SIMLA

SIMLA is a special-purpose computer program system for nonlinear static and dynamic analysis of pipelines.

MAIN FEATURES

The structural integrity throughout the pipeline life cycle can be evaluated by SIMLA. All relevant nonlinear effects for pipelines can be modeled such as elasto-plastic material responses, large 3D motions and frictional contact interactions. Two efficient computational procedures tailor-made for simulation of pipeline laying operations are included.

Detailed seabed surface representation and advanced soil-pipe interaction models are available. Complex irregular seabeds topographies can therefore be addressed. High-performance contact elements for bellmouths, rollers, 3D bodies and pipe-in-pipe systems are also implemented.

A 3D visualisation module developed specifically for assessment of pipeline routes and seabed intervention is included. The module utilizes a very fast rendering technique which is capable of exporting high quality images and animations.

CAPABILITIES

- Effective and robust laying simulation method

- Lateral and upheaval buckling analysis

- Simulation of fishing gear interaction loads

- Assessment of laying stability

- Optimisation of pipe route and seabed intervention

- On-bottom stability analysis
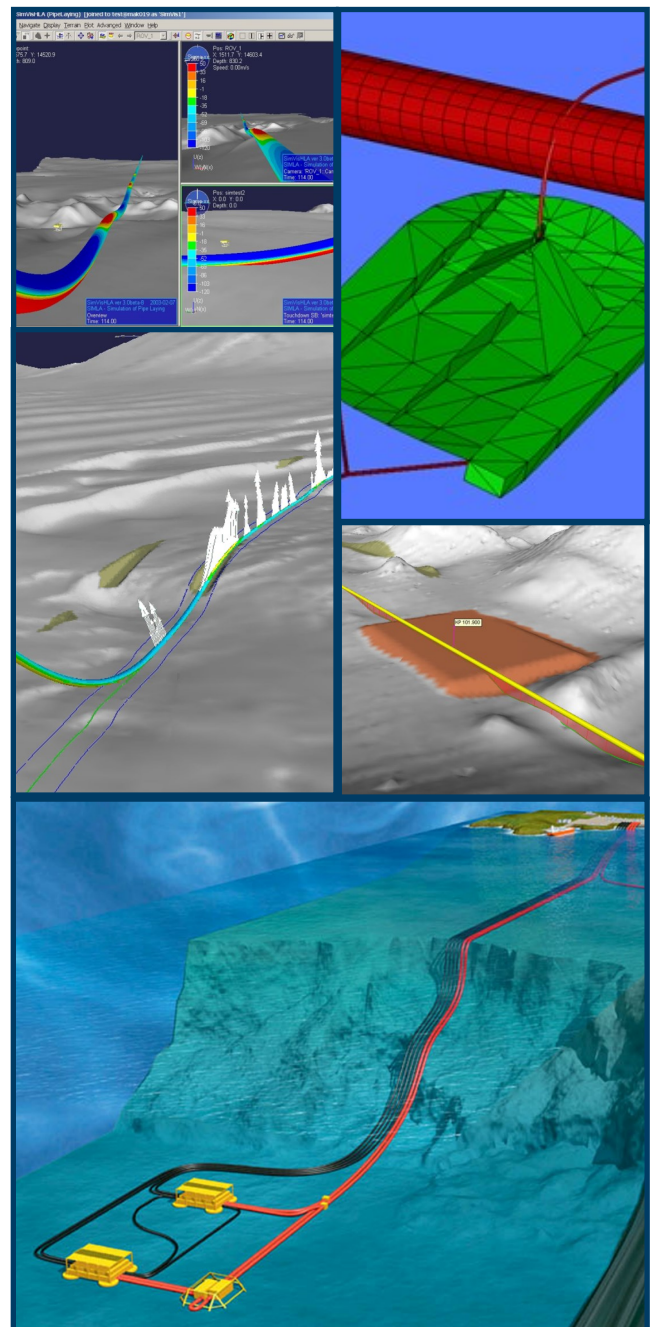
KEY RESULTS

