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Newsletter
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OrcaFlex 9.6 (Oct-12) and 9.7 (Sept-13)

...showcasing the new Line Contact model...

You might recall that, because of delays, our last newsletter covered both 9.4 and 9.5 releases. We attempted to revert to a single newsletter per release, but unfortunately were thwarted in this ambition. So here is the newsletter to accompany versions 9.6 and 9.7 of OrcaFlex. Indeed, so late are we with this that the v9.8 release is on-going at the time of finishing this one - so there'll be a newsletter to accompany that in due course.

As usual, we cover some of the main enhancements seen in each release, including the option to use different bend stiffness in statics and dynamics, changes we have made to introduce **full QTFs**, and the newly introduced **64-bit** version of OrcaFlex. We also outline some **Shear7 interface changes**, explain how to implement user-defined results into OrcaFlex and some Fatigue changes. Our major article in this newsletter gives an overview of the new **Line Contact model**. This is a major enhancement to the modelling capabilities, setting OrcaFlex significantly apart from the rest of its peer group.

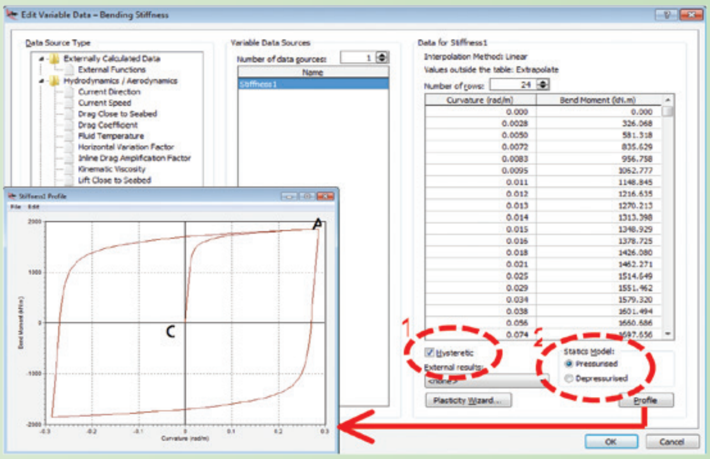
We discuss **Sea State RAOs** for modelling the change to the seastate caused by the presence of a vessel, explain **Coupled Vessel Hydrodynamics** and briefly introduce the new vessel **Hydro Import** feature. And we show off the extra **Code Checks** we've added for risers and pipelay, and **Post Calculation Actions** to aid those post-processing other than in the OrcaFlex Spreadsheet.

As always, a full list of the new features can be found in the What's New section of the OrcaFlex help menu and on our website at: www.orcina.com/Support/OrcaFlex.

In this newsletter:

Statics and Hysteretic Bending (in v9.6)

Non-linear hysteretic bending can now be different in statics and dynamics...



There are several options for setting the bend stiffness of a Line. The simplest is a constant value giving a linear elastic response. Alternatively, a non-linear elastic response can be specified, as shown in the curve OA in the above screenshot. For composite cross-sections (flexible risers, umbilicals, etc), selecting the Hysteretic checkbox (highlight 1) means the full non-linear hysteretic curve, as shown, will be used.

Hysteretic behaviour arises in composite cross-sections as a line bends. It's a function of the friction between different layers as they move relative to each other, and is also clearly affected by the internal pressure within the line.

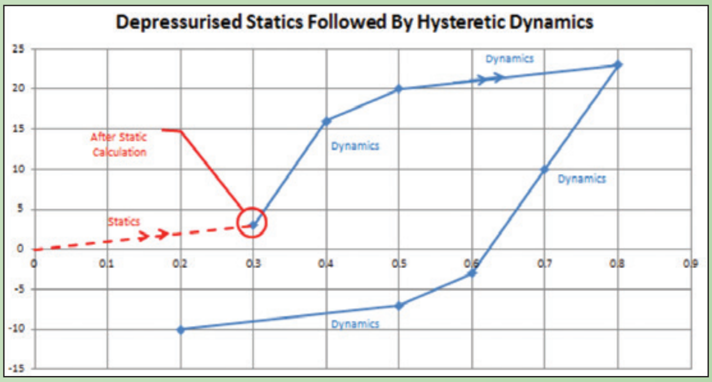
These options for setting bend stiffness were all previously available in OrcaFlex and are still available with the latest release.

So, what's new? Well, it's this - previously the same data were used in both the static and dynamic parts of the OrcaFlex calculation. New is the ability to use different bend stiffness for the static calculations, reverting to the defined hysteresis curve in dynamics. This control comes through a new data selection item, **Statics Model** (highlight 2 in the above screenshot), which has two options:

Pressurised: This option retains the same behaviour as previous releases - ie. the same data are used in the static and dynamic calculations.

Depressurised: This is the new part..... here the same hysteretic data are used during dynamics, but different bend stiffness data are used in statics. Precisely how this is done is shown in the graph. The (linear-elastic) bend stiffness used in statics is shown in red, and the curve in blue is the bend stiffness used in dynamics. However, you'll immediately notice that on the OrcaFlex data form (screenshot left) there is nowhere to specify the static bend stiffness data. Rather, this new model uses the slope of the last segment in the hysteresis table to define bend stiffness used in statics. Once dynamics starts we assume that the line is pressurised and the hysteretic data in blue is used.

Hope you find the new feature useful!



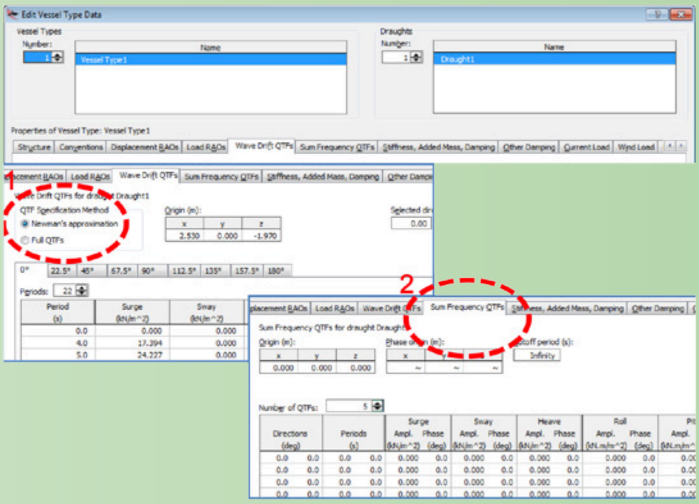
QTF Changes (in v9.6) *Full low-frequency and high-frequency QTFs…*

In diffraction theory, the theoretical treatment expands the various terms in a Taylor series, and then gathers terms of the 'same order'. Zero order terms are the steady or mean loads. First order terms give us the Load RAOs (which are then commonly post-processed to give Displacement RAOs). Second order terms give loads significantly smaller than first order terms, but are nonetheless important in certain situations (see below). Second order terms have components with frequencies of $(\varpi_i - \varpi_j)$ and terms with frequencies of $(\varpi_i + \varpi_j)$ – so-called second order low (or difference) frequency and second order high (or sum) frequency terms respectively. There are higher order terms resulting from the expansion, but these are rarely invoked.

Second order *low*-frequency loads are only important for resonant excitation of a floater on its moorings. For nearly 12 years OrcaFlex has calculated these 'drift loads' using the well-known Newman approximation. This approximation comes in 2 parts: (1) to reduce the computational intensity of the calculation, and (2) to provide an approximation to off-diagonal terms using only leading diagonal terms (the mean wave load), and therefore only requires a 1st order diffraction solution.

Newman's approximation often works well, but breaks down in shallow water. However, as far as we know, there is no accepted guidance on this point. According to work by BMT [private communication] there's a clear dependency on the ratio of water depth (d) to vessel length, the ratio of vessel length to wave period, and the mooring system stiffness. For a 289m long moored tanker, BMT's work shows Newman's approximation is (a) is fine for d > 72m, (b) breaks down completely for d < 23m, and (c) is valid only for a certain range of Tp for intermediate water depths. Brun et al (OTC 19450, 2008) draw similar conclusions: for a 274m long LNG carrier, their figures 1 to 6 provide a general confirmation and they conclude that Newman's approximation…*"largely underestimates the low-frequency loads for shallow water depths (below 60m) or when the mooring system is stiffened"*. These references illustrate the breakdown of Newman's approximation, but the conclusions are not easily generalised. The only sure way is to compare results from Newman's approximation and the full QTF for a particular application.

To address Newman's 'shallow water problem', v9.6 allows the full low-frequency QTF (eg. from a second order diffraction calculation) to be imported. The full calculation is more computationally intensive than using Newman's approximation, so we still retain Newman's approximation for those deeper water cases – see highlight 1.



But once the full second order *low*-frequency QTF was implemented, we realised it could be easily extended to allow **second order *high*-frequency** QTF calculations – see highlight 2. These terms are important for systems with high frequency resonant periods, such as TLPs. There is no equivalent to Newman's approximation for the sum frequency case, so there is only the one option here.

As mentioned, using the full low-frequency QTF is more computationally intensive than using Newman's approximation. Using the full sum-frequency QTF is similarly intensive. To try and reduce this extra effort, cut-off periods have been introduced for both sum and difference QTFs. For low-frequency cases there are difference frequencies which are too high (ie. small periods) to contribute to the loading. So the cut-off period excludes those QTF load contributions *less* than the specified cut-off period. Conversely, for the high-frequency QTFs the cut-off period will exclude QTF load terms with period *greater* than that specified.

So overall, some great new modelling capabilities for the vessel object, which we hope are useful.

64-bit OrcaFlex (in v9.6) *The new 64-bit version gives you lots, lots more memory - if you need it!*

v9.6 of OrcaFlex introduces OrcaFlex as a 64-bit process. This sits alongside the still-supplied 32-bit version.

It has to be said that it's not the most visibly exciting development as it looks absolutely identical to 32-bit OrcaFlex ;-)! Unfortunately it's not even true that 64-bit OrcaFlex runs a lot faster than 32-bit – although it does indeed run a little faster.

So why make the change? Mainly to address memory limitation in the 32-bit version…. any 32-bit process can only address 4GB of memory, even if there is more physical memory present. This becomes limiting – especially with the ever increasing trend for large jobs (eg. fatigue post-processing) on multi-core machines.

64-bit Windows operating systems have been around since 2005, but have only become more common in the last couple of years. Happily, 64-bit Windows runs 32-bit programs perfectly well, and up until now, that's how OrcaFlex has always been run on 64-bit Windows. Fortunately the trend for larger jobs coincided, more or less, with our compiler vendor moving to support 64-bit Windows.

So, what are the practical implications?

a) By default, on a 64-bit system, the OrcaFlex install program will setup shortcuts for 64-bit OrcaFlex. But the 32-bit version will also be installed and can be run if necessary.

b) OrcaFlex files created by the 32-bit version can be read by the 64-bit version and vice versa.

c) 64-bit OrcaFlex allows the OrcaFlex Spreadsheet to be run with 64-bit Excel (and 32-bit OrcaFlex with 32-bit Excel).

d) Likewise, Python and MATLAB users can use the 64-bit versions of those programs with 64-bit OrcaFlex (and 32-bit OrcaFlex with 32-bit Python / MATLAB). You can use the same Python / MATLAB code no matter which OrcaFlex version is running it.

It's not necessary to update your existing Excel, Python or MATLAB installations to 64-bit unless you are suffering memory limitations. Unless this is the case, we'd recommend not bothering to upgrade. We will carry on supporting 32-bit OrcaFlex for a long time to come.

e) Other issues:

- Native external functions (C++ / Delphi) will need to be re-compiled to 64-bit DLLs to work with 64-bit OrcaFlex.
- The XVID codec may need updating. The latest installation from xvid.org installs both 32-bit and 64-bit variants of the codec.
- Distributed OrcaFlex has been updated so that it can run the 64-bit OrcaFlex.
- VIVA does not run under 64-bit OrcaFlex because it uses a 32-bit VIVA DLL. Therefore you presently need 32-bit OrcaFlex to run VIVA. SHEAR7 works under 64-bit because it calls the SHEAR7 executables which run in a separate process. We plan to update the VIVA interface to work in this way too.

For those doing the large jobs needing more memory, we hope this serves well!

Changes to Fatigue Analysis (in v9.6) *Three simple changes to allow much greater flexibility…*

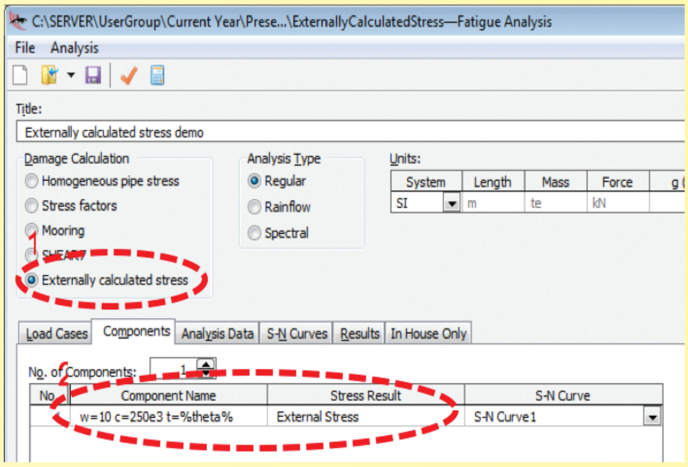
Externally Calculated Stress

The 'Externally calculated stress' damage calculation option (highlighted in screenshot 1) has been around for a while. But until now we hadn't got around to publishing the interface – something we've now rectified.

Now the stress used in the fatigue calculation can be calculated by a user-defined external function. This function would be defined in much the same way as user-defined results described in the article below. The external function also needs some of the other input data – tension and curvature stress factors and the line location – to perform the fatigue calcs, so we've hijacked the 'Component Name' field for this purpose (see highlight 2). The process is fully described in the help file.

The user-defined stress model can take any form you like – most commonly stress factors are defined as a function of line curvature so as to include this non-linearity in the fatigue life computation. ϖ

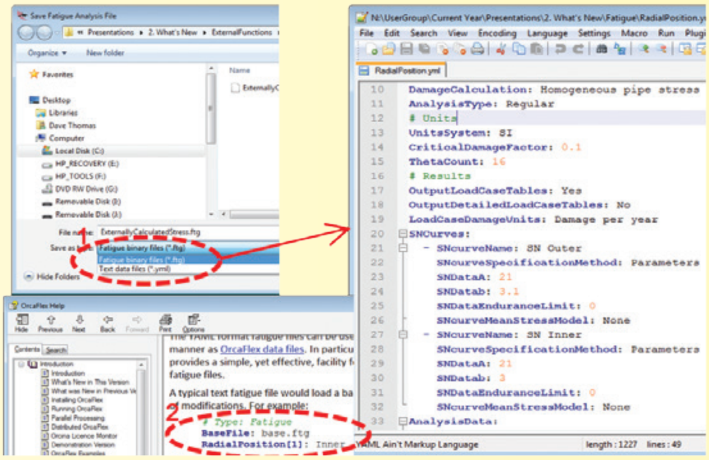
However, there is a time penalty in using externally defined stress calculations. We tested C++ and python external functions both reproducing the same linear stress calculation as built into OrcaFlex. The C++ implementation was significantly quicker than the Python version.



