MARIN

Challenging wind and waves

Linking hydrodynamic research to the maritime industry

Risk Assessment; Cables, Pipelines and Platforms

Subsea cables & pipelines

On the bottom of the sea lie many pipelines to transport oil from a drilling unit to a platform or from a platform to the shore. Also power and optical cables are buried on the sea bottom, connecting different power and telecommunication systems. The maritime traffic over these pipelines and cables can damage the pipelines or cables due to different causes:

- A ship founders on the pipeline / cable
- A ship sinks on the pipeline / cable after having been involved in a collision
- A container falls on the pipeline / cable
- Deck cargo falls on the pipeline / cable
- An anchor is dropped on the pipeline / cable
- An anchor is dropped by a ship just before passing the pipeline/cable, causing the anchor to "hook" the pipeline / cable
- A ship strands on the pipeline / cable
- A fishing vessel crosses the pipeline / cable while fishing

The SAMSON-model (Safety Assessment Models for Shipping and Offshore on the North Sea) can be used to determine the frequency of certain "events" (incidents) for a specific pipeline / cable or a new pipeline / cable location.

The calculations are based on a maritime traffic database of the North Sea, local environmental conditions and mathematical models. In the traffic database, two main groups of traffic are distinguished: *route-bound* and *non-route-bound* traffic. The *route-bound* traffic consists of the merchant vessels and ferries sailing from one port to another using traffic lanes. The *non-route-bound* traffic consists of fishing, supply, work and recreation vessels, which do not follow traffic lanes.

The frequencies of the different incidents can be combined with information about the ships involved and the characteristics of the pipeline / cable. This can be used to assess whether the pipeline /cable might be seriously damaged assuming that it is unburied. For some incidents it is also possible to determine how deep the pipeline / cable should be buried to meet the risk criteria.

In the past years several risk assessments have been executed for cables and pipelines on the North Sea. Examples are a cable and a pipeline between The Netherlands and the UK and a cable in the Ems estuary in the Netherlands. In some of the studies the results have been extended with respect to the risk of anchoring, by analysing the anchoring behaviour of ships in the vicinity of the pipeline/ cable using positional information of ship traffic (AIS).

Offshore platforms

Every five years a Safety Case has to be prepared for each offshore platform in the Dutch sector of the North Sea to demonstrate that the platform meets safety and legal requirements. Part of this Safety Case is the quantitative assessment of the collision risk. Due to different causes, there is always a possibility that an offshore installation is struck by a passing ship. To calculate the risk of such an incident for a specific platform we use one of the casualty models of SAMSON: the ship-platform collision model. This model can also be used to determine the collision frequency for other types of objects at sea.

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Like the model used for pipeline and cable studies, the ship-platform collision model uses a maritime traffic database and environmental conditions. In the mathematical model, two types of collisions are distinguished:

- *Ramming collision* - A ship is on a collision course with a platform because of a navigational error. This error is undetected until the point of no return and the ship collides with the platform nearly at its service speed.
- *Drifting collision* - A ship in the vicinity of a platform suffers a failure of the propulsion or steering equipment and as such becomes uncontrollable. The combined effect of wind, waves and current, may carry the ship at low speed towards the platform.

The results of the calculations contain collision frequencies and consequences in terms of the kinetic energy that is involved in the collision. The kinetic energy is calculated using the speed and sizes of ships in the vicinity of the platform.

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