

ICE MECHANICS

Ice Interface Properties

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- Interface properties
- Adhesive strength
- Icing
- Conclusion

Interface properties

This class of property that relates to the behaviour at the interface between ice and substrate material involves mechanical and thermal processes.

The properties are commonly known as:

- adhesion,
- friction,
- icing, etc.

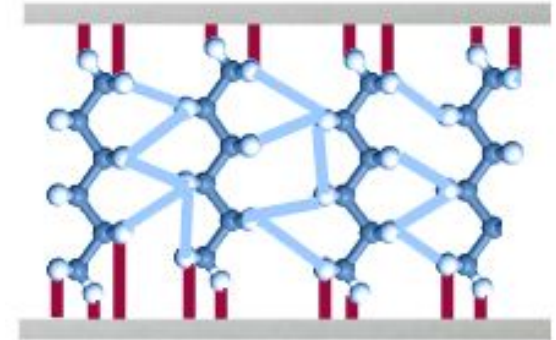


Adhesive strength

Adhesion is the tendency of dissimilar particles or surfaces to cling to one another.

A floating ice cover can develop substantial vertical loads on a structure to which it's frozen as a result of water level changes. Because of this, a knowledge of adhesive strength of ice to various materials is important.

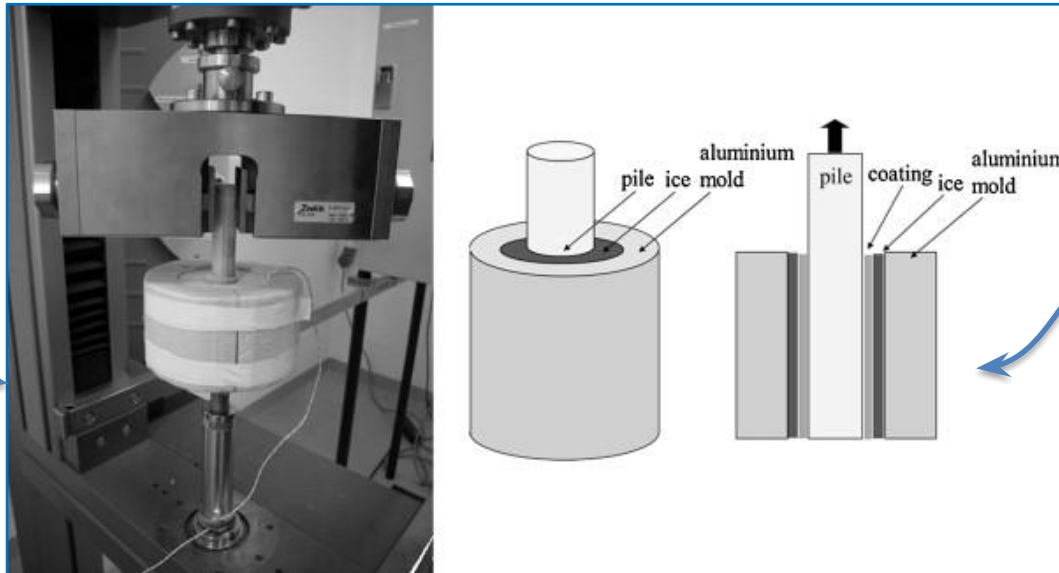
Adhesion



Adhesive strength

There're different methods for evaluating ice adhesive strength. One of them is depicted below:

adjustment of mould and corresponding frozen-in pin at tensile testing machine



sketch of the ice adhesion test setup

Ice adhesion test setup

Icing

Icing is ice growth occurring when impinging liquid droplets freeze on a surface as a result of latent heat transfer mainly to the atmosphere.

The potential for ice accretion on offshore structures and vessels is directly related to the environmental conditions:

- air temperature,
- wind speed/direction,
- wave height,
- sea-surface temperature.



Icing

Icing in the ocean can be divided into two main categories

Atmospheric icing

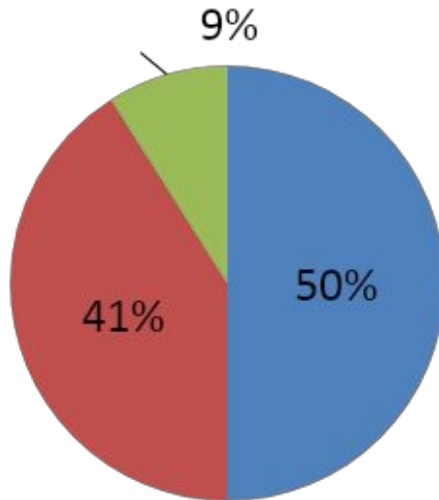
Is caused by freezing rain or drizzle, freezing fog, or cloud droplets mostly depositing on the super-structure.

Sea spray icing

Is caused by interaction between waves and the structure or structure members or from wave crests of breaking waves.

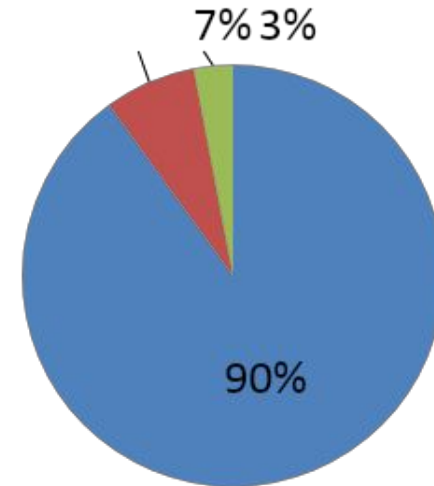
Relative frequency of sources of ice accretion on ships in Arctic seas

- Spray alone
- Spray with atmospheric ice accretion
- Atmospheric ice accretion alone



Relative frequency of sources of ice accretion on ships in non-Arctic seas

- Spray alone
- Spray with atmospheric ice accretion
- Atmospheric ice accretion alone



Icing

Ice accretion on fixed or floating offshore structures is a potential concern for operations in cold climates and can lead to a variety of problems.

For ground-based structures, heavy ice accretion can be a serious concern because of the increased size of the structural members. This can lead to higher lateral wave and wind forces than anticipated.

For floating structures and vessels, the effects are more serious, in that ice accretion can increase the draught, reduce the freeboard, and raise the centre of gravity of the structure/vessel, thereby compromising stability.





Thanks for attention!

