



WORK PACKAGE 5 REPORT

Equipment Testing

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Abstract

This document describes selected state-of-the-art rescue and safety equipment used in transshipment ports in the Baltic region. Interviews were conducted with port operators, emergency service personnel and officials at a number of major Baltic Sea Region ports for this purpose.

These interviews were used to prepare an up-to-date summary of the available equipment, while also taking the subjective experiences of users into account.

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1 INTRODUCTION

HHLA considers this document to be the final result of Work Package WP5 “Equipment testing”, which is part of the HAZARD Project. It provides an overview of the available safety equipment or which could be made available in order to minimise the impact of incidents in port areas.

The data for this overview was derived from interviews and major safety drills at a number of Baltic ports. A survey was also used to collect detailed information.

1.1 Information

A number of ports are subject to special safety requirements due to the volume of hazardous goods, which they handle. These requirements are designed to protect people, the environment and the goods in the hazardous area. However, not even the most effective structural and organisational precautions can completely eliminate the risk of incidents occurring. This risk can be minimised through the use of appropriate technology.

1.2 Comparability

Due to differences in national legislation and the specific features of different port facilities (e.g. terminal layout, capacity, proximity to residential areas and nature of the goods which are handled), not all of the systems outlined in this document will be appropriate for every port.

Instead, information is provided about the port facilities in which the equipment is used for the purposes of comparison.

Another important factor is the availability of internal or external emergency services and a reliable fallback system. For this reason, this document also includes individual systems used by fire departments for averting dangerous situations in ports and on ships.

2 METHODS

2.1 Data collection

The main sources of data for this document were information about existing safety and rescue equipment and observations of the equipment deployed during major drills.

2.2 Interviews

In-person interviews were held to gather information about the available equipment, in addition to finding out more about people's experiences for the purpose of developing recommendations for individual technologies.

These interviews used three different questionnaires:

Goods handling questionnaires (containers, solid, gas and liquid goods) were prepared for port operators. A questionnaire was also prepared for fire departments.

The questionnaires for port operators were based on the "Reference Document on Best Available Techniques on Emissions from Storage July 2006 (Code ESF)", and the "Safety Considerations When Storing Hazardous Goods Containers" (Sicherheitsrelevante Aspekte bei der Gefahrgutcontainer-Lagerung) guidance published by the North Rhine-Westphalia State Environment Agency (Dipl.-Ing. Manfred Schütz) in May 2006. Questions about other topics were added to the questionnaires. These questions covered areas like capacity, the proportion of hazardous goods handled, legal requirements and the risk for objects in the vicinity. The questionnaire for the fire departments was prepared on the basis of previous drills in collaboration with the Hamburg Fire Department.

The interviews provided background information about how safety equipment is selected and used, in addition to information about existing risks.

2.3 Major safety drills

Ten major drills were conducted in different countries as part of the HAZARD project. The majority of these drills simulated fires, the release of hazardous substances and injuries. Port operators and the responsible authorities deployed their emergency response equipment under realistic conditions.

This provided first-hand experience and impressions. The responsible personnel were on site to provide information about procedures and answer any questions which arose.

3 OUTCOME

The following sections provide information about the equipment which can be used in a variety of incidents.

3.1 Release of hazardous substances scenario

3.1.1 Mobile collection tray

Mobile collection trays are available in a variety of designs. They are all largely similar in terms of their mobility, size and storage volume. They usually accommodate two 20-foot containers or one 40-foot container. Mobility is provided by wheels attached to one side and a coupling which allows for attachment to a suitable vehicle. Collection trays have also proven to be an option for holding containers for contaminated firefighting water.



Figure 1: Collection tray for 1x40ft or 2x20ft container. Mobile with coupling on one side and wheels on the other side

3.1.2 Inflatable collection tray

Ports with a high proportion of RoRo traffic frequently use inflatable collection trays. The majority of goods are placed on mobile loading units, which must then be placed on the tarpaulin. The tray is inflated with either gas cartridges or a pump. Collection trays should always be kept in locations which are easy to access and make strategic sense.



Figure 2: Inflatable collection tray for mobile use (RAW Handel und Beratungs GmbH)

3.1.3 Stationary tray

In addition to mobile collection trays, stationary trays recessed into the ground are another important piece of equipment used to collect hazardous substances. This makes it possible to position road and rail traffic above the collection tray quickly and securely in order to prevent the further uncontrolled spread of hazardous substances. Once the substance has been identified, the valve to the sewer system can be opened or the substance can be pumped out by a cleaning company, depending on the nature of the substance.



Figure 3: Collection tray recessed into the ground for road and rail traffic with shut-off valve

3.1.4 Remotely controlled valve control unit

If hazardous substances reach the sewer system, the lines affected must be isolated without delay. This is done by closing the surrounding valves, ideally through the use of a central or local control unit—these units prevent hazardous substances from spreading within the sewer system. Manually operated valves are also sufficient. The personnel involved in operating valves of this kind must ensure their own personal safety and avoid direct contact with the substances.



Figure 4: *Remotely controlled valve control unit*

3.1.5 Bladder with compressor

If valves are not available in a certain location or if the distances involved are too great, bladders can be installed in surrounding lines at a sufficient distance from the point of exposure. These are then inflated using gas cartridges or compressors to form a tight seal. These bladders are available to suit a variety of diameters.



Figure 5: Bladder with compressor for sealing drainage lines

3.1.6 Water- or air-filled hose

A hosesystem can also be used to prevent hazardous substances from spreading on uneven surfaces. This system can be used on land or in open water and can be filled with either air or water. The hose can be filled with air to provide a barrier on the surface of the water. On land, the hose can be filled with water to provide a barrier which will prevent hazardous substances from spreading further.

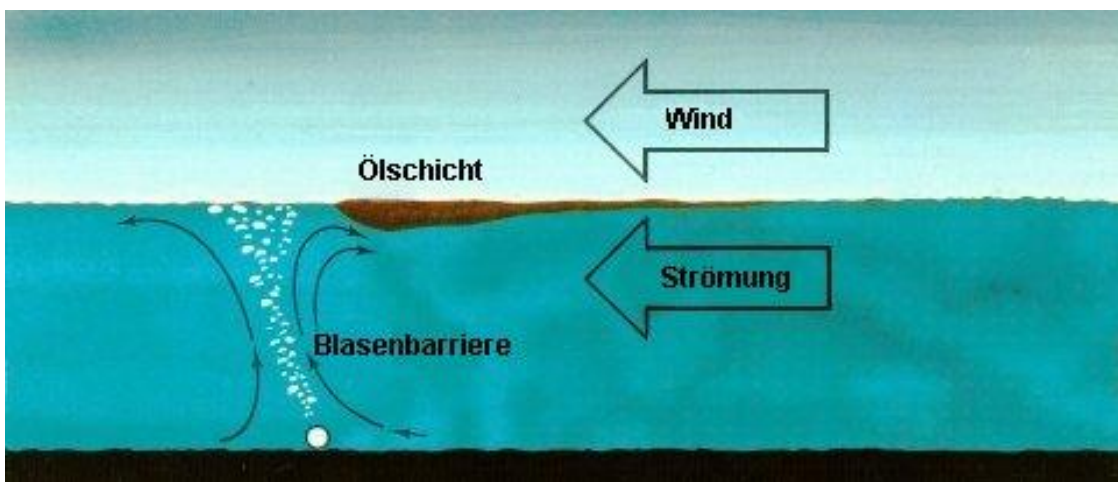


Figure 6: Water- or air-filled hose (AGO Hydroair GmbH)

3.1.7 Oil barrier and skimmer

A wide variety of oil barriers are available for use in water. They are most effective in calm conditions. They also require careful handling to account for the impact of currents and tides. Oil barriers and skimmer mounted on a boat is one solution to prevent the damages of oil spills in port areas. The skimmer removes the oil while the barriers are slowly pulled up.



Figure 7: *Oil barrier and skimmer*

In most cases, the oil is absorbed by booms and removed by active skimmers.

3.1.8 Emergency boxes and containers

Emergency boxes and containers for the necessary equipment can be used for minor leaks on dry land. Small containers can be carried in cars, while larger containers can be transported to the affected location. Contents:

- Binding agents
- Booms
- Fire extinguisher
- Sewer coverings (tarpaulins, magnetic foil, bladders)
- Personal protective equipment (gloves, overalls, safety glasses)
- Empty buckets and barrels
- Pumps
- Hoses



Figure 8: *Emergency equipment trailer containing the aforementioned equipment for combating small leaks on dry land*

3.1.9 Roll-off container

While operators are capable of combatting small leaks using the aforementioned equipment, the fire department is capable of deploying significantly more equipment and personnel in hazardous situations.



