

OrcaFlex is a general purpose dynamic analysis software program suitable for a wide range of global dynamic analysis applications. Its user interface, functionality, productivity features and wide range of applications, along with very active program development and technical support, make it the leading option in its peer group.

It has been further enhanced over recent years to provide an improved user interface and workflow for pipelay applications.

Pipelay features include

- Dedicated Supports User Interface
 - perfect for modelling rollers on stingers
- Fully interactive UI
 - ideal for visualisation and checking
- Built-in code checks
 - API RP 1111, DNV OS F101 & F102, PD 8010
- Multi-directional RAOs
- Robust contact model
 - ideal for intermittent pipe-roller contact
- Non-linear bend stiffness
 - with or without hysteresis
- Full environment specification
- Coatings and linings easily defined
 - additional bending stiffness can be included
- Arbitrary support configurations
- Lay table automation
 - using Python or Excel
- Excellent agreement between OrcaFlex and OFFPIPE
- Equivalent lines, explicit pipe-in-pipe and / or piggybacks
- Fully integrated fatigue analysis

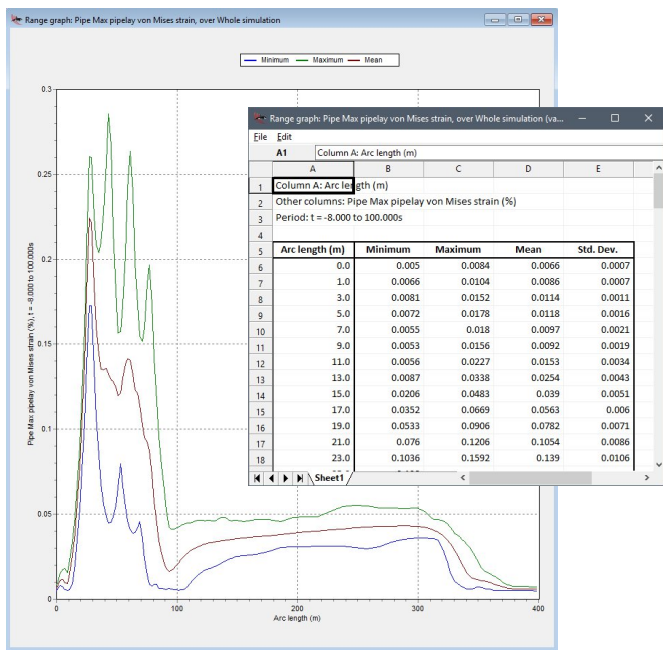
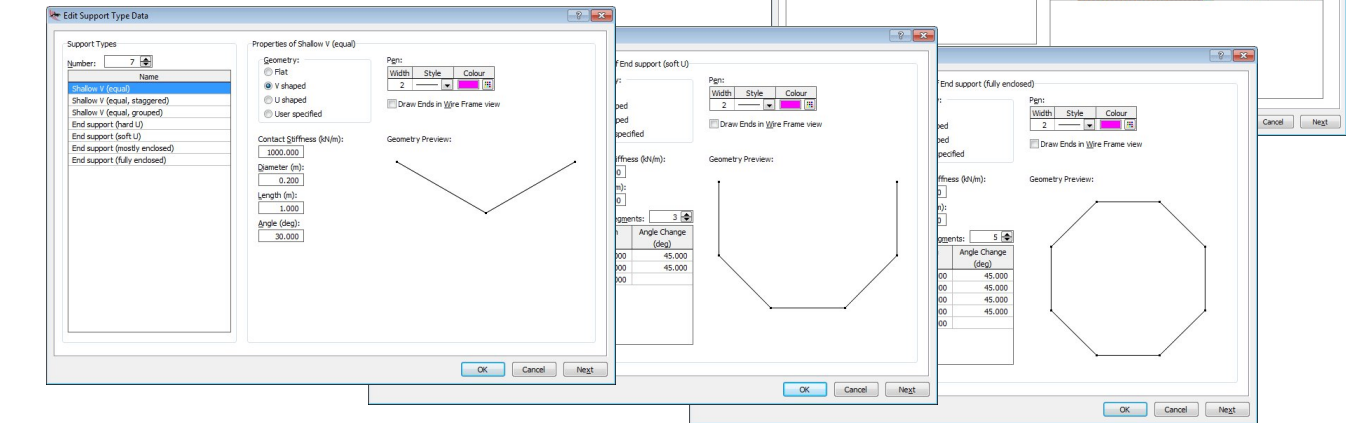
Contents

