New in OrcaFlex 8.3...

...here is a short list of some of the main developments.

## Developments To The VIV Toolbox

Since the last newsletter, there have been a number of enhancements to the VIV Toolbox. In summary these include:

• Full release of the Iwan & Blevins Wake Oscillator model;

• The Sarpkaya and Schoaff Vortex Tracking model has been fully released and significantly speeded up;

• Wake oscillator models can now handle relative flow accounting for the motion of the line (vortex tracking has always accounted for this!);

• In-line and transverse force factors have been added to the time domain methods (the wake oscillators and the Vortex Tracking model). This allows the user to model, for example, the effect of strakes, by reducing the VIV force acting transversely, but enhancing the in-line VIV drag.

• Transverse and in-line components of the vortex force are now available as results variables.

As the VIV Toolbox has become more widely known, many clients have applauded the ability to model several approaches to VIV through one interface.

Extend Simulation Feature

Ever had that feeling that your simulation was just not long enough? if only you could add another 100 seconds onto the end of it without having to reset and start again, wouldn't life be much more rosie? Well now you can. Under the Calculation drop down menu, there is a new option to extend the existing simulation.
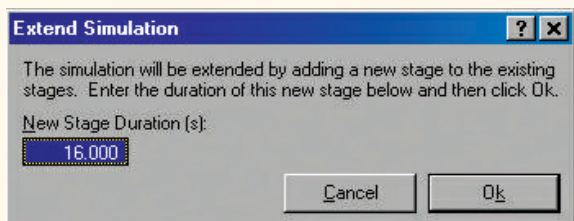
Model Browser Grouping Facility

There have been some important changes to the OrcaFlex Model Browser. It now contains a powerful new Grouping Facility allowing the user to switch quickly and easily between the traditional view of the model browser (by object types), and the new Grouped View.

This feature has the major advantage that the user can now group together OrcaFlex objects into meaningful collections. The entire group can then be copied and pasted - so if you have set up a single mooring leg composed of a number of Lines and Buoys, and you need seven more legs just like the first one - grouping will do it. Nested groups are fully allowed for, and groups can be renamed, and imported from libraries. This is a great new facility allowing the user to organise models in a much more readily interpretable manner.

To make the library easier to use, we now only allow objects to be *imported* from the library to the current model. Previously you were also able to export from the current model into a library. We found that this can lead to significant confusion and loss of library data – hence the change.
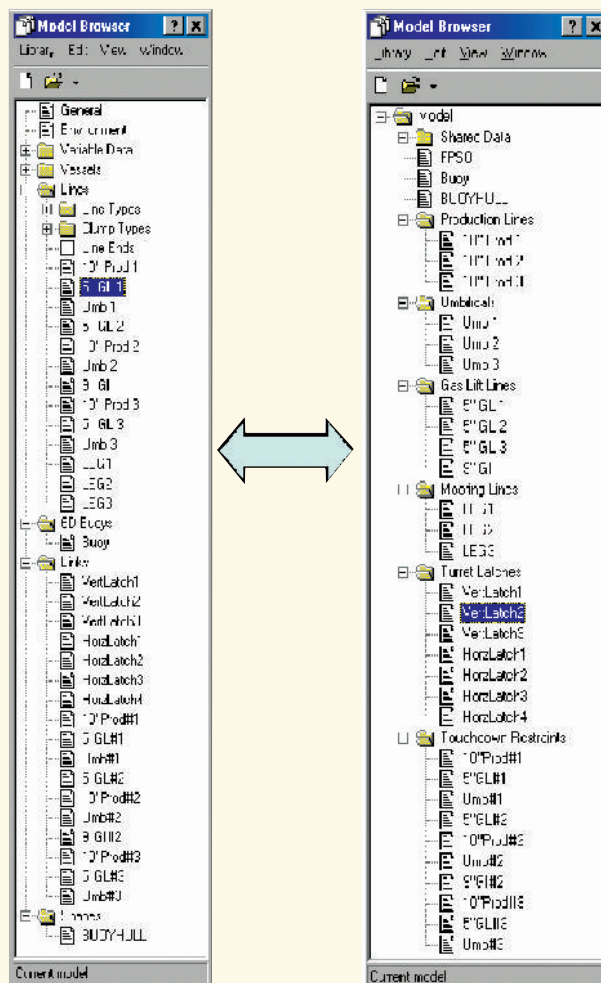
Multiple File Replay Facility

