Response Considerations: Floaters
(applicable to all groups with "F" of SEBC as behaviour)

PHYSIC STATE	LIQUIDS				SOLIDS	
SEBC CODE	F	FD	FED	FE	F	FD
Density @20°C	< dsw					
Vapour Pressure @20°C (kPa)	<0,3		0,3 - 3		-	
Solubility @20°C (%)	≤ 0,1	0,1-5		<0,1	≤ 10	10-100

Attention: for SEBC subgroup "FD"," FED" see also → **Response Considerations: Dissolver**

for SEBC subgroup "FED" → **Response Considerations: Gases and Evaporators**

Response strategies need to consider the factors affecting the behaviour and fate of the released substances as well as the short- and long-term processes when spilled at sea:

PROCESSES AND FACTORS AFFECTING BEHAVIOUR AND FATE OF FLOATERS IN MARINE ACCIDENT							
PHYSICAL STATE		LIQUIDS				SOLIDS	
SEBC CODE		F	FD	FED	FE	F	FD
BEHAVIOUR and FATE	Processes when spilled at sea	Spreading	Spreading	Spreading	Spreading	Spreading	Spreading
			Dissolution	Evaporation Dissolution	Evaporation		Dissolution
	Environmental Factors influencing intensity of processes	State of the sea, wind intensity, air and water temperature					
	Drift and spread of HNS	Drifting of the slick on sea surface (temporal continuity and persistence are variable). Possible impact on shoreline.				Drifting on sea surface	
		Possible emulsification, production of aggregates that could sink or involve shoreline (high viscosity substances)	Dispersion, dilution	Dispersion, dilution Atmospheric dispersion with potential production of dangerous air mixture in case of hazardous chemicals	Dispersion, dilution Atmospheric dispersion with potential production of dangerous air mixture in case of hazardous chemicals	Potential shoreline involvement	Dispersion, dilution
		Evaluate potential violent reactions and aerosol production.					
	Other relevant HNS properties and behaviour	Viscosity Persistency	Viscosity	Vapours density	Vapours density	Buoyancy Persistency	Viscosity
	Impact for marine environment	Floaters affect mainly surface and pelagic and pleuston ecosystem and their slicks (F- liquids) can alter atmospheric/sea-surface gas exchange, especially if substance is persistent ($F_{(p)}$). Shoreline ecosystem can also be affected by floating chemicals spill. FE and FED could generate potentially dangerous vapours; main social effects are related to navigation safety and strong limitations for legitimate use of the sea.					
For hazard and risks see also → **Hazard**							

Considerations

- Oil spill response technique could be used for floater spill also
- In case of floater dissolving substances, containing and recovering operations could be very limited. Usually, the only response is leave natural processes act (e.g. dispersion, dilution, and, where possible, determine an acceleration of these processes).
- Selection of response techniques are strongly related to weather conditions

SITUATION ASSESSMENT AND FIRST ACTIONS

Information gathering

- Immediately refer to SDS or chemical databases. In case of unknown substance act as in case of maximum risk → **Safety Data Sheet Content**
- Immediately refer to data related to location of the incident and other relevant information
- Consider sea-weather conditions

→ **Incident Data Gathering**
→ **Incident Notification**
→ **Incident Resource**

Situation assessment

On the base of the information gathered on the incident and the contingency planning risk, proceed to:

- hazard identification

→ **Response Consideration: Toxic Substances**
→ **Response Consideration: Hazard flammable and explosive substances**
→ **Response Consideration: Reactive Substances**
→ **Response Consideration: Corrosive Substances**

- estimation of risk and vulnerability
- evaluation of consequences

→ **Situation Assessment**

First Actions

- Take into account the first actions to guarantee safe conditions for the responders identifying and reducing possible exposures to toxic vapours and/or hazards of explosion, fire, etc. and then to stop or reduce the source of the HNS spill. → **First actions (responders)** → **First actions (casualty)**
- Consider public safety
  → **Safety Zones**
- Equipment/Logistics
  → **PPE**
  → **Hazard: Portable gas detectors for first responders**

MONITORING

Modelling

- Modelling drifting floaters (solids and liquid slicks) on sea surface. Input to be considered: chemical-physical parameters of the substance (e.g. viscosity), current sea-weather condition and weather forecast, type of spill source → