the TEMP directory and the project directory reside on the same partition.

Video
Required: 1024 x 768 pixels, 32-bit color palette

Recommended: 1920 x 1080 pixels, 32-bit color palette

Find out about Bentley at: www.bentley.com

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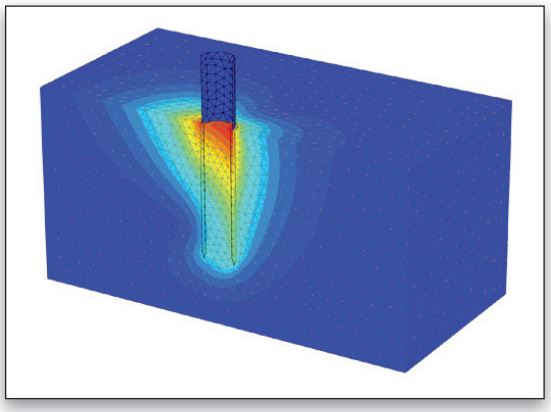
PLAXIS Monopile Designer At-A-Glance

Modeling
- Analysis of homogeneous and layered profiles according to PISA Phases 1 and 2
- Seamless integration with PLAXIS 3D
- Nonlinear soil reaction curves for lateral loading, rotation, base shear, and base rotation (PISA) or lateral loading only (API)

Calculations
- Automatic calibration and optimization of numerical soil reaction curves (PLAXIS 3D)
- Robust 1D kernel with highly efficient calculation times

Results
- Realistic assessment of displacements and structural forces
- Visualization and export of numerical (PLAXIS 3D) and parametric soil reaction curves
- Automatic generation of (PLAXIS 3D) design verification models

Capabilities
- Timoshenko beam theory ensures accurate results even for large diameter monopiles
- Optimized design method for monopile foundations



Analysis of layered soil profiles in accordance with PISA Phase 2.

PLAXIS Monopile Designer Features	Stand Alone	With PLAXIS 3D and GSE
1D ANALYSIS		
Homogeneous Soils	✓	✓
Layered Soils	✓	✓
With User-defined Depth Variation Functions	✓	✓
With API P-Y Curves	✓	✓
Export Results as TSV	✓	✓
CALIBRATION		
Generation of 3D Calibration Models		✓
Calibration with Target Displacement		✓
Calculation of Soil Reaction Curves		✓
Parameterization of Depth Variation Functions		✓
Export to SACS/OpenWindPower™ (Numerical)		✓
Export to SACS/OpenWindPower™ (Parametric)		✓
3D DESIGN VERIFICATION		
Generation of 3D Verification Models		✓
Calculation of 3D Verification Models		✓
3D Verification Results		✓
Accuracy Metrics		✓
Export to SACS/OpenWindPower™ (Numerical)		✓
Export to SACS/OpenWindPower™ (Parametric)		✓

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