Figure 9: *Roll-off container used for responding to oil emergencies*

Leaks are not always visible. Online analysis systems can provide help in this area, particularly when used in a drainage system. Retained water is only discharged if the measurements do not exceed any set thresholds.

3.1.10 Water quality measurement and control unit

Port operators which focus on liquid or gas substances are required to monitor the atmosphere in hazardous areas. Permanent sensors in closed rooms and individual workplace monitoring systems are used to provide an immediate warning if the air has any unusual properties. Such units are used for for measuring water quality and opening valves.



Figure 10: *Measurement and control unit*

3.1.11 Special vehicles

The fire department is usually called on to respond to large-scale emergencies. The response to incidents involving hazardous substances involves the use of vehicles with specialised tracking and measurement technology, in addition to roll-off containers fitted with gas chromatographs and mass spectrometers.



Figure 11: *View from inside of a specialised roll-off container*



Figure 12: *View from inside of a specialised roll-off container*



Figure 13: *Scanning Infrared Gas Imaging System (SIGIS)*

The Scanning Infrared Gas Imaging System can detect invisible gas clouds from a distance of up to 5 km, eliminating the need to enter the hazardous area.

The module is mobile and expandable, and it can be installed in different areas, e.g. on cranes or on roofs.

The wind is another challenging factor which needs to be taken into consideration when attempting to halt the spread of hazardous substances. Container terminals and densely packed facilities are susceptible to “wind corridors” which do not match the direction which the wind is actually coming from. Basic equipment like wind socks or sensors in different locations around the facility can be used to detect possible danger in a serious incident.

3.2 Fire

3.2.1 Flame detection system

It is important to detect fires at an early stage in order to minimise their impact. Warning systems within buildings usually respond to heat and smoke. External systems operate by detecting flames or measuring infrared radiation. Such systems constantly compare images of the facility to one another and trigger an alarm if it detects any irregularities indicating the presence of flames. Sudden changes in weather or temperature may cause false alarms. These systems should therefore be used in combination with video surveillance.



Figure 14: *Flame detection unit*

3.2.2 Semi-stationary foam fire extinguishing system

It is also extremely important to initiate a firefighting response as quickly as possible. This can be provided by using a semi-stationary extinguishing systems for water or (if needed) foam. These systems provide assistance and reduce heat levels as soon as the firefighting water supply is connected. This is particularly important when there is an increased risk of the fire spreading quickly. In the case of such an extinguishing system, the pipe system takes effect when firefighting water is supplied.



Figure 15: *Semi-stationary foam fire extinguishing system at tank container facilities*

This water is provided from different sources. Pipes and ground hydrants provide water from the drinking water network, and can also pump water from the dock if needed.

Pumps in the dock provide a supply of firefighting water.

3.2.3 Cutting equipment

Ships and containers frequently have to be opened up in order to combat a fire effectively. This can be done using equipment like fognails, lances or cutting extinguishers. High pressure and abrasives are used to gain access to an area, which is then cooled using a fine water mist.



Figure 16: Lance used for gaining access to fire site

In the case of a fognail, the nails are driven through the wall of the container. Water is then pumped through the nozzle, creating a fine water mist within the container.



Figure 17: Fognail

3.2.4 Fire response teams

Internal factory or company fire response teams are frequently used on industrial estates or by large companies which manufacture flammable products, e.g. refineries. This ensures a quicker response to emergency situations. Company fire response teams are made up of voluntary employees who have a fire response role in addition to their actual job. A factory fire response

team is made up of permanently employed and fully qualified individuals who have the necessary equipment at their disposal. They are also provided with training about the substances, which are produced or handled on site.



Figure 18: Response vehicle with ABC powder on board

3.3 Accidents

A variety of organisational measures are used to rescue and provide initial medical care for people injured during large-scale emergencies. These measures are dependent on the size of the facility and the number of employees involved. All of the facilities surveyed have a certain number of trained first aiders distributed equally in terms of shift assignments and their location. Larger facilities also use emergency response officers (BetriebsSanitäter). These personnel are only responsible for providing initial medical care and handling evacuations. The patient is handed over to the care of the notified emergency response team upon arrival.