Fatigue File Saved as Text

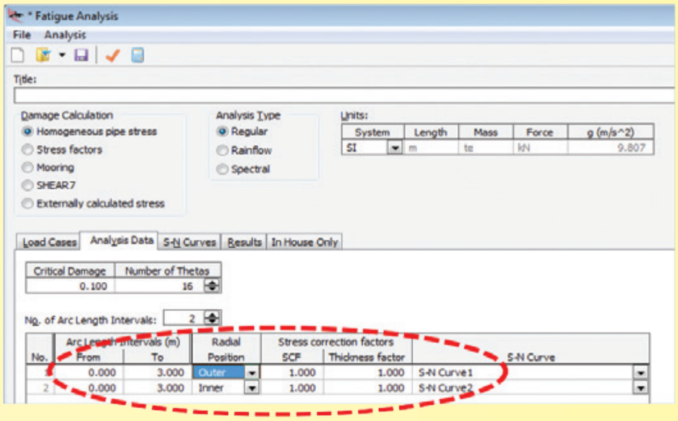
As well as the traditional binary fatigue file (.ftg), fatigue files can also now be saved in text form – see screenshot.

Recall that for pre-processing we recommend Excel- or yaml-based automation of input files to create variations on the binary input file ie., the .dat file. But there is the same need to automate fatigue analysis. Highlight 2 of the screenshot (extracted from the OrcaFlex help file) shows what we mean.



Simultaneous Inner & Outer Radial Positions

In the past, OrcaFlex fatigue calcs could be done simultaneously at both the inner and outer radial positions (though with the same S-N curve). We subsequently figured that the worst stress would always be on the outside of the pipe, and changed the program accordingly. User feedback, however, suggested that this was a retrograde step …. so we've added this capability back in – and improved it. Now the program allows over-lapping arc-length intervals so the inner and outer positions can be included in the same analysis, and with different S-N curves.



User-Defined Results Variables (in v9.6)

Now you can define your own results…

Whilst OrcaFlex offers the vast majority of common results, there are always some which we don't have. Indeed sometimes it's useful to create new results based on results offered as standard…. well, now this is possible through external functions.

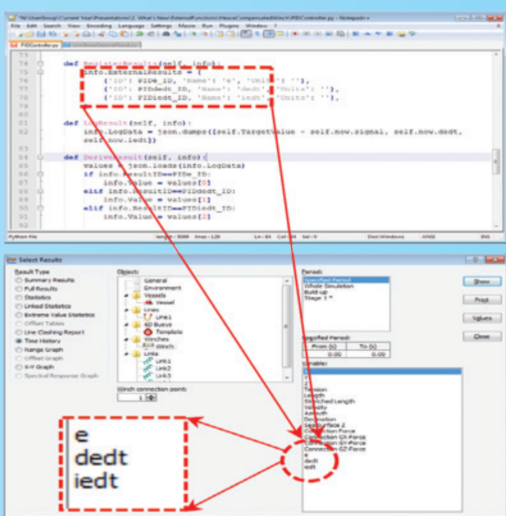
The top screenshot shows part of a python external function for user-defined results - there are three main elements to this:

(i) RegisterResults is called once at the start of the simulation to define the new results.

(ii) LogResult writes to the OrcaFlex simulation file the user-defined results.

(iii) DeriveResult is called when the result is asked for after the simulation has started. The user-defined results appear in the OrcaFlex Results form - shown in the lower screenshot. These results can be treated in exactly the same way as any OrcaFlex standard result.

We hope you enjoy the new flexibility this allows!



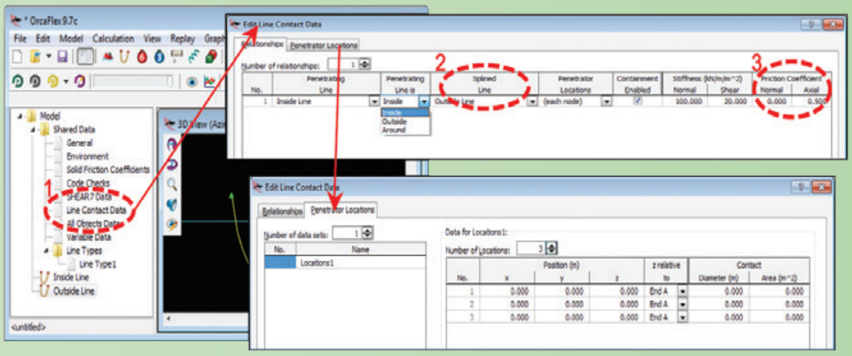
The new OrcaFlex Line Contact Model (in v9.6)

V9.6 sees the introduction of the new Line Contact model, a major modelling advance for Line-to-Line interactions in OrcaFlex. The original motivator for this model was the desire to explicitly model pipe-in-pipe systems. But we quickly realised that pipe-in-pipe was only one application that this model was good for – hence the more general "Line Contact" name.

This article aims to give a high level introduction to the Line Contact model (many more details are at www.orcina.com/Support/UserGroup/2012 and in the OrcaFlex Help File), but with the emphasis on applications.

Main Features of the Line Contact Model

The key message of the new Line Contact model is that ***one Line is explicitly modelled inside another Line***, fully accounting for the interaction between both. This is explained a little further below, with the aid of the following screenshot:



The Line Contact model sets one line as a smooth continuous surface (the Splined Line), against which the nodes (or penetrators) of the other (Penetrating) line will interact. Initially the user does not see this distinction – both lines are defined in OrcaFlex in the usual way with length, segmentation, end connections, properties, etc. The new part comes on a new form called the **Line Contact Data** form. This is accessed from the Model Browser (see highlight 1), and defines the interaction we want to create between the two lines.

Within all this, it's the **Splined Line** (highlight 2) which is the really new concept. One way of thinking of the Splined Line is as a flexible version of the OrcaFlex hollow Cylindrical Elastic Shape (as a rigid object it's been in OrcaFlex for many years), but with two important differences: (i) the centreline of this flexible cylinder aligns with the smooth spline curve which passes through the nodes of the Splined Line, and (ii) it effectively has an infinite wall thickness (avoiding the issue with finite thickness Elastic Solids of Line nodes sometimes being pushed to the wrong side of the shape).

Some of the key features of the Line Contact model are:

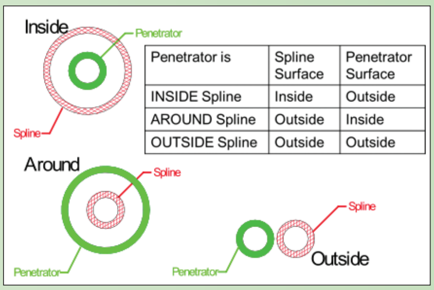
a) That it **works in statics**. OrcaFlex uses the defined Relationship(s) during the static solution. This has many benefits in lots of situations, and is a massive user enhancement in OrcaFlex.

b) The splined line provides a **smooth continuous surface** against which the penetrators of other Line(s) interact. This gives a model which is very robust and suffers few instabilities compared to other models where interactions are between 2 segmented models.

c) The model does ***not add* explicit contact springs** at specific locations. Rather a contact reaction occurs at the time and position where clearance has gone to zero. Consequently, the model allows large scale relative axial motion of the lines. When this happens the reaction load varies in a continuous fashion thereby avoiding numerical discontinuities.

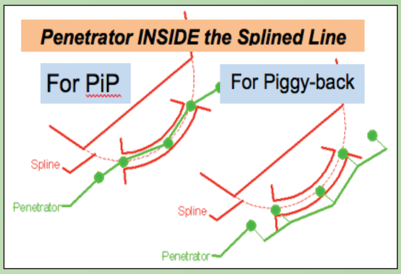
d) **Friction** between the Lines defined in the relationship can easily be included (see highlight 3 above).

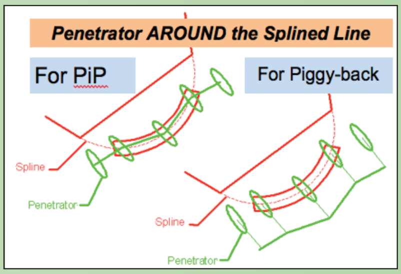
e) There is no restriction on whether the penetrating line is inside, outside or around. This can be confusing, but a helpful summary sketch from the UGM presentation mentioned earlier is shown to the right.



f) A **'contained'** line will be shielded from the external fluid forces (and from contact with elastic shapes and the seabed). But the shielded section of a contained line sees fluid effects from the contents fluid and contents motion in the containing outer line.

g) By default, **penetrators** are attached to all of the nodes in the penetrating line. However, it's often useful to have penetrators at different arc-lengths along the line – we could just re-segment the line to achieve this, but re-segmentation may not be desirable for other reasons. So the Line Contact model allows different sets of penetrators to be defined and used (see screenshot above). Note that penetrators can also be offset from the axis of the line – these sketches show this:





h) There are no restrictions on the **number of Relationships** which can be specified. So one line can interact with lots of others, eg., an SCR through guides; One line slipping off another and then interacting with a third line; a line inside a line inside a line inside a line……, etc.

The new OrcaFlex Line Contact Model (in v9.6)

OrcaFlex Contact Models

There are several existing contact models in OrcaFlex, to which the new Line Contact model has been added. The table below summarises these to give some context for the new model, and provides some usage notes for each.

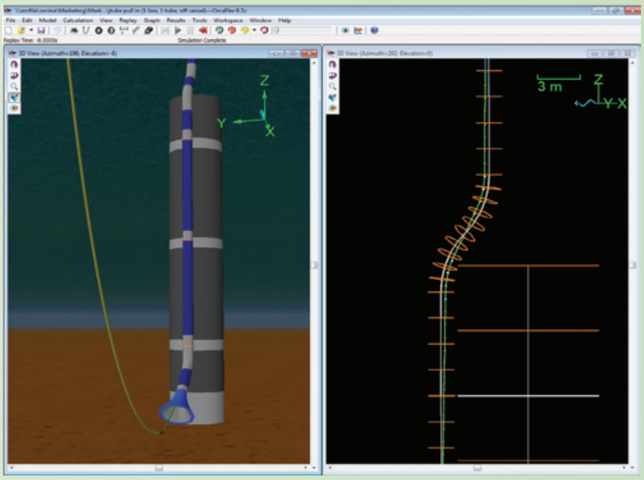
Object...	...Can Contact	Uses
3D & 6D Buoys	Elastic Solids, Seabed	To define boundaries which limit the motion of the Buoy.
Line	Seabed	To model flat, 2D or 3D seabed profiles, with a contact reaction which can be linear or non-linear hysteretic.
	Elastic Solids (more boundaries for Lines)	Mid-water arches; bell-mouths; float-over mating units; vessel decks, side or bow/stern structure; lay chutes; pulleys and sheaves; subsea towers; any other guide surface that limits the motion of a Line.
Line	Lines (with the existing clashing model)	Interference analysis between lines; pipelay rollers; reeling; mid-water arch gutters where detailed contact results are required (gutter profile modelled with many Lines rather than an Elastic Solid); impact with vessel boundaries (eg. moonpool edges, bow profiles etc.).
	Lines (with the new *contact* model)	Pipe-in-pipe systems; pull-in operations; drilling riser choke and kill lines; installation guide wires; pipe-on-pipe / piggy back risers; hybrid riser towers; bend stiffeners with friction; guide wire lowering operations.

Note that we have a summary document giving more information on each of these contact models listed above. Please get in touch if you would like a copy.

Applications of the Line Contact Model

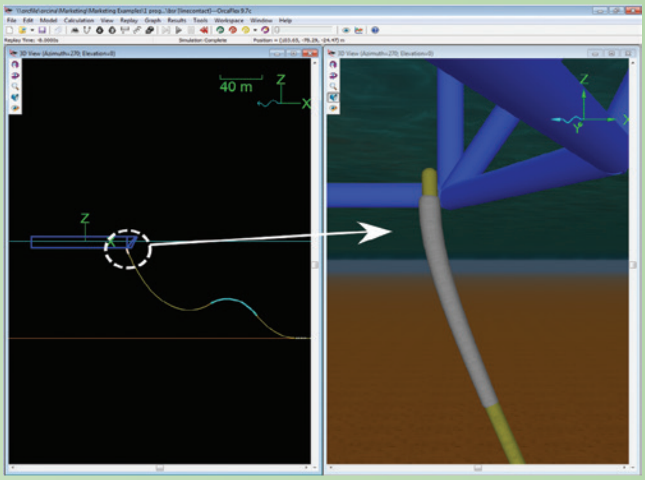
So we've had a brief introduction to the main features of the model – and as mentioned there is plenty more in the OrcaFlex help file and the 2012 UGM notes. Given this, what kind of applications can be modelled with this new feature? Below we list some of the common applications where we see the Line Contact model being used:

J-Tube Pull-in



J-tube modelled as an OrcaFlex line with pre-bend so it responds to the loads acting on it from the pulled-through riser. The J-tube is clamped to the structure also using the Line Contact model. Friction and large scale relative motion now mean that the Line Contact model is the preferred way to model J-tube pull-ins.

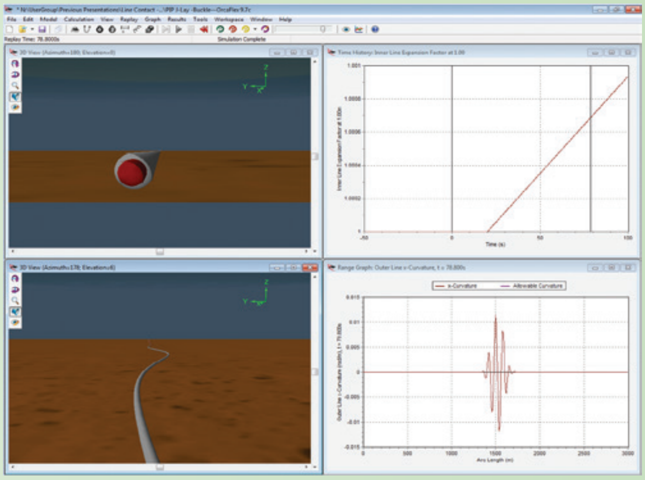
Explicit Bend Stiffener



Here the bend stiffener is modelled explicitly as a separate OrcaFlex Line with a tapered profile. The Line Contact Relationships call for the riser to be inside the stiffener, and this is achieved in statics. Friction between the riser and the bend stiffener is optional. The dynamic run then proceeds as normal. Results can be obtained for both lines separately.