OrcaFlex pipelay functionality.....	2	The back page.....	4
Comparison with OFFPIPE.....	3		

OrcaFlex pipelay functionality

Supports UI - ideal for pipelay

The OrcaFlex User Interface is class-leading, and includes features specifically designed to facilitate pipelay model building. Roller boxes are defined as 'support types', using built-in or user-defined configurations. It is then simple to position the rollers on the barge or stinger. The roller supports can also include friction if desired.



Code checks

Several code check results are built into OrcaFlex and are easily the simplest way to perform standard industry code checks.

Variable:

- API RP 2RD stress
- API RP 2RD utilisation
- API STD 2RD method 1
- API STD 2RD method 2
- API RP 1111 LLD
- API RP 1111 CLD
- API RP 1111 BEP
- API RP 1111 max combined
- DNV OS F101 disp. controlled
- DNV OS F101 load controlled
- DNV OS F101 simplified strain
- DNV OS F101 simplified stress
- DNV OS F101 tension utilisation
- DNV OS F201 LRFD
- DNV OS F201 WSD
- PD 8010 allowable stress check
- PD 8010 axial compression check
- PD 8010 bending check
- PD 8010 torsion check
- PD 8010 load combinations check
- PD 8010 bending strain check

The usual OrcaFlex presentation of graphs and values now includes results from pipelay code checks.

Lay tables

Standard automation facilities built-in to OrcaFlex mean that lay tables are easily generated. There are two approaches:

- OrcaFlex spreadsheet
- Python scripting

Examples of each are available as part of our standard examples set.