This great new feature allows you to collate several OrcaFlex files (data files and / or simulation files) into a single OrcaFlex replay. We have found this to be another very useful feature, particularly when looking at installation procedures. Installations are often best analysed as a series of static solutions. The new feature allows you to replay them in sequence, as you would present them to the installation team or to your client. Using the following process gives a very effective tool for planning the installation:

a) Use OrcaFlex to set up a base case datafile of the installation.
b) Use a batch script to generate (say 10) new datafiles, each representing different steps in the installation procedure.
c) Write the corresponding OrcaFlex replay file.
d) Set up the OrcaFlex results spreadsheet to load the (10) datafiles and generate the results of interest.
e) Load the replay file into OrcaFlex and view in 3D the static results for each of the 10 steps, and use the results spreadsheet to produce the results of interest.

Using this methodology, it is very easy to add, delete and change the steps in the installation process such that you optimise the procedure. Then you can look at one stage in more detail (dynamically) by changing the batch script for the appropriate step to produce a simulation file.

This works by effectively adding another stage to the existing OrcaFlex simulation, with a user specified duration. The user can then continue the simulation through the 'Run Simulation' button.

News in *Short...*

Fully Rendered Graphics

Century Subsea Limited (Aberdeen & Houston) are a survey and positioning company who have developed a sophisticated rendered graphics package called Aquarius. This takes navigation and positioning information, allows the user rendered visualisation, and the ability to transmit this data world wide. When needed, Aquarius uses the OrcaFlex DLL to compute the line catenaries from the real-time monitored data.

A reduced version of Aquarius, has been produced and is being linked with OrcaFlex. Now any OrcaFlex datafile or simulation file can be visualised with 3D rendered graphics, incorporating hidden lines and perspective. Aquarius 3D is available as an additional module to OrcaFlex. Please contact us for details.

Paper at OTC

Orcina have never been big on writing papers, preferring to spend the time on developing the best possible software for our clients. However Mike Isherwood (Orcina) and Mark Chang (SBM-IMODCO) have recently co-authored a paper for inclusion in this years OTC proceedings. In the paper the facilities in the recently developed OrcaFlex VIV Toolbox have been used to compare different methods for the prediction of VIV. A general review is included, and the results of VIV predictions for SCRs and are given using VIVA, Shear7, Milan Wake Oscillator model and the Sarpkaya and Schoaff Vortex Tracking model.

The paper number is 15106, and is titled 'Vortex-Induced Vibrations of Steel Catenary Risers and Steel Offloading Lines due to Platform Heave Motions'.

DISH (Deepwater Installation of Subsea Hardware)

The second phase of DISH* – Deepwater Installation of Subsea Hardware – is under way, and Orcina is taking part. Not surprisingly, the main emphasis is on the handling and properties of manmade fibre ropes, since wire rope self weight becomes prohibitive in deep water. Our experience of modelling these deep installation scenarios is that snatch loading is often unavoidable in realistic sea states. This means that time domain modelling is essential, and that simplistic linear models are just inadequate as predictive tools. A particular bete-noir is the industry's tendency to characterise the rope behaviour in terms of frequency-dependent or amplitude-dependent stiffness – something which a time-domain modeller cannot use or interpret sensibly. We expect that the JIP will highlight specific modelling issues, leading in due course to additional features in OrcaFlex.

*DISH is a JIP managed by BMT Fluid Mechanics Limited, with assistance from OTM Consulting Limited.