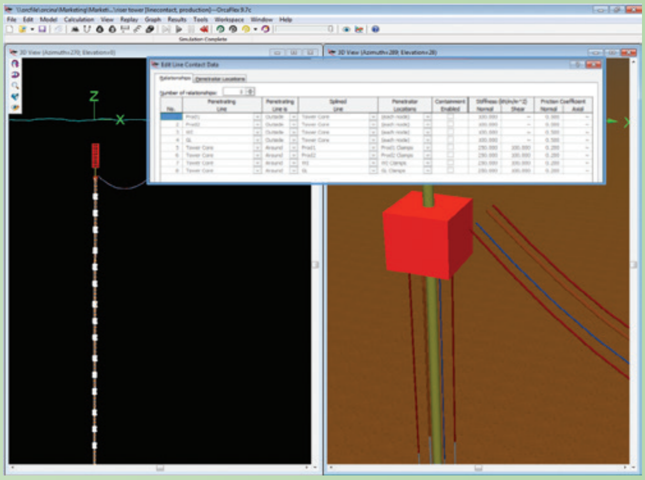
Applications of the Line Contact Model

Pipe-in-pipe buckling



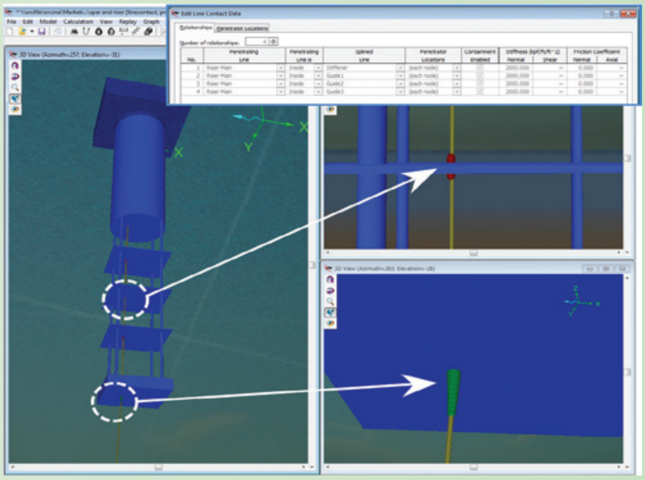
This model shows a classic pipe-in-pipe system. OrcaFlex is explicitly modelling one line inside another. The inner line is set with an expansion factor representing thermal expansion. The resulting buckle in the line is clearly shown.

Riser Tower



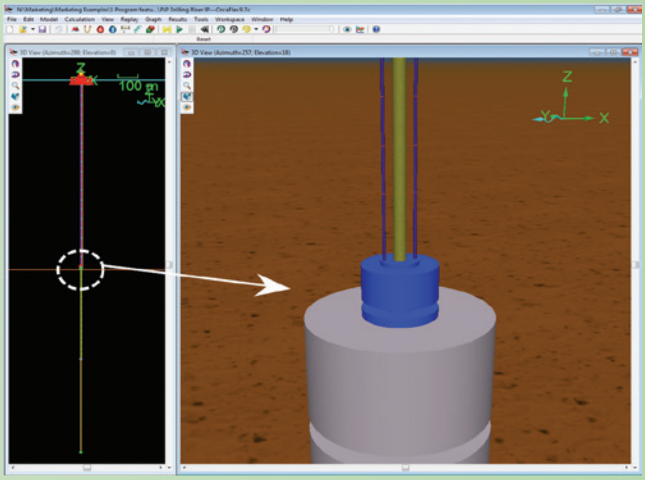
The riser tower has a central core with 4 production lines around it. Relationships 5-8 set the core's penetrators around the production lines to represent clamps. Strictly the Relationships 1-4 are not needed as we don't expect the 4 production lines to contact the tower core… but just in case ;-).

Guide Tubes



This model shows an SCR on a SPAR with 3 guide tubes and a stiffener on the keel, all using the Line Contact model. The Relationships are shown inset. These are quick and easy to setup and now make statics convergence very much easier than before.

Drill Riser



Here the Choke and Kill lines on a drilling riser are explicitly modelled clamped to the marine riser. The drill string is not visible but runs inside the marine riser through the Flex Joint, BOP and sub-seabed casing.

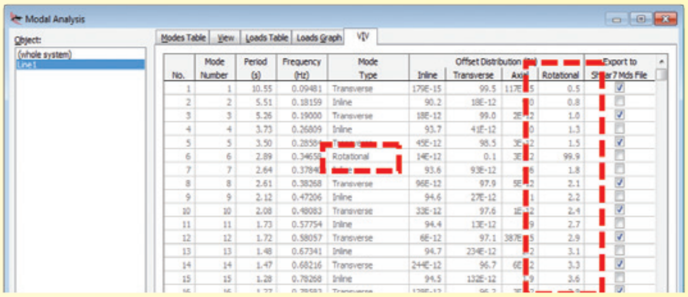
…and of course then there is **Pipelay** – something for which OrcaFlex has been used for many years. However, setting up the models has always been a little tricky. So for v9.8 (due cOct-14) we're working on some UI to make this much easier. We mention this here because the Line Contact model is ideal for this application – remember that this model works in statics so it's now very easy set up a Relationship telling the pipeline to be above the lines used to model the rollers (or 'Supports' as we call them in OrcaFlex)!....watch this space.

Conclusions

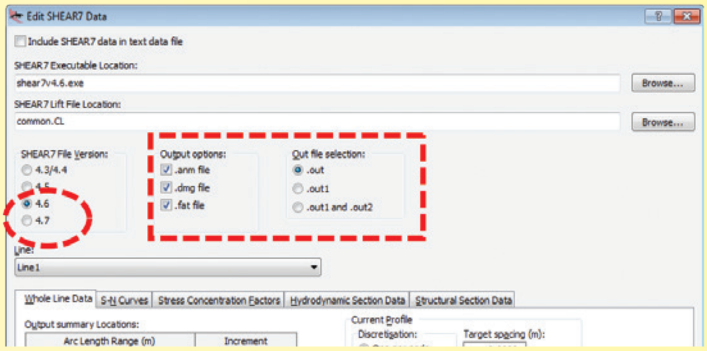
The new Line Contact model is a major enhancement to the modelling capabilities in OrcaFlex. Its robustness, numerical stability and wide range of applications clearly mark it out in our peer group. Happy use - and please let us know if you need any help or guidance.

Shear7 Interface Changes (in v9.6)

A number of changes for the Shear7 interface…



V9.6 allows Shear7 modes files (.mds) to include lines with torsion – this was not previously possible. You can see from the screenshot the addition of a fourth column, 'Rotational' in the Offset Distribution table, and that some of the modes are now classed as being 'rotational'.



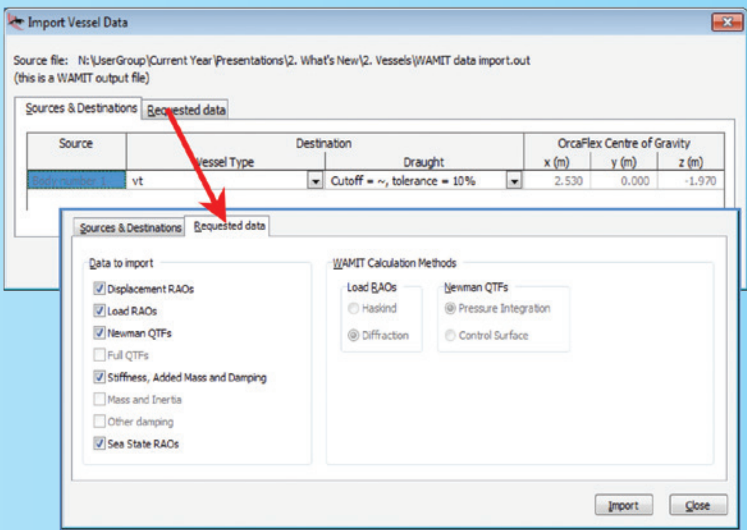
V9.6 also gave the user control via OrcaFlex over which Shear7 output files are generated, and in v9.7 we added support for v4.7 of Shear7 - both highlighted in the adjacent screenshot.