- Stresses, strains and cross-sectional stress-resultants
- Dynamic responses and pipeline stability during laying
- Stress histories for fatigue analysis
- Realistic initial configuration for on-bottom buckling analysis
- Prediction of loads and responses from fishing gear
- Buckling loads and instability modes
- Recommended laying vessel position and operation guidance

DEVELOPMENT

- *2001*: Large displacement 3D beam model including elasto-plastic material models
- *2000s* : Advanced soil-pipe interaction models
- *2001*: Efficient computational procedures for simulation of J-lay and S-lay operations
- *2001*: 3D visualisation module for route optimisation and seabed intervention
- *2002*: Reeling analysis module
- *2003*: Contact elements for pipe-in-pipe systems, rollers and bellmouths
- *2004*: Material model for concrete-coated cross-sections
- *2010*: Advanced 6-DOF trawl board hydrodynamic load model
- *2013*: Frictional contact model for 3D rigid bodies
- *2017-2021*: DROPS JIP Phase I - Pipe-soil interaction models and hydrodynamic load models for on-bottom stability analysis
- *2021-D.D.*: DROPS JIP Phase II - Continuation of work in phase I with focus on small diameter products and shallow water

PROJECT REFERENCES

- Establish design loads by simulations of trawl pull-over, Statoil & DNV GL, 2016-D.D.
- Trawl board and pipeline pull-over interaction, NTNU & Statoil, 2010-2015
- Online simulations using monitored key parameters from pipe lay operations, DEMO2000 JIP 2008-2011
- Laying stability analysis of the Camarupim pipeline offshore Brazil, Reinertsen & Subsea 7, 2008
- Snaking analysis of Ormen Lange 30" pipeline, including comparison with inspected pipe configuration, Statoil, 2007-2008
- Laying stability analysis of two pipeline routes from the platform to the northern manifold at the Pluto field, Woodside, 2005

KEY PUBLICATIONS

Sævik, S. and Ye, N (2016), Aspects of Design and Analysis of Offshore Pipelines and Flexibles, ISBN 978-7-5643-4466 -5.

X. Wu, V. Longva, S. Sævik & T. Moan. A simplified approach to estimate the *probability of otter board hooking at pipelines*. Journal of Offshore Mechanics and Arctic Engineering, Vol 137(6), Paper No: OMAE-15-1048, 21 pages, 2015

Longva, V., Sævik, S., Levold E. and Ilstad H. (2013), Dynamic simulation of subsea pipeline and trawl board pull-over interaction, Marine Structures, Vol. 34, pp. 273-291.

Passano E., Gjøsteen J. K. Ø. and Sævik, S. (2008), Onboard Screening of Forecast Weather During Installation, OMAE'2008-57438

Klæbo, F., Giertsen E. and Sævik, S. (2008), Efficient Analysis of Offshore Pipeline Buckling on Uneven Seabeds, OMAE'2008-57378
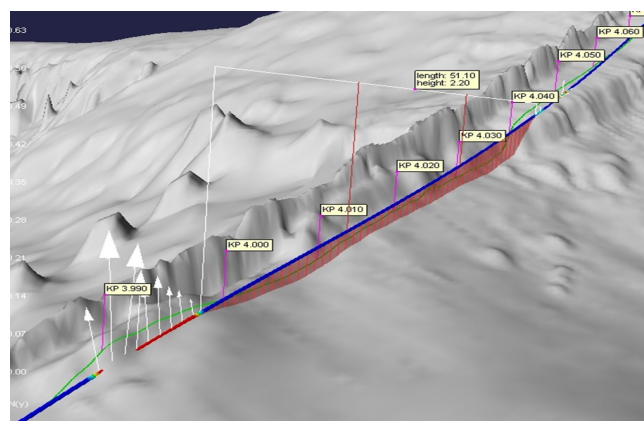
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