OrcaLay - Pipelay Optimisation Software

Our previous newsletters have mentioned the work we have been doing for the pipelay industry. This has culminated in the development of OrcaLay, a stand alone pipe and umbilical installation planning software tool. We thought that rather than mention it in passing (again!), now was the time to introduce our readers to this tool, outline what is does and why it has made such an important difference for some of our major clients.

Application

So what is OrcaLay for?

• For **PLANNING** and **OPTIMISING** installation procedures;

• Covers **ALL PHASES** of laying – initiation, lay, laydown and A&R;

• It's **FULLY AUTOMATED** analysis gives the Range of Acceptable Tensions

• Allows user specified **ACCEPTANCE CRITERIA** including; API and DNV pipe codes.

Benefits

What are the user benefits? Well, as we see them, they include:

• automatic calculations…
  - saves time and therefore money;
  - enhance QA and minimise re-work.

• full Windows style interface…
  - promotes familiarity and ease of use;
  - import, export and copy/paste facilities deliver efficient working.

• full program support…
  - comprehensive on-line context sensitive help;
  - backed up with total support from Orcina engineers.

But, as they say, 'how do we do that?': Well, the answer is that OrcaLay automatically calculates the range of top tensions for a particular phase of the installation process, such that various constraints (see below) are not violated. This means that the lay engineer then knows the acceptable range of top tensions for which the installation can be performed. Not only are the range of acceptable top tensions determined automatically for a particular installation configuration, but this automation can be repeated for as many installation configurations as the user cares to define….all this at the press of a button!

By way of a bit more background, most installation procedures are divided into three stages: Initiation (getting the first end of the pipeline / umbilical safely to the seabed), Lay (the ongoing and substantive part of the installation) and Laydown (where the other end of the pipeline / umbilical is laid to the seabed). Although there are subtle distinctions in the data the user needs to supply for these three

stages, as far as the analysis is concerned all we are looking at is modelling different material properties and possibly different connection positions of the line – all this is bread and butter for OrcaLay. Better still, all three stages can all be modelled in the same OrcaLay session without having to create different datafiles for each. *(see fig 1.)*

Pipelay engineers will know that there is a wide range of constraints on pipelay. Keeping them all in mind at once is tough, and using conventional one-shot analysis, the engineer had several days of concentrated work to achieve a satisfactory analysis. But OrcaLay can handle multiple constraints, and retaining concentration is no problem to a computer – so it's an ideal case for analysis. The constraints are mostly pretty obvious and straight forward to define, but in the past they have not always been simple to check for violations. One key aspiration behind OrcaLay was the need to have the analysis automatically check for these and let the user know when violations occurred.
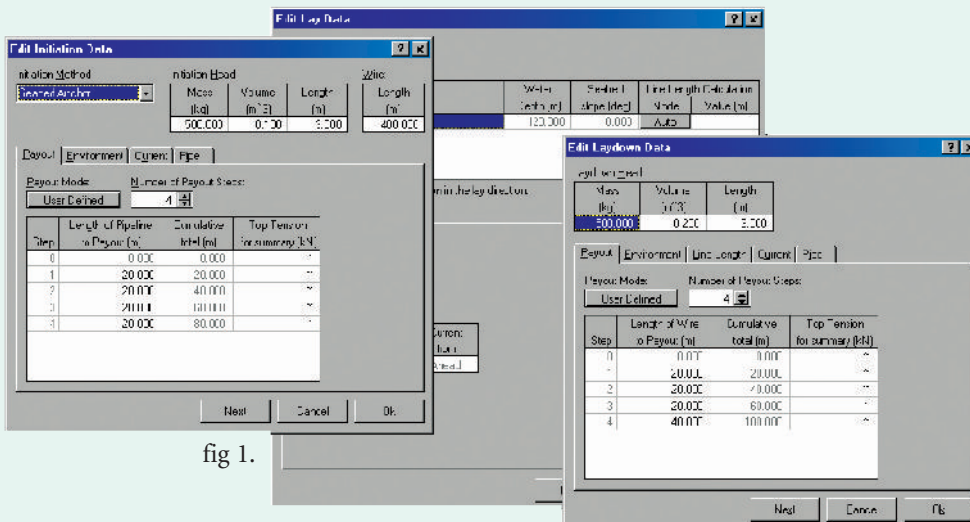
Orcina

fig 1.