Improved Hydrodynamic importing (in v9.7)

Much easier hydro-importing – why didn't we think of this before….

Over the years our hydrodynamic import capability has grown bit-by-bit, in step with the various developments requiring imported data. However, in making the Vessel Hydro changes in the 9.7 development round, we realised how unwieldy this import functionality had become…..so we took a fresh look and have come up with a much cleaner UI for importing vessel hydro data. Pressing the "Import…" button on the Vessel Type Data form prompts you to select a file for import. When you do, OrcaFlex opens the file, examines its contents and presents the users with options to map the data in the file to Vessel Types & Draughts in OrcaFlex. Then, on the "Requested data" page, the user is shown all the existing data in the import file. The user can then select which data they want to import, by simply making the appropriate selections.

This development has made vessel data import much clearer for us to use – we hope you find the same.

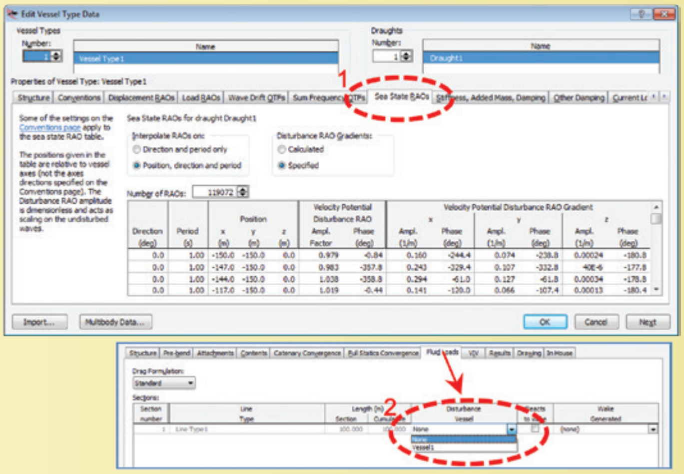


Sea State RAOs (in v9.7) *Different waves all in the same simulation….*

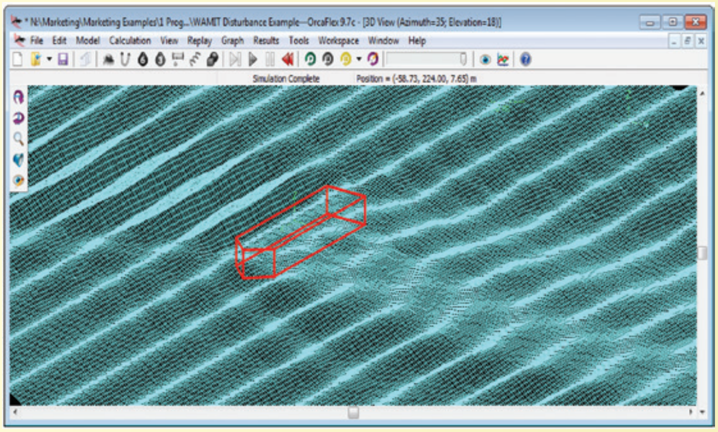
If installation work is hampered by a just-too-high seastate, installers will often turn their vessel beam to the waves. In doing so a modified (reduced) wave field is created in the lee of the vessel and this can be sufficiently reduced to allow installation work to continue.

In this real-world situation the motions of the vessel would be affected by the incident (unmodified) wave field, and the motions of an object transiting the splash zone would be influenced by the modified wave field. But in OrcaFlex this is not possible - all OrcaFlex objects have no effect at all on the fluid field, ie., they are transparent to the fluid (with the exception of wake interference). Of course, OrcaFlex has lots of fluid-structure interaction load models to describe the loading induced on the objects by the fluid field, but the latter remains unmodified.

So for some time now we've been asked if we can add the capability for 'wave shielding' in OrcaFlex – effectively something to allow the installed package to see a reduced wave field. And having described above what OrcaFlex couldn't do, happily we're now able to say that you can do this – via the concept of **Sea State RAOs** introduced in v9.7. As shown in the screenshot, these live on a new page on the Vessel Type Data form (highlight 1).



The modification to the seastate comes from a diffraction program – OrcaFlex can import this automatically from WAMIT. Alternatively, relatively simple seastate modifications can be entered manually. Typically the user would need modified RAO data for a grid of points around the vessel – OrcaFlex will interpolate where necessary. This modified seastate then 'travels' with the vessel – rightly so, as it's the vessel causing the disturbance.

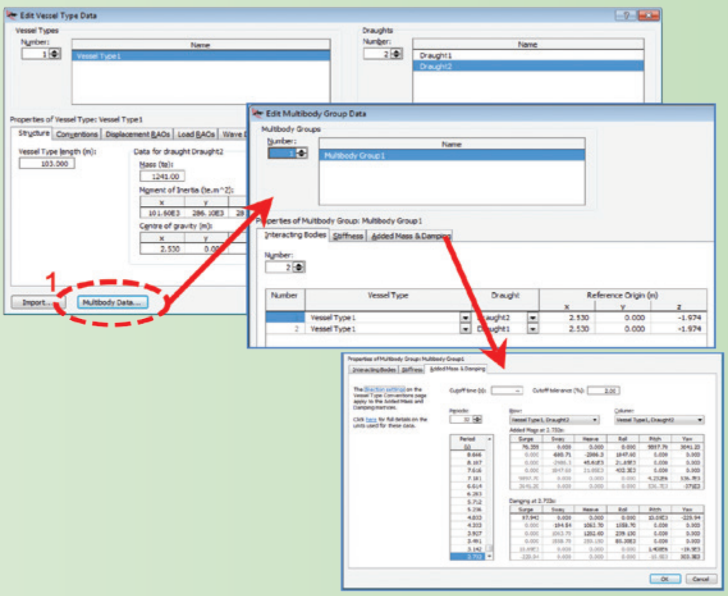


So far so good, but we still haven't quite finished. We figured that that the user might not want all the objects in a model to respond to a modified seastate. Those objects which can be influenced by Sea State RAOs are: 3D & 6D buoys, Line sections and Line attachments (clumps, drag chains, 6D buoys and stiffeners). But you have to *tell each of those objects* whether or not they are to respond to the disturbed sea state – highlight 2 shows this for a Line, but similar exists for the other objects.

Although normally we'd only be interested in the wave climate in the lee of the vessel, the screenshot left shows the disturbed sea state all around a vessel – both up- and down-wave!

We hope that this makes OrcaFlex even more capable for marine operations.

Vessel Hydrodynamic Coupling (in v9.7) *Hydro-coupling between Vessels has all the options….*



As well as wave disturbance, hydrodynamic coupling between vessels has been high on the list of users' requirements – remembering, of course, that structural coupling (with Lines, Links and Winches has been around for years). Again, as with Sea State RAOs, this was not possible before v9.7 …. but now we can do it!

OrcaFlex still needs the data to be generated by a 3rd party diffraction program – but OrcaFlex can automatically import from WAMIT & AQWA.

The following data need to be set to model the hydrodynamic interaction: displacement RAOs, 1st order wave load RAOs, 2nd order QTFs, sea state disturbance RAOs and the stiffness, added mass and damping matrices. Hydrodynamic interaction is modelled by setting these data appropriately to account for the presence of another vessel (or vessels) in the group.