OrcaFlex Pipelay Table (Python)																					
Basecase Data										Comments											
Vessel	Vessel									<p>This results sheet is intended to replicate a typical OrcaFlex results sheet as a way of demonstrating that Python and OrcaFlex can be used as a viable alternative. It is an example of the type of data that can be automatically presented through the use of Python.</p> <p>The spreadsheet is built and formatted entirely in Python with no user input required in Excel.</p> <p>Cells and rows are highlighted automatically to identify pass/fail.</p> <p>Cells highlighted in red are those that do not meet the necessary acceptance criteria.</p> <p>Rows highlighted in green represent the 'acceptable' cases that remain within all acceptance criteria.</p> <p>If the reaction force for all supports in a load case is zero, this infers that the line is completely in sag/bend, and this will consequently place 'N/A' in the corresponding overbend cell.</p> <p>User needs will of course vary, and this sheet is only intended as an example. The Python code can be modified as required by the user.</p>											
Age	27 = 1 year Type																				
Ramp Angle (deg)	55																				
Water Depth (m)	120																				
Sealed Slope	0																				
Current Speed (surface, m/s)	0																				
Current Speed (seabed, m/s)	0																				
Current Direction (deg)	180																				
Code Check	API RP 1111																				
Acceptance Criteria																					
Max Tension (kN)	250																				
Min Tension (kN)	0																				
Max Batten Pull (kN)	500																				
Uncontrolled Stress Limit (MPa, 72% of yield)	257.75																				
Controlled Stress Limit (MPa, 96% of yield)	343.68																				
Load Case																					
Load Case	Anchor X Position	Support Reaction Force					Max Support Lift Out	Tension		Minimum Tension	Top Bend Moment		Suspended Length	Horizontal Projection	Projection Growth	Maximum Stress		Departure Angle	Constraint Clearance	Code Check	Roller Pad
		1	2	3	4	5		Top	Bottom		kN	kN				kN.m	kN.m				
Case001.dat	-383	0	0	0	0	0	41.56	0.511	154.038	62.743	54.347	0.659	234	173.48	69.52	N/A	102.3	55.3	1.85	PASS	96.3
Case002.dat	-384	0	0	0	0	0	39.7	0.495	157.567	66.36	57.755	1.358	258	176.48	69.52	138.22	176.8	54.8	1.87	PASS	96.3
Case003.dat	-385	0	0	0	0	0	37.73	0.46	159.922	70.269	60.887	0.648	261	182.48	69.52	111.02	168.81	54.37	1.86	PASS	106.48
Case004.dat	-386	1.131	0	0	0	0	36.51	0.465	160.269	74.302	65.313	0.862	245	187.48	69.52	290.31	161.85	63.89	1.72	PASS	103.13
Case005.dat	-387	2.583	0	0	0	0	35.12	0.491	159.849	79.849	69.897	0.444	149	192.48	69.52	244.48	156	63.48	1.74	PASS	106.48
Case006.dat	-388	4.071	0	0	0	0	30.57	0.438	174.367	82.79	74.844	1.587	253	197.48	69.52	238.01	148.59	53.52	1.72	PASS	110.07
Case007.dat	-389	5.564	0	0	0	0	27.84	0.429	178.849	87.617	78.897	2.311	257	202.48	69.52	218.42	142.49	52.48	1.74	PASS	113.35
Case008.dat	-390	5.051	1.023	0	0	0	24.66	0.469	184.849	92.774	84.149	2.352	381	207.48	69.52	186.47	52.09	52.09	1.74	PASS	117.07
Case009.dat	-391	4.037	1.775	0	0	0	21.19	0.388	189.849	98.207	89.813	2.529	396	212.48	69.52	148.52	130.77	51.63	1.76	PASS	120.47
Case010.dat	-392	3.063	1.148	0.143	0	0	17.44	0.346	196.474	104.215	95.808	2.764	411	217.48	69.52	115.52	91.52	50.75	1.76	PASS	124.44
Case011.dat	-393	2.266	0.433	2.429	0	0	12.72	0.30	201.953	110.547	101.547	2.726	276	222.48	69.52	77.95	120.1	50.05	1.76	PASS	128.47
Case012.dat	-394	1.549	1.82	0.579	2.744	0	8.433	0.316	208.174	117.448	108.148	2.715	261	227.48	69.52	48.14	115.14	50.75	1.76	PASS	132.47
Case013.dat	-395	1.136	1.198	1.192	5.748	0	6	0.303	218.045	124.803	117.409	2.746	237	232.48	69.52	33.34	110.45	48.7	1.76	PASS	137.38
Case014.dat	-396	0.713	1.161	0.546	6	0	0	0.305	221.835	132.373	125.822	2.745	213	237.48	69.52	24.72	109.22	48.85	1.76	PASS	142.43
Case015.dat	-397	0.407	0.729	0	0	0	0	0.303	231.438	140.777	133.854	2.743	189	242.48	69.52	16.11	102.4	48.85	1.76	PASS	147.38
Case016.dat	-398	0.623	0	0	0	0	0	0.305	241.827	149.827	142.481	2.742	165	247.48	69.52	8.65	88.91	47.13	1.88	PASS	151.76
Case017.dat	-399	0	0	0	0	0	0	0.302	247.761	156.327	151.426	2.694	141	252.48	69.52	0	85.84	46.21	1.61	PASS	156.48
Case018.dat	-400	0	0	0	0	0	0	0.304	254.761	163.327	158.426	2.647	117	257.48	69.52	0	85.84	46.21	1.41	PASS	160.48

Comparison with OFFPIPE

The OrcaFlex analysis used 10 elements between supports.

For Case A (700m water depth), OFFPIPE used its default of 1 element between supports.

