Training on OrcaFlex Software

Course Venue
UAE

Course Duration
Two Days

ARYATECH MARINE & OFFSHORE SERVICES PVT LTD
B-1, HAUZ KHAS, NEW DELHI – 110016
Tel: +91 – 11 – 46018102, Fax: +91 – 11 – 46018103
Email: info@aryatech.net, support@aryatech.net
Website: www.aryatech.net

Schedule:

1. The course assumes no prior experience with the software and is organised as a series of lectures and practical sessions each lasting typically 1½ hours to 2 hours. The course is intended to be 'hands on' and we encourage attendees to follow the trainer's actions throughout.

2. The training will be carried out in two days in Chennai

Training Material:

1. Workshop training material will be provided.
2. Software and key access to each individual candidate will be provided by Aryatech Marine & Offshore

COURSE REQUIREMENTS

1. Attendees must bring their own laptops capable of running OrcaFlex software.

Certificates:

1. Upon completion of training, certificates will be provided by Aryatech.

TRAINING SCHEDULE

1. **Introduction to OrcaFlex**

Establish backgrounds and areas of interest

Reasons for doing dynamic analysis

Show some OrcaFlex examples:

A01 (Catenary & Waves), A02 (Midwater Arch), B01 (Drilling), B06 (Running BOP),

C05 (SPM), E03 (Pipelay), H01 (Chinese Lantern), Z02 (Zip wire)

Do OrcaFlex tutorial:

Show how to find tutorial (menu, toolbar and shortcut keys)

- Setting up a simple model (catenary line + vessel)
- Axis systems (global & local)
- Model browser, data forms, right click, default data and Help (F1)
- Statics (static results: tables, range graphs)
- Dynamics (replay: control & view parameters)
- Dynamic results (time histories, range graphs, X-Y graphs, linked statistics)
- Using live results and interrupting & extending simulations

Copy / paste & exporting to file (views, graphs / tables, workspaces)
Binary data files, text data files, simulation files

2. **Lines & Line Properties**

Lines

- Line theory (nodes and segments)
- Sections, segmentation
- Connections, end conditions and end angles
- Contents (uniform, free-flooding, slug flow)
- Torsion (where appropriate, run-time & data implications)
- Clashing (enabling contact, effect of contact stiffness, use of clash energy)

Line types

- Categories
- Line Type Wizard
- Right-click properties (applies for all objects)

Attachments

- Lazy wave example (smeared using line type vs. discrete buoyancy using clumps)
- BSR modelling (using bend stiffener attachment) and TSJ modelling (using line type)

3. Worked Example

- Line Setup Wizard
- All-objects data form (polar / Cartesian coordinates)
- Lay azimuth (as laid direction)
- Grouping objects (create, duplicate, move & locate)
- Library facilities

4. Links, Winches and Shapes

Links

- Connection data (to lines and other objects)
- Linear spring (no compression)
- Non-linear spring/damper (supports compression)
- Link connecting lines & link results

Winches

- Connection data (to lines and other objects)
- Winch control (length or tension, by stage or whole simulation)
- Pull-in to a specific point & winch results
- Elastic solids / trapped water / drawing - applications
- Connections, geometry, contact stiffness, friction
- Example using line interacting with elastic solid (catenary over cylinder)
- Nodal interaction and 'locking'

5. The Environment

Sea properties

- Reynolds number (viscosity, temperature and formulations)
- Density (constant and spatially varying)

Seabed

- Types of seabed (flat, profile, 3D), origin and direction
- Interpolation methods
- Contact stiffness and damping
- Non-linear hysteretic model with trenching, suction and re-penetration

Current

- Interpolated data (profile, reference speed and direction)
- Power law data
- Use of variable data
- Multiple current data sets
- Ramping current in build-up
- Vary horizontally

Wind

- Wind type options (constant, spectral and time history)
- Which objects affected

Waves

- Regular and random (different wave types)
- Wave height, period and direction (spread waves)
- Wave preview (for random waves)
- Multiple wave trains

6. Buoys

3D Buoys

- Draw parallel with data for clump attachments
- Irrotational example

6D Buoys

- Degrees of freedom included
- Type (lumped / spar / towed fish)
- Lumped properties (arbitrary geometry)
- Distributed properties (axisymmetric geometry)
- Slam loads
- Wings, applied loads, buoys as attachments (torsion)
- Attaching buoys to buoys: composite objects and negligible lumped buoy properties

7. Vessels

Overview

- Vessels and vessel types
- Three frequency regimes (zero, wave, low)
- Imposed and calculated options

Vessels

- Position, heading etc.
- Statics, primary and secondary motion
- Imposed motions (prescribed, harmonic, time history, displacement RAOs)
- Calculated motions (3DOF, 6DOF, included effects)

Vessel types

- Structure and conventions (symmetry)
- RAOs (displacement / load)
- RAO checks: graphs and replay in long wave
- Hydrodynamic data import
- Drawing (wire frame / shaded / origin for draught)

8. Statics, the General Data Form and Dynamics

Statics overview: lines only and lines connected to other free objects Statics of lines only

- Step 1: (quick, catenary, prescribed, spline, user specified)
- Step 2 : full statics adds all relevant loads

Statics of lines connected to other free objects

- Separate buoy and line (SBL) or whole system statics (WSS)
- Degrees of freedom included (buoy and vessels)
- Use calculated positions
- Convergence parameters (tolerance and minimum / maximum damping)
- Two lines & 6D buoy example (also showing rotational indeterminacy)

The General Data Form

- Comment field, units
- Stages, ramping, sample interval (peak logging)
- Starting velocity

Overview of Selecting Integration Method:

- Iterative vs. non-iterative
- Conditional and un-conditional stability

Explicit

- Inner and outer time steps
- OrcaFlex recommended values for time step (shortest natural nodal period)

Implicit

- Setting time steps
- Constant and variable step options
- Accuracy and time step sensitivity studies

9. How to Use OrcaFlex Efficiently

QA checks of models:

- Mesh sensitivity
- Time history (settled dynamics)
- Movement at anchor (terminated model too soon)
- Compression (Euler buckling)
- File compare

10.Automation (OrcaFlex Spreadsheet)

- Script Tables (batch scripts and text data files)
- Batch Processing (running simulations)
- Instructions sheet (instructions wizard)
- Duplicate Instructions

11.Review, Questions and Worked Example

- Worked examples, or trainees own project models, and general discussion time:
- Modal analysis (resonance problems)
- Fatigue analysis (and wave scatter conversion)
- External functions and the dll
- VIV analysis
- Wake interference

Regards

Tarun Rewari
Director
Aryatech Marine & Offshore Services Pvt. Ltd