

Alkyon is an independent Dutch company founded in 1996 by a group of specialists and expert consultants with an extensive record in harbour, coastal, offshore, hydraulic engineering and research.

We provide specialised consulting services to the offshore industry, including:

- Metocean data;
- Seabed dynamics and impact of sand waves;
- Pipeline self-lowering and free span development;
- Local scour and protection, pipeline stabilisation;
- FPSO's, tankers and offshore structures;
- Pipeline Risk assessment;
- Environmental impact assessment, and
- Intake and discharge systems.



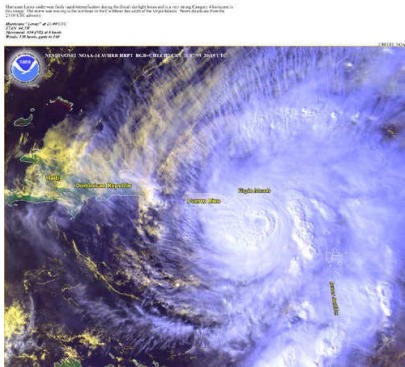
**OFFSHORE**

# Services

## Metocean data

Alkyon applies numerical models all over the world to obtain wind, wave, water level and current design conditions. Depending on the purpose and scale of study, one of the following approaches can be applied:

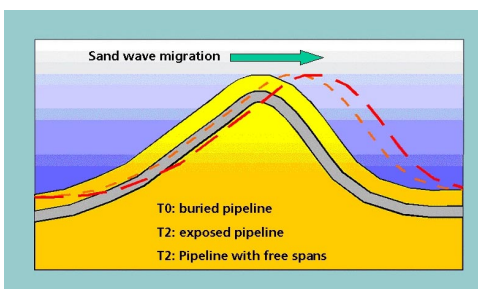
- Level 1: Extraction of criteria from Alkyon's global metocean databases (1 day) suitable for feasibility studies;
- Level 2: Use of archived hindcast model data (1 week) suitable for feasibility studies and detailed designs;
- Level 3: Site specific detailed hindcast (4–8 weeks) suitable for detailed designs.



Where necessary Alkyon co-operates with meteorological specialists to obtain the results. Alkyon also provides operational 5 day forecasting of metocean conditions at shallow water or sheltered locations.

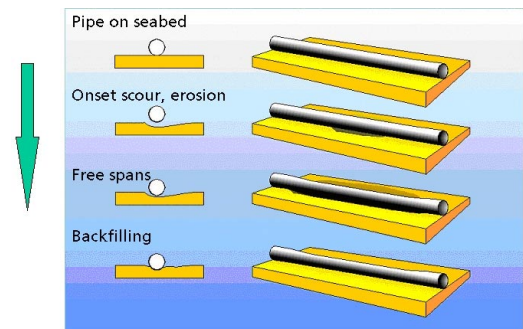
## Seabed dynamics and impact of sand waves

Seabed variations due to sediment transport, beach erosion and sedimentation are an important consideration in the design of offshore pipelines, particularly in landfall areas and in sand wave fields. Alkyon has developed an integrated approach to design and develop the burial strategy for offshore pipelines and cables in areas with a dynamic seabed to achieve a cost-effective design and minimise risks.



## Pipeline self-lowering and free span development

Self-lowering and free span development of offshore pipelines can be predicted using our model PIPESIN. The model (originally developed in a JIP) has been upgraded by Alkyon to incorporate the interactions between a pipeline and migrating sandwaves and to predict the development of existing free spans.



## Local scour and protection, pipeline stabilisation

Alkyon has developed tools to predict scour around offshore structures and to design the bottom protection and pipeline covers. Alkyon can design the scour protection system following both static and dynamic stability approaches.

Alkyon provides a full range of services from initial feasibility studies based on in-house data to detailed design studies in which we supervise laboratory experiments and prepare the technical tender documents.



## FPSO's, tankers and offshore structures

- Response of FPSO's or other floating structures to wind, waves and flow, including slowly varying wave drift forces and wind turbulence.
- Manoeuvring simulations of LNGC's or tankers arriving at or departing from (moving) FPSO's including tugs, wave, wind and current sheltering by the FPSO, thrusters on the FPSO, and the influence of waves on the tug efficiency.
- Safety of arrival and departure operations of carriers and LNGC's at GBS's.
- Mooring system analysis including SPM's and spread moorings systems. Our SHIP software is suitable for ships making large motions and for multi-body systems.
- Loads on offshore structures.



## Pipeline Risk assessment

Alkyon has developed a probabilistic approach to assess risk related to hydrodynamic, morphological aspects and external impacts on pipelines.



The approach has been applied to determine the optimal burial depths of pipelines and cables. Our activities also involve risk analysis related to geo-hazards and free spans.



## Environmental impact assessment

Alkyon's numerical tools have been used to assess the impact of offshore activities on the environment including the influence on currents, sediment transport, geomorphology and turbidity.



## Intake and discharge systems

We provide specialist services on hydrodynamic morphological aspects of intake and discharge systems.

# Publications and Tools

## Publications

- 2004 J. Onassis and D.P. Hurdle. Manoeuvring large tankers alongside a floating (FLNG) facility. OMAE conference, Vancouver 2004.
- 2002 Z. Chen and M. Venturi. Morphology and pipeline design through a dynamic landfall area, The Black Sea pipeline case. OMAE conference, Oslo, 2002.
- 2002 K-J. Bos, Z. Chen, H. Verheij, M. Onderwater and M. Visser. Local scour and protection of F3 offshore GBS platform. OMAE conference, Oslo, 2002.
- 2001 Z. Chen and R. Bijker. An integrated approach to pipeline design through sandwave fields: Dongfang pipeline. OMAE conference, Brazil, 2001.
- 2001 D.P. Hurdle, G. Ph. van Vledder and Z. Chen. A hybrid approach to determine extreme wave and wind conditions in the Andaman Sea due to tropical storms. OMAE conference, Brazil, 2001.
- 2001 Z. Chen and R. Bijker. Interactions of offshore pipelines and dynamic seabed. IAHR conference, Beijing, 2001.
- 2001 R. Bijker and Z. Chen. Predictions of abandoned offshore pipelines. ISOPE, Stavanger, 2001.
- 1998 Z. Chen and R. Bijker. Probabilistic design of burial depth of offshore pipelines and cables. Proc. of offshore mechanics and arctic engineering, Lisbon.

## Tools

A selection of Alkyon's tools relevant for offshore activities:

SWAN	2D spectral wave model
TRISULA	2D/3D curvilinear flow model
DELFT2/3D	2D/3D morphodynamic model
PIPESIN	self-lowering, free span development of pipeline
SUTRENCH	sedimentation in trench
UNIBEST	coastline and beach profile morphodynamics
BREAKWAT	conceptual design of rubble mount structures
STATPACK	statistical analysis, extreme value analysis
SHIP-MOORINGS	behaviour of moored ships