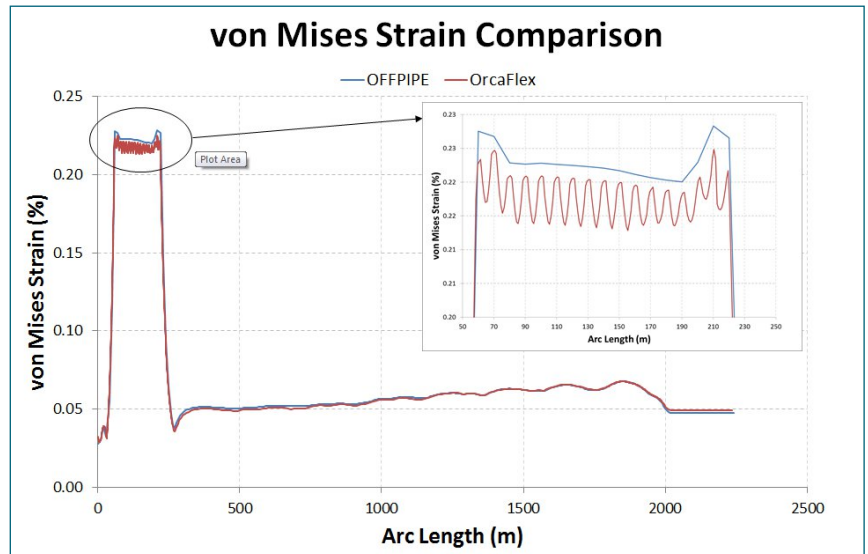
For Case B (150m water depth), OFFPIPE used 16 elements between supports.

Initially differences in results were found. Eventually these differences were found to be caused by:

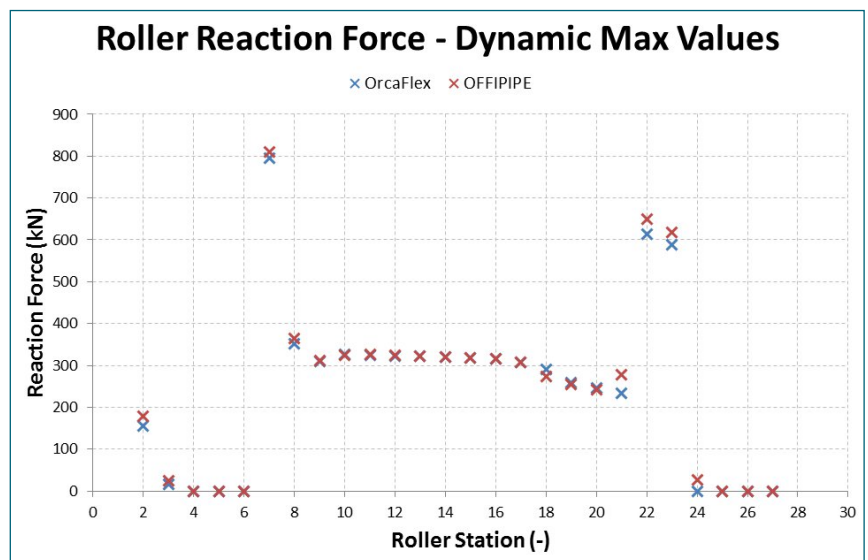
- **Correct tensioner placement** in OrcaFlex (on the barge at pipe start) correctly allows minor pipe movement over rollers, slightly flattening peaks in results.
- **Dynamic results presentation** - OFFPIPE results equate to a mix of OrcaFlex minimum and maximum range graph results.
- **High frequency damping** - OrcaFlex fully and correctly captures stress waves travelling along the pipe (from eg., intermittent pipe-roller contact).
- Slight differences in the specification of **non-linear moment-curvature data**.
- Subtle differences in the calculation of **von Mises strain**.

Once these differences were accounted for, then the results (e.g. graphs on right) were in near-perfect agreement.