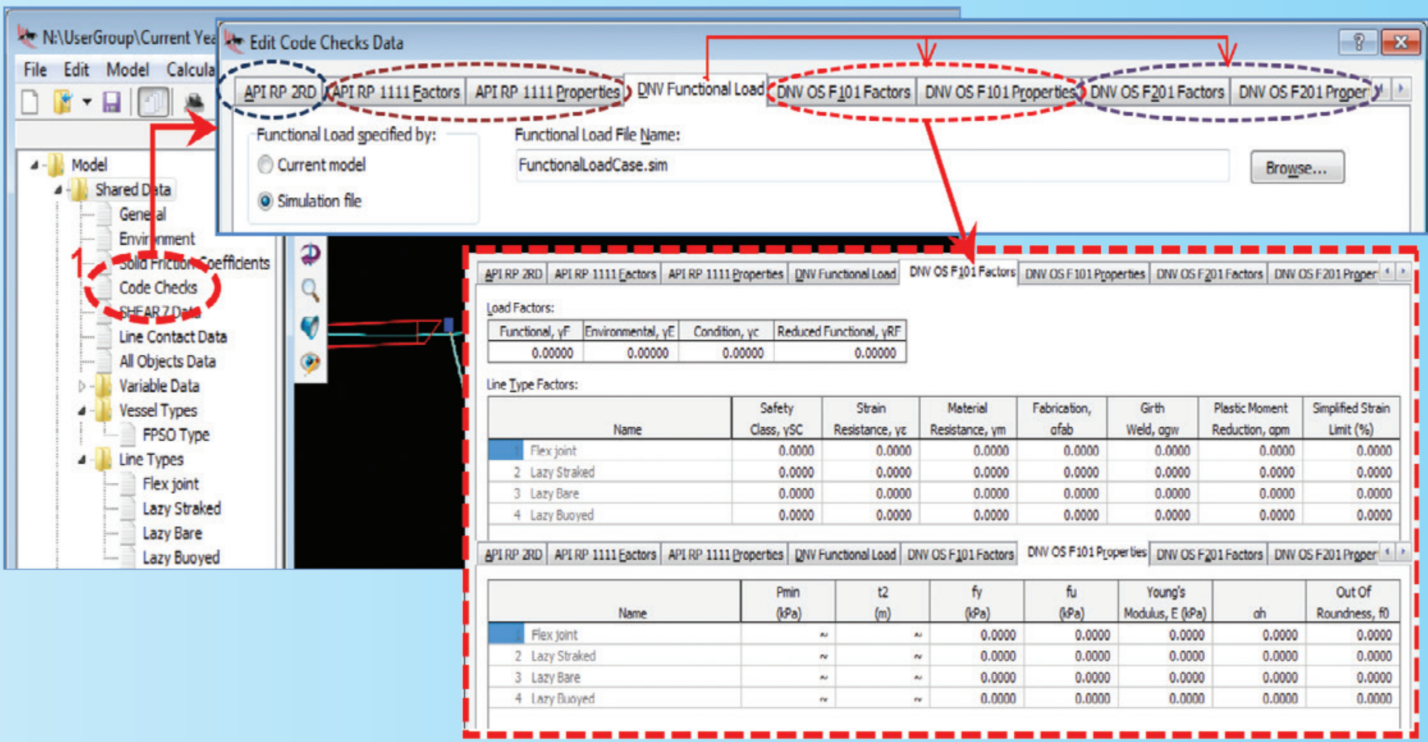
However, for stiffness and added mass & damping, hydrodynamic vessel coupling needs some new data. This is because the added mass and damping matrices must be specified for all pairs of vessels in the group, not just matrices for each vessel. But this requires more data – hence the new "Multibody Data…" button (highlight 1) and the associated new data form shown in the screenshot. So when a multibody group is used the stiffness, added mass and damping matrices no longer appear on the Vessel Types Data form.

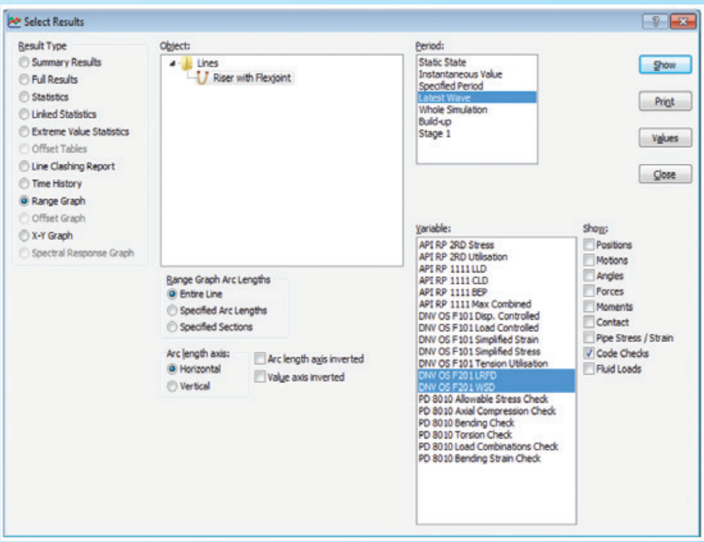
Another significant new feature in the program. Enjoy, but as ever, come back to us if you have any questions.

Code Checks (in v9.7) *More code checks in OrcaFlex….*

Way back in version 9.3 we introduced a *Code Checks* section of the line type data form, and implemented a single code check, API RP 2RD. The use of the plural in code checks was indicative of our intention to implement more codes. After a (short!) delay we're now able to make good on that intent with 4 new code checks: for pipelay/pipelines we add **API RP 1111, DNV OS F101** and **PD 8010** and for risers we add **DNV OS F201**.

Remember that previously, the 2RD data lived on a dedicated section of the Line Types data form. But now, with five codes checks, we decided to move the data onto a dedicated form:





The data form contains the *input data* to the code checks. Remember that the data specified here augment the data specified elsewhere in the OrcaFlex model. These code check data have no impact on the OrcaFlex simulations - indeed, they can all be modified after a simulation has finished.

The actual code check *results* are available as standard results variables (screenshot left), so they can be processed in the normal way, including through the various post-processing interfaces.

Of course there are some subtleties in using this feature, but it's all fully documented.

In principle, adding more code checks is now relatively straightforward from a programming and UI perspective. However, interpreting the standards documents to work out exactly what to implement and how to do so is surprisingly tricky. So, we are certainly open to supporting more codes in the future, but will only do so for codes that we believe to be sufficiently widely used!

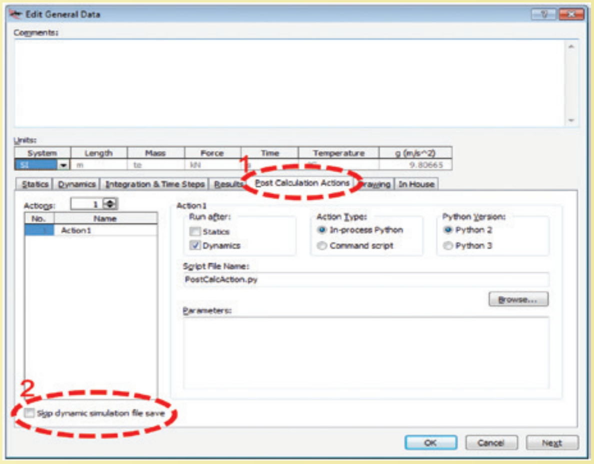
Post-Calculation Actions (in v9.7) *Making life easier for non-Excel post-processing….*

Typically, many users will use the automation facilities supplied with OrcaFlex to create, run and extract results from multiple variant files. The Batch form is used to support this, using as many processors as are available on the machine. Where all the automation is done with the OrcaFlex Spreadsheet, both the pre- and post-processing can all be done from the Batch Form.

However, if your post-processing is done in tools other than the OrcaFlex Spreadsheet, then post-processing was, until now, a separately launched activity. To make this an integrated part of the workflow, a new page has been added to the General Data form (highlight 1 in the screenshot).

There are two Post Calculation Action options: The ***In-process Python*** option allows Python post-processing directly on the model loaded into OrcaFlex, and the ***Command script*** option runs a separate process which would typically launch your post-processing options. Many such Post Calculation Actions can be executed, either after Statics or Dynamics or both. Of course all this is fully documented, with examples, in the Help file.

This facility means that you can perform post-processing immediately after the simulation, without having to re-load the simulation file. And if you've extracted all the results you need, then you can also choose not to save the simulation file, saving on storage and bandwidth (highlight 2).



Note that Post Calculation Actions are only executed when you perform a calculation using batch mode or Distributed OrcaFlex (requires version 5 or later) or via the OrcaFlex programming interface. But Post Calculation Actions are *not* executed when an analysis is performed interactively in OrcaFlex.

Agents' News

Normally we'd include some updates on the activities of our agents. However, in this edition of the newsletter lack of space precludes this. However, we will just mention that in Jun-13 we held the first Orcina Agents meeting here in Ulverston. The meeting was intended to allow all the agents to better get to know one another and to discuss a range of technical and commercial matters. We plan to hold these every 2 years and hope that these gatherings will allow Orcina and our Agents to provide an even better service to end-users.

Here is our list of agents and their contact details:

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Training Courses

Orcina runs a large number of OrcaFlex training courses each year. We thought it would be useful to give a brief outline of the options.

We have a standard **2-day Introduction to OrcaFlex course**. We deliver this either:

(i) at our 2-day Open Training courses (events on fixed dates which are open to all-comers), or

(ii) as part of a Client Specific course. Because these are for a specific client, there is also the option of tailoring the course to focus on that client's particular application area and / or to extend the course.

For more advanced users we often run **Workshops** – here we work through specific modelling concerns with clients. We've done sessions ranging from half a day with a single user, through to 20 or 30 users in a lecture theatre over 1 to 2 days!

We're delighted to announce that recently both RINA and IMarEST have endorsed our Introduction to OrcaFlex course. This means that both professional bodies recognise this course as counting towards an individual member's Professional Development requirements.

Please drop us a line if any of this is of interest, or see www.orcina.com/Support/SoftwareTraining for a list of forthcoming Open Training events.

OrcaFlex User Group Meetings

Since the last newsletter there have been 2 rounds of OrcaFlex UGMs – 2012 and 2013. These annual events are held between September and December in Houston, Rio, Aberdeen, Oslo / Stavanger (these alternate each year), Amsterdam, KL and Perth (WA). And in 2013 we also ran a new event in Singapore (up-to-date details can always be found at www.orcina.com/UpcomingEvents).

We started these events back in 2004. Back then we had a total of 87 attendees and we felt that this was a very good start. However, even we were amazed when we checked the 2013 attendance list and saw that just over 450 colleagues attended! In addition to the standard 'What's New in OrcaFlex', the following topics were presented:

2012: *Presentations focussed on the new Line Contact model, showing examples of: Sheave & J-tube pull-in, pipe-in-pipe, BSR, pipelay piggyback and rollers, riser tower, drill riser, gravity slug.*

2013: *Lowering and various ways to model it, and more Python Automation.*

The presentations for these can be found at www.orcina.com/Support/UserGroup, along with a newly added index to all the presentations from past years.

We are very fortunate that many OrcaFlex users are kind enough to act as guest speakers for these events. We know from the feedback forms that these slots are especially well received. The speakers for the last two UGMs include:

2012	2013
Oslo: Lasse Moldestad (Odjell Drilling) In-house developed system for handling large amounts of OrcaFlex Analysis	**Perth: Ali Khosroshahli (Subsea7) Gorgon large bore spools deployment analysis**
KL: Herman Perera and Cecep Hendra (Zee Engineering) Case Study: Labuan Pipeline	**KL: Keresan Hariharan (MISC Berhad) FPSO Kikeh Accommodation Module Installation**
Houston: John Shanks (Risertec) Design Optimisation Using OrcaFlex	**Houston: Jose Vasquez (3Dent) Using OrcaFlex for Conducting "Going on Location" Analysis for Jackups/Liftboats**
Aberdeen: Andrew Mosley (AS Mosley) Analysis of Steel Top Tensioned Riser Systems using Orcaflex	**Aberdeen: Alistair Olsen (Prospect) Investigation into Motion Reduction Methods for payload from an A-frame**
Amsterdam: Annemarie Damen (Vuyk Engineering) Venice Storm Surge Barrier: Analysis of Installation	**Rio: Prof. Antonio Carlos Fernandes (Federal University of Rio) WS/BS Method as Alternative to the 5-seed approach in the design of mooring lines of floating offshore units.**
Rio: Gabriel Nascimento (Genesis) Docking Analysis	

OrcaBuilding

Those of you who have been using OrcaFlex for a long time may remember that over 12 years ago, just after we occupied our present office, we responded to popular demand (well 2 requests!) and included a picture of our new, small, but perfectly formed, bike shed. OK, OK, I hear the clamour for the picture – see right.

But now we can report that we're onto slightly bigger things. Our new 'OrcaExtension' has been going up since Sept-13. This was the first, and biggest, part of a site re-development program – see below for the extension, with our existing building somewhat overshadowed in the background.

All the work was completed in April-14. We now have a facility which is much better for meetings, staff comfort, company expansion and hosting on-site OrcaFlex training courses.

Of course we realise that many of you will work in buildings of a much grander scale – but in our own little way we're quite pleased at the site re-work we've been doing, and we very much look forward to welcoming visitors to this new facility.

Did You Know.....

We would normally include a section of small hints in the Newsletter. Unfortunately space has beaten us this time…but it should be back in the next newsletter.

Orcina Out and About

Exhibitions and Training Courses

Since the last newsletter we have exhibited at Oi10 and Oi12 both at the ExCel Centre in London, OTC12 in Houston, Offshore Europe'13 in Aberdeen and OMAE12 (Rio) and OMAE13 (Nantes). In a departure for us we also did ADIPEC'13 in Abu Dhabi and the Subsea Lifting'13 event in Stavanger. These all ran to form, providing a good way for us to catch up with existing colleagues and meet some prospective new ones.

In the next newsletter

The table shows some of the items we're currently working on – when these make it into OrcaFlex, there'll be a newsletter to accompany it!

But as ever our development list is largely dependent on client feedback. User suggestions, especially when accompanied by the reasons why a feature is felt important, are always appreciated. And of course whilst we'd really like to please 'all of the people all of the time', in reality this is not possible - but we hope that we mostly get it right!

Items for v9.8 (cOct-14) and beyond:

- Frequency Domain analysis
- Better hydrodynamics near surface & seabed
- Pipelay stinger and roller setup UI
- Parameter study facilities and custom results
- Software licencing rather than hardware dongles
- Line payout, especially for modelling inertia and drag on winches, pipelay etc.
- Line results at nodes in addition to mid-segments
- Restarts

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(see www.orcina.com/ContactOrcina for full details)