Very briefly the installation of a pipeline (or umbilical) must make sure that some or all (at user discretion) of the following are not violated:

• That a pipe never locally buckles during the installation (cf API, DNV, etc);

• That the compression in a pipe does not exceed the maximum allowable;

• That stress levels in a pipe don't exceed user defined values;

• That the top tension in the pipe or umbilical does not exceed the handling capacity of the tensioner or the handling winch;

• That the horizontal component of the top tension does not exceed the bollard pull of the vessel.

• That the line does not come into contact with user defined physical constraints (objects, etc);

• That the minimum bend radius f or the umbilical is not exceeded;

• That the umbilical in not allowed to wrap beyond theChute included angle.

All these data can be set by the user; standard pipe codes (API, DNV and BS) are used to check that the pipe doesn't buckle. And if you want to do dynamic analysis of your lay configuration, then simply check the box 'Write OrcaFlex File' and with no further effort you have the necessary

data file to use with OrcaFlex! It really is as easy as that.

Recent Codes allow a strain-based approach which accepts that the pipe material can legitimately exceed the material yield point without infringing the code. This is handled in the latest version of OrcaLay using a Ramberg-Osgood material model.

And that is that! Well, almost…OrcaLay also has all the easy-to-use graphical user interface expected of Orcina software, as well as comprehensive context sensitive help, full results output and unrivalled technical support for which we continue to receive plaudits from our clients.

If you would like to find out more, then please look at our website (www.orcina.com) or contact us by phone or email. We are always very happy to chat these things over and see if our software can help to meet your requirements.
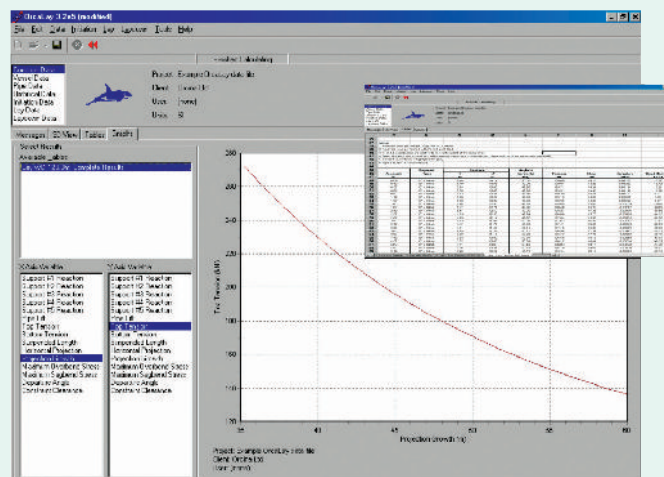
Did You *Know...*

…on 3D views you can now use CTRL + the mouse wheel button to scroll and zoom. Also the Status Bar now reports the global co-ordinates of the cursor position in the current view plane.

…on the Line Types Data Form, you have for a while now been able to right click (or Alt+Enter) and obtain a summary of line properties (weight in air, displacement, weight in water, Diam/Wt Ratio). This has now been extended to include OrcaFlex objects such as Lines, 6D Buoys, 3D buoys and vessels. The resulting Properties window is a simple and accurate way to check that you have the net properties you were looking for.

…as promised in the Autumn 2002 Newsletter, Current Speed & Direction can now be time varying.

…a new Line Clearance results variable has been added which takes account of the diameter of the lines. The existing variable reports clearance between line centrelines. Note that clashing has always accounted for line diameter.

... on the General Data form, you now specify the logging interval, rather than the number of log samples. This is better since changing the simulation duration no longer affects the logging interval.