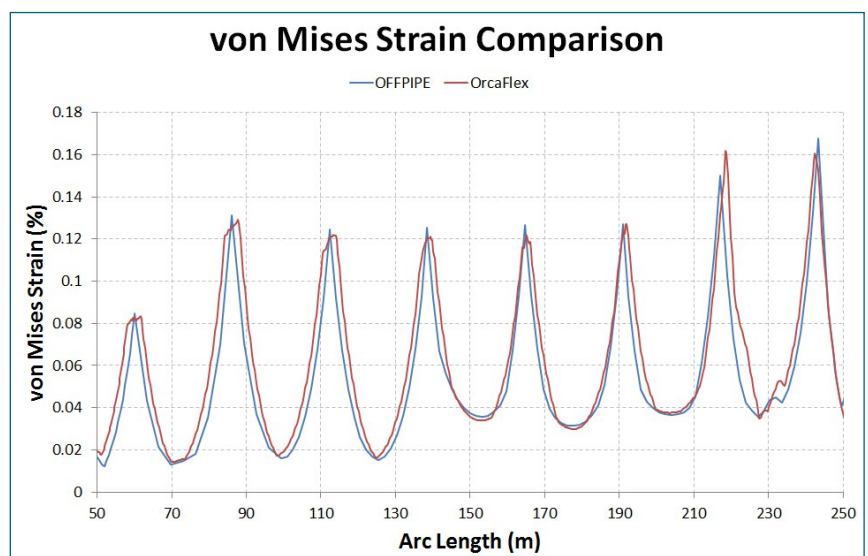
Statically, there was again near-perfect agreement: For Case A, layback differed by less than 0.01%, bottom tension differed by less than 0.2% and stinger tip separation differed by less than 1.1%. For Case B, all results were identical.



Case A: Different meshes still agree



Case A: Excellent agreement



Case B: Excellent agreement

Further applications

OrcaFlex can also be used for a huge range of other applications, including:

- **Riser Systems:** TTRs, SCRs, hybrids, flexibles, umbilicals, offloading & floating hoses
- **Installation:** Risers, moorings, anchors, lift dynamics, subsea hardware, floatover, decommissioning, etc.
- **Moorings:** Global Performance, coupled, permanent & mobile, SPMs, TLPs, SPARs, oceanographic & jetty, etc.
- **Pipelines:** on-bottom stability, spans, VIV analysis, trawl impact, etc.
- **Renewables:** compliant wind & wave systems, power cables.
- **Towed Systems:** Bundles, seismic arrays, towed fish, etc.
- **Other applications:** aquaculture, booms, sea-fastening, minesweeping,...

Key features

- Time and Frequency Domain solvers
- Automate via Excel, Python, Matlab, C++, etc
- Proven FE engine
- Most efficient & robust in class
- Coupled or uncoupled analysis
- Major releases annually
- Best-in-class technical support
- Worldwide annual user meetings

Commercial options

OrcaFlex is easily the most cost-effective in its peer group

- All-in-1 package - no extra modules
- Multi-threading at no extra cost
- 'Distributed' tool boosts throughput
- Comprehensive MUS (Maintenance, Upgrades & Support) contract
- Multi-copy price discounts
- Purchases include a free MUS period
- Month-by-month leasing, includes MUS
- Lease-to-purchase credit option

More information

Please see our website for OrcaFlex release information, User Group Meetings, training courses, newsletters, papers, validations, technical notes, and many other resources.

About Orcina

Founded in 1986, Orcina is now widely recognised as a global leader in its field, with a well-established reputation for innovation, excellence and real-world capability. Our software and approach is flexible enough to accommodate the needs of large corporates requiring hundreds of licenses and individuals who just require one. The core sectors we serve are focused on research, analysis and engineering in oil & gas, wet renewables, oceanographic, seismic, defence, and aquaculture. However we are constantly developing our software to meet the needs of evolving engineering challenges and new market requirements.

Orcina Agents

Orcina is supported in its marketing and technical support activities by the following agents:

USA, Canada & Mexico

Jacob Technologies

Paul Jacob
pj@jtec-tx.com
+1 713 398 9595

Heron Offshore

Dongmei Chu
dchu@heronoffshore.com
+1 832 725 2438

South Korea

SACSKO OceanTech

Hyunwoo Jang
hyun.j@sacsko.com, +82 2 421 8018

South America

NSG Engenharia

Nelson Galgoul
nsg@nsg.eng.br, +55 21 99995 9212.

China

Richtech

Yujing (Jean) Chen
orcaflex@richtechcn.com
+86 10 8446 7760 / +86 1812 129 2356.

Social Media

If you use LinkedIn please follow us:

Orcina Ltd - the home of OrcaFlex



Orcina Limited

+44 (0)1229 584 742

orcaflex@orcina.com

www.orcina.com