case study of the tanker accident near Loreley Rock in January 2011

SEMINAR ON THE OCCASION OF THE TWENTY-FIFTH ANNIVERSARY OF THE SANDOZ ACCIDENT
8 and 9 November 2011 in Bonn
radar map of accident-location
rhine-km 555,3
data of TMS „Waldhof“
What we knew in the early beginning

tanker:  110 m long, 10,50 m wide, double hull, type C
crew:   4 persons on the ship, 2 rescued, 2 missed
charge: 2400 to high concentrated sulfuric acid (96%)
construction:
  7 several tanks for acid
  7 several ballast-tanks

(Bild von 1993 als 85 m-Schiff)
Phase 1: First Settings

- searching for the missing crew members
- „build up“ of infrastructure at the accident site (ships, technical equipment, meeting rooms, communication technology, etc)
- provisionally securing of the ship against increasing flood with towing ships, wires and pontons
- to get known with involved persons and authorities
two open questions in the beginning

**LEAKAGE** in the ballast and product-tanks?

open connection between the tanks?

acid going out, water coming in or both?

a **DEEP HOLE** is formed under the ship

the ship moves into the hole

stability? working on the ship?

What kind of risk does this create for **ship**, **salvage crew**, **people**, **living areas** and **environment**?
the hole under the ship .... (day 3)
the hole under the ship (day 5)

... is getting bigger
the hole under the ship...(day 9)

... and bigger.
- a barge with gravles is brought to the site, to fill the hole, if neccessary
- swimming cranes have arrived and stabilize the ship
- passage of 91 ships
day 2: the leakage problem
thermal images, ph-concentration

thermal reactions in two tanks:
water has come inside the ship

decreasing ph-concentration downstream:
acid has come out of the ship
the process of sulfuric acid / gas inside the tanks

- concentrated sulfuric acid
  + water

- heavily increasing temperature
- lower concentration of acid

corrosion of the steel tanks

- stability of the ship is questionable

creating of hydrogen gas

- danger of explosion
- danger of sudden contamination of the river

we need to know: what is inside the 7 tanks?
Identification of gas in the tanks:
- drilling holes 8 mm
- hydrogen gas in all 7 tanks
- that means – drilling in a „bomb“

- inertisation, change hydrogen gas with nitrogen gas
  - drilling holes with 80 mm

- homogenisation of the liquid to a known concentration

- pumping the acid liquid into a tank-barge.
  - drilling holes with 800 mm

- no pumping into the river
# Phases of the Salvage Process

<table>
<thead>
<tr>
<th>Phase</th>
<th>Duration</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1</td>
<td>7 days</td>
<td>Provisionally securing of the ship</td>
</tr>
<tr>
<td>Phase 2</td>
<td>5 days</td>
<td>Stabilization</td>
</tr>
</tbody>
</table>
| Phase 3 | 7 days   | - Drilling holes in the tanks  
- Inertisation with nitrogen |
| Phase 4 | 11 days  | - Getting probes,  
- Homogenisation,  
- Pumping |
| Phase 5 | 2 days   | Lifting of the ship                              |
day 23: changing of salvage concept after pumping out the first tanks

- limited capacity of the barges
- Stability of the ship questionable
deformation of the ship because of pumping from tank to tank
- risk of homogenization
heavy chemical reactions in the tanks, risk of destruction

changing of salvage concept

part of the acid has to be pumped into the river
What happened with the acid?

- 900 tons: uncontrolled loss in the beginning
- 850 tons: pumped into the river under controlled conditions (12 l/s)
- 650 tons: pumped into a barge
phase 5: pumping and lifting / turning the ship
Phase 5: lifting the ship

turning ...
Wir machen Schifffahrt möglich.

Phase 5: Bergen

... swimming
major topics during the salvage (33 days)

- difficult technical tasks, chemical and environmental problems
- information of the public, shippers and shipping industrie
- working with press, professional press, television, broadcast
- managing the high number of involved authorities and firms
- well ordered start of shipping (650 ships waiting)
- organisation of communicakation
analysis: factors of success

- **experience** in handling and managing accidents with ships at the staff of the water and shipping office Bingen (about 120 accidents a year)
- decision makers **continously on the scene**
- **no confrontation between authorities** about money, material and staff
- **extensive and open communication and information of the public**
  - 50 press-informations
  - twice a day speaker for television, broadcast and press)
  - forum for discussion on the homepage
- **one press center, speaking with one voice**
  (water police, fire department, state cancellery and district office)
- defined and **clear responsibility „water“ and „land“**
analysis:
what to learn and what to look at in the future

- better **knowledge of responsibility and possibilities** of involved authorities and firms

- **accident investigation and analysis** (this accident and in general)
  - why did it happen?
  - what else could happen?

- **risk analysis** of ship transport and potential danger of goods

- **analysis of impacts** on environment and economy

- better **IT-technology for communication** „in the outback“

- better **technical equipment for first securing** of the ship

- more **emergency alert drills** (to get familiar with such situations)
risk of shipping

**conclusion:**
heavy accident with great impact on shipping and economy
heavy impact on environment could be prevented

**but:**
easily could have come worse
- cabin ship with passengers involved
- toxic product
- flammable or explosive product
- collision
- mobile danger areas because of flowing water
thanks for your attention