

# PDPWAVE

## Prediction of Pile Driving with Impact Hammers or Vibratory Hammers

### PDPWAVE program

PDPWAVE (PDP = Pile Driving Prediction) is a powerful, yet user-friendly program to perform driveability studies. For Impact Hammers it predicts the blow count, related pile stresses, dynamic and static soil resistances, driving time, hammer performance and the relation between blow count and bearing capacity. For Vibratory Hammers it predicts the pile



*Pile driving monitoring offshore.*

penetration speed, stresses, dynamic soil resistances and driving time. PDPWAVE is one of the applications of the Wave Equation program TNOWAVE.

### The purpose of PDPWAVE

In preparing for a pile-driving set-up the optimal combination between hammer and pile (incl. if applicable impact block, anvil, cushions, etc.) has to be determined in order to optimize the efficiency of the pile driving process and to prevent damage and/or refusal. Also, precautions must be taken to avoid damage to the piles as a result of unexpected compression or tensile stresses exceeding the pile material strength.

PDPWAVE can be used for professional driveability studies to determine this optimal combination and required precautions. With the results of PDPWAVE the piling engineer can:

- Predict driveability
- Optimize the selection of the Impact Hammer or Vibratory Hammer
- Select the maximum energy level without damaging the pile
- Increase the efficiency of the pile-driving set-up
- Optimize the energy transfer and, if applicable, the cushion and pile adapters selection

### PDPWAVE user interface

The program is extremely user-friendly, and includes an electronic manual and an extensive Help function. The PDPWAVE application is designed for professional geotechnical engineers as well as technical practitioners to make pile behavior predictions and simulations. All dimensions and parameters are expressed in engineering units (SI or English).

The advantage of the user interface is that the design is kept simple and logical for any user. The program has three application levels: simple, intermediate and advanced:

#### *Simple*

In this case the program sets default values and many actions are performed automatically.

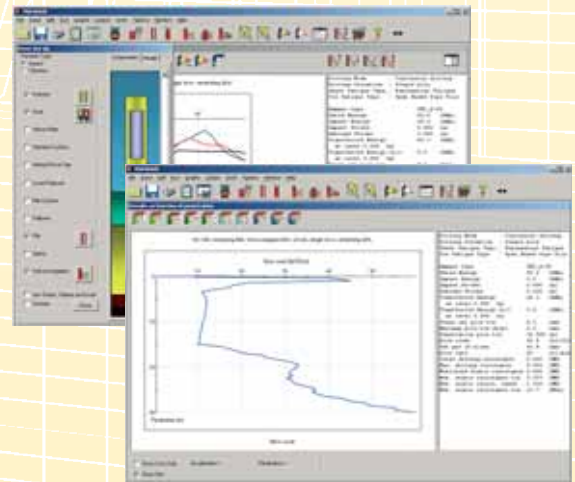
#### *Intermediate*

The user has access to the fundamental parameters of the program and can apply parameter values based on his/her own experience.

#### *Advanced*

The advanced option allows for maximum flexibility and is intended for experienced users, giving them access to a multitude of input parameters and programming options.

Help options with practical examples are available to assist the user. For the intermediate and advanced levels it is advised that the user follows a training course before running the program.



*Screenshots*

### PDPWAVE features

#### *Hammer selection*

- PDPWAVE has an extensive hammer library of more than 500 hammers; all major brands of Impact Hammers (incl. diesel-, hydraulic-, steam-, air- and free fall hammers and other



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types of impact rams) and Vibratory Hammers are included. For each hammer type an accurate description of the performance can be made. Users can easily edit hammer details as required. The hammer library is regularly updated to include new hammer types

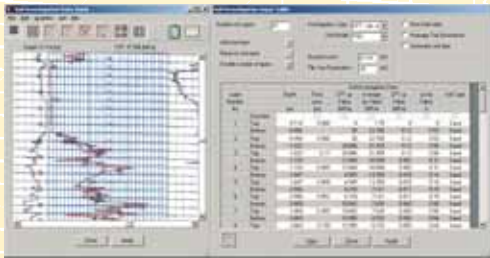
- Option for Impact Hammer Energy variation with penetration depth
- Graphical drive set-up configuration allows easy modeling of the hammer - pile configuration

### Pile parameters

- Pile parameters can be chosen freely for any pile type, such as tubular steel piles (open ended or closed), sheet piles, H-piles, concrete piles with any cross section (circular, square, etc.), composite piles and wooden piles
- Extensive library for sheet piles and H-piles
- Multiple no-tension levels
- In case of Impact Hammers, multiple cushion model options, with the cushion characteristics either taken from the library or defined by the user

### Soil parameters input

- Soil input for peat, sand, silt, clay, rock and subclasses
- Soil input with digitizing option for CPT, SPT, DMT, PMT, Cu and Soil Laboratory results
- User defined input for unit friction and unit end bearing based on sub-classification of soils; access to friction and end bearing data
- Soil gap modeling
- Dynamic soil parameter options (either the original Smith soil model or the TNO Model); full access to input parameters
- Geotechnical Exchange File (GEF) soil data input
- Multiple options for soil fatigue modeling
- Static Load Displacement behavior of modeled pile and soil



Digital input soil data (CPT).

### Calculations

- Maximum compression and tension stresses
- Shaft friction; toe resistance
- Impact energy, transferred energy
- Blow count, set per blow (for Impact Hammers)
- Time count, penetration speed (for Vibratory Hammers)
- Maximum forces, accelerations, velocities, displacements

### Output

PDPWAVE has extensive graphical output options:

- Graphs as function of time (one blow)
- Driveability graphs as function of penetration:
- Blow count or time count
- Pile stresses
- Mobilized static capacity
- Transferred energy
- Driving time
- Total number of blows (for Impact Hammers)
- Penetration speed (for Vibratory Hammers)
- Bearing graphs.

### Results obtained with PDPWAVE include:

#### Time signals

- Impact or Vibratory force, upward and downward traveling waves
- Acceleration, velocity, displacement
- Soil resistance, shaft friction and toe resistance
- Transferred energy

#### Driving logs

- Graphs available of the pile top, the pile toe, the middle of the pile or at a user defined level
- Blow count, blow rate, set per blow (for Impact Hammers) or penetration speed, time count (for Vibratory Hammers)
- Maximum compression and tensile stresses, location of maximum stresses in the pile
- Maximum energy: both theoretical, impact and transferred in the pile
- Maximum acceleration, velocity and displacement
- Soil resistances during driving and static resistance
- Toe resistance and shaft friction per layer

### Advantages of PDPWAVE

- PDPWAVE is based on the Method of Characteristics for Stress Waves, known for its accuracy (note: discrete lumped mass based models could experience problems with numerical instability)
- Digital option for input of soil data from SPT, CPT, DMT or PMT logs (easy and fast data input)
- Large variation of input options for hammer, pile and soil
- Extensive graphical options to display prediction results
- Very user-friendly interface

### Applications

The PDPWAVE software can be purchased separately or in combination with the hardware available from Profound. For a full list please consult our website [www.profound.nl](http://www.profound.nl) or contact us. We would be pleased to provide additional assistance to help you select the best hardware platform for your needs.

### For further information:

#### Profound BV

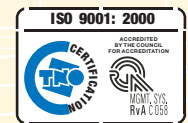
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