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Fragility assessment of chemical storage tanks subject to floods

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Highlights

- A methodology is proposed for fragility assessment of chemical plants in case of floods.
- Fragility functions are generated using limit state equations and logistic regression.
- Floatation, shell buckling, and impact-induced sliding are considered as prevailing failure modes.
- Bayesian network is used to combine the fragility functions
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Abstract

In the context of natural-technological (natech) accidents, flood-induced damage of chemical facilities have received relatively less attention mainly due to the scarcity of experimental or high resolution field observations. In the present study, we have introduced a methodology based on load-resistance relationships to assess the vulnerability of process facilities in form of fragility functions. While logistic regression is used to develop fragility functions for different failure modes such as floatation, buckling, and sliding, Bayesian network is employed to combine the fragility functions, taking into account common causes and conditional dependencies. Although the application of the methodology has been demonstrated on atmospheric storage tanks, it can be applied to fragility assessment of a variety of chemical and process vessels.

Keywords: Natech accidents; Floods; Atmospheric storage tanks; Logistic regression; Bayesian network.

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