…there is a new Delete Unused Types facility on the Model menu. This allows you to quickly and reliably get rid of all the unused line and vessel types in your OrcaFlex model. We use it for producing 'uncluttered' models, but beware that you don't delete any unused Types that you might want to use later!

…rather than using the OrcaFlex File | Open command, you can now drag and drop files onto an open OrcaFlex session.

…ever wanted to know the frequency content of your time history results? You can get this data now by right clicking on the graph and selecting the Spectral Density option.

…you can now optionally have hints shown on 3D View to identify the object underneath the cursor. See Use Tools | Preferences | General | Show Hints.

Orcina

News

Line End Connection Form

This actually came out in a previous version of OrcaFlex, but we thought it was such a handy tool, that we really should say a few words ...to find it, look in the Model Browser under the Lines category, and you will see the following icon.

☐ Line Ends

Look in here and you will see a host of useful data to help in the setting of the line end connections.

In the screen shot, the Positions and Connections tabs echo data from the Line Data Form – this means that you can see (and change) the data which has been set for all the lines in the model – but all in one place!

However, the real point of interest is the Polar Coordinates tab. This allows you to set the range and bearing of both ends of the line relative to a user defined axes system. So you can set the range and bearing of the top end of a mooring line (for instance) to be relative to the axes of the vessel to which the line is attached. You can then set the range and bearing of End B relative to the upper connection point, rather than having to work out the cartesian co-ordinates of End B. The polar co-ordinate data on this tab and the positions data on the Positions tab are fully synchronised. Change either and the other set of data are immediately updated.
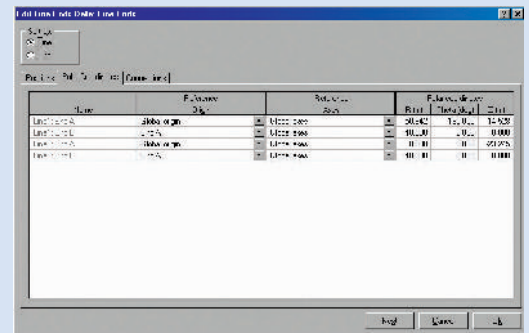
New Post Processing Features

Previously the OrcaFlex post processing results spreadsheet could only extract the results from pre-run OrcaFlex simulation files. Now the results spreadsheet has been extended in two important ways:

a) Static results from an OrcaFlex data file can now be obtained. This is a key development, and makes obtaining results from the sort of installation analysis described on the front page very easy.

b) You can now extract data items from either simulation or data files. This means that you can now annotate the spreadsheet holding the results with information such as the environmental conditions, line lengths etc.

The OrcaFlex Results Spreadsheet actually uses the OrcaFlex DLL. In the previous incarnation of the spreadsheet, the DLL was used only to extract results from the pre-run simulations. Now, when a data file is specified in the results spreadsheet, the DLL actually does the static calculation, and then extracts the requested static results.

More News in *Short...*

Updated Website

The Orcina website (www.orcina.com) has finally received some long intended attention. This will be an ongoing process, so expect to see some major changes in presentation and content over the next 12 months or so, and incremental changes thereafter. The major changes so far primarily affect the user support area, where we have added an area giving the 'What's New' information for each of the OrcaFlex major releases. Here you can see the major developments and also check out the release dates. This area also lists any bug fixes, and has downloadable bug fix patches, and a section outlining the developments we are presently working on. The latest up-to-date OrcaFlex helpfile can be found in the public area under.
www.orcina.com\OrcaFlex\OrcaFlex documentation
for all to freely download.

In the Autumn 2003 Issue

As well as the usual digest of software developments, news and hints & tips, we will feature a couple of technical articles on...

Modelling wave power devices with OrcaFlex.

How to model objects colliding with underwater nets.

Exhibitions

Orcina will be present at the following conferences / exhibitions during 2003:

- **Offshore Technology Conference (Houston, May)**
- **Oceanology Americas (New Orleans, June)**
- **Offshore Europe (Aberdeen, September)**
- **Oceans '03 (San Diego, September)**

Hope To See You There!

Orcina