

## SYNOPSIS

In this dissertation, a decision model for deploying measures to combat oil spills from seagoing vessels has been presented. The model concentrates on rescue actions to be taken in an emergency in which a hazardous situation occurs as a result of a sudden oil spill incident on the sea on a scale of an ecological disaster. Parameters related to the rescue actions have been analysed, and mathematical models serving as a basis for the decision model have been developed. The models presented in the dissertation allow the course of a rescue action characterised quantitatively with isolated parameters (the number of dams, the duration of the rescue action, the size of the oil spill) to be analysed.

Chapter one contains an introduction to the research problem. The current state of play has been described based on an analysis of literature on the subject. The dissertation objective and hypothesis have been formulated. Models and research methodology employed in the dissertation have been presented.

In chapter two, the duration of rescue actions has been analysed, and parameters relevant for the studies have been identified. Models for the duration of rescue actions have been presented, in which the duration stands for the crucial variable of the decision model.

Measures and methodology for modelling the oil spill and strategies for deploying the measures have been presented in chapter three. Algorithms to predict the spread of the oil spill and combat it, which is a part of rescue actions consisting in surrounding a spill with dams to prevent it from spreading further.

Models for the oil spill movement have been presented in chapter four. The models take account of the influence of sea currents and winds on the oil spill movement. The models allow for estimating the distance of the oil spill from vulnerable areas, which are a variable in the decision model.

The dissertation contains a computer simulation used for visualising the processes analysed – the spread of the spill and the rescue action. The results of the simulation have been used in the analysis of the decision situation. Chapter five covers information on the software structure and configuration and an analysis of the results.

The decision model has been presented in chapter six. The decision model for deploying measures to combat oil spills from seagoing vessels is based on the component models presented in the previous chapters. The models support the decision process, allowing for the development of possible action scenarios. The possibility of analysing and comparing the results obtained for different scenarios allows for gaining knowledge of the phenomenon and is useful in choosing the best solution. The objective of the decision analysis is to support the decision-maker in using available rescue resources (rescue units, dams) effectively and in verifying the sufficiency of available dams to conduct a rescue action in case of a large oil spill.

In Appendix entitled *A Problem strażaka (The Firefighter's Problem)*, a problem which has served as an inspiration for using grids in modelling has been described, whilst Appendix B entitled *Rozkład zmiennych losowych (Distribution of Variables)* contains a detailed description of the density of a variable used in the modelling of the time needed to prepare a rescue action.

The conclusion contains a summary of the studies conducted as well as the direction of further research in the field.