3.3.1 Ambulance

The ambulance is equipped with a stretcher, first aid equipment, AED and dressing material. It is primarily used to transport material and personnel to the location of an injured individual. It can also be used to transport the patient from that location.



Figure 19: *Ambulance in use of Hamburg Fire Department*

3.3.2 First-aid boxes and external defibrillators

First-aid boxes and automatic external defibrillators should be available in locations with a high density of personnel. Such defibrillators also monitor how it is being used and is capable of independently diagnosing pathological symptoms.



Figure 20: *An automatic external defibrillator explains how to treat a patient correctly*

3.3.3 Crane-rescuing equipment

Working at height (e.g. cranes, straddle carriers) is becoming increasingly common at port facilities. This poses a challenge when it comes to rescuing patients. The majority of port operators have their own equipment and procedures, which fire departments can use until specialised units arrive. These include cages which can either be attached to specific points on a crane or moved to the location of an accident using a vehicle.

The rescue cage is used to rescue individuals who have been involved in an accident on a ship. It is kept in a central location in the terminal. It is moved and attached to the relevant location whenever it is required.



Figure 21: *Rescue cage*

The rescue platform can be used with the help of a variety of handling equipment (e.g. forklifts and reach stackers) to rescue people working at height.



Figure 22: *Rescue platform*

3.3.4 Litters

Litters are used whenever it would be difficult to transport injured people using traditional means, e.g. stretchers or carrying chairs.



Figure 23: *Litters*

3.3.5 Decontamination equipment

Decontamination equipment can be used to decontaminate people or objects which have come into contact with hazardous substances.



Figure 24: *Decontamination station*

4 CONCLUSION

This report provides an overview of how various equipment and facilities are used in emergencies by port operators, fire departments and rescue services in the major ports of the BSR.

The report was based on information derived from interviews which used standardised questionnaires and drills conducted in major ports in Finland, Germany, Lithuania and Estonia.

The requirements for safety equipment represent the state-of-the-art and are derived from the current Seveso Directive, local safety requirements and the risk analyses performed by the relevant ports.

Increasing levels of digitalisation and automation require the operators of transshipment ports to constantly re-evaluate the risks they face. Interest groups should therefore discuss their experiences using new state-of-the-art safety equipment.

APPENDIX 1

Questionnaire

Deployment	
Type of action: Wählen Sie ein Element aus.	Use in case of: Wählen Sie ein Element aus.
Possible area of threat: Wählen Sie ein Element aus.;	Category: Wählen Sie ein Element aus.
Provision by: Wählen Sie ein Element aus.	In operation since: Klicken oder tippen Sie, um ein Datum einzugeben.

Specifications	
Manufacturer: Klicken oder tippen Sie hier, um Text einzugeben.	Product name: Klicken oder tippen Sie hier, um Text einzugeben.
Requirements: Klicken oder tippen Sie hier, um Text einzugeben.	Techn. data: Klicken oder tippen Sie hier, um Text einzugeben.
Description: Klicken oder tippen Sie hier, um Text einzugeben.	
Datasheet:	Cost in the order of: Klicken oder tippen Sie hier, um Text einzugeben.

Experiences	
Pro: <ul style="list-style-type: none">• Klicken oder tippen Sie hier, um Text einzugeben.	Contra: <ul style="list-style-type: none">• Klicken oder tippen Sie hier, um Text einzugeben.
Comment: Klicken oder tippen Sie hier, um Text einzugeben.	

HAZARD project has 14 full Partners and a total budget of 4.3 million euros. It is executed from spring 2016 till spring 2019, and is part-funded by EU's Baltic Sea Region Interreg programme.

HAZARD aims at mitigating the effects of major accidents and emergencies in major multimodal seaports in the Baltic Sea Region, all handling large volumes of cargo and/or passengers.

Port facilities are often located close to residential areas, thus potentially exposing a large number of people to the consequences of accidents. The HAZARD project deals with these concerns by bringing together Rescue Services, other authorities, logistics operators and established knowledge partners.

HAZARD enables better preparedness, coordination and communication, more efficient actions to reduce damages and loss of life in emergencies, and handling of post-emergency situations by making a number of improvements.

These include harmonization and implementation of safety and security standards and regulations, communication between key actors, the use of risk analysis methods and adoption of new technologies.

See more at: <http://blogit.utu.fi/hazard/>

