Updates of GRLWEAP 2010-7

To meet the increasing demand on the vibratory hammer analysis, this update has been focused on the improvement of vibratory hammer analysis. Following are the details of the changes and fixes:

Vibratory Hammer Analysis Changes

(The details on the change can be found in the help)

- Additional ***Power Adjustment Options*** were added to limit the power to target power input. If a vibratory hammer has been selected, there are three options now in Power Adjustment Tab in General Options/Options as follows:
  - Power Adjustment by frequency reduction
  - Analysis without power adjustment
  - Power adjustment by force reduction - This option is the default and similar to the existing program's approach
- The Direction of the Power Adjustment can be now effected by the sign of the Vibratory Delay input in Options/Hammer Parameters.
- The maximum analysis duration has been increased, for each resistance level analyzed, to 10 seconds of driving time; this allows for analysis of 10 times frequency [Hz] cycles.
- For accuracy of penetration calculation the analyzed frequency is now slightly adjusted so that an integer number of time increments corresponds to 1 time period (the inverse of the frequency). Output, therefore will show a frequency that differs slightly from the input frequency even if no frequency adjustment is done.
- Penetration velocity convergence procedure has been improved to include more cycles considering frequency reduction option, extreme cases during hard driving, etc.
- On the hammer section window of the main input screen the eccentric moment is now shown in either kip-ft or kN-m instead of the weight of the eccentric mass which is often an assumed value while the eccentric moment is really the specified value.
- Improved output for vibratory hammer analysis:
  - The program now outputs a more realistic power demand value that is occurring during the last cycle analyzed.
  - In the extrema tables, the maximum displacement is now the difference between maximum and minimum displacement, calculated for the last cycle. This difference is what is sometimes called the peak-to-peak or double amplitude.
  - The numerical output now also includes a table of final results related to vibratory hammer analysis.

Regular output

- For variable vs. time output, the resolution (and thus the time span covered by the plot) can be modified by the output time increment in Options/General Options/Output, checking Variables vs Time and Output Segments and then clicking on Edit Segment Number. The default value has been improved as follows:
    - 10 for vibratory hammer;
    - For impact hammers: 2 for pile length <= 200 ft (61 m); 4 for pile length > 200 ft (61m).
- For variable vs. time output, the heading labels have been improved to be more specific and accurate.
- Fixed: For higher resistance, the program automatically switch force unit form kN to MN if SI unit system was selected. Output header for variables vs. time was corrupted for vibratory analysis ; this has been fixed.
- Driving time was added to the output of the driveablity analysis of a vibratory hammer.

Offshore wave option related

Structural fatigue table output

For vibratory hammers, the number of cycles is now calculated for each depth by multiplication of the vibration frequency with the driving time determined for each depth.

Friction fatigue option (FF)

- Allow shape factor to be different for each soil layer.
- Shape factor is defined as Alm&Hamre shape factor if Limit Length is zero
- With driveablity analysis the setup time column in the S1 form is changed to Shape Factor if FF option is enabled.
- Since same input field is used for setup time or shape factor, when the FF option is switched on/off, a warning message appears if the pre-entered data is out of the range and needs resetting.
- The Friction Fatigue tab in Options/Offshore option only appears when Driveability analysis is selected.
- If the value of shape factor is zero, it is defaulted to 0.01 when analysis is performed;

Others

Fixed: The input of unit system in Job Information dialog is not synchronized with the document content.

Help/Example

- The on-screen help and background report have been updated to detail the changes made on vibratory hammer analysis and friction fatigue option along with suggested default values.
- Example #17 has been updated to demonstrate modelling vibratory hammer on sheet piles.
- Example # 24 was added to demonstrate the new or modified Friction Fatigue options
- Example #25 was added to demonstrate a driveability analysis using vibratory hammer.

New Hammers

ID	Maker	Model	Type
527	DAWSON	HPH15000	ECH
1211	GPE	D6-42	OED
1212	GPE	D8-42	OED
1213	GPE	D12-42	OED
1214	GPE	D19-42	OED
1215	GPE	D25-32	OED
1216	GPE	D30-32	OED
1217	GPE	D36-32	OED
1218	GPE	D46-32	OED
1219	GPE	D62-22	OED
1220	GPE	D80-23	OED
1221	GPE	D100-13	OED
1222	GPE	D125-32	OED
1223	GPE	D138-32	OED
1224	GPE	D160-32	OED
1225	GPE	D180-32	OED
1226	GPE	D225-10	OED
1227	GPE	D250-10	OED
831	HMC	H3	ECH
1081	ICE	110C	VIB
342	IHC	SC-200	ECH
982	JUNTTAN	HHK3SL	ECH

983	JUNTTAN	HHK5SL	ECH
1561	JUWEI	DD3	OED
1562	JUWEI	DD4	OED
1563	JUWEI	DD6	OED
1564	JUWEI	DD12	OED
1565	JUWEI	DD18	OED
1566	JUWEI	DD25	OED
1567	JUWEI	DD35	OED
1568	JUWEI	DD45	OED
1569	JUWEI	DD55	OED
1570	JUWEI	DD65	OED
1571	JUWEI	DD75	OED
1572	JUWEI	DD85	OED
1573	JUWEI	DD105	OED
1574	JUWEI	DD128	OED
1575	JUWEI	DD160	OED
1576	JUWEI	DD180	OED
1577	JUWEI	DD200	OED
1171	MOVAX	DH-20	ECH
1172	MOVAX	DH-30	ECH
1701	RTG	HRS5	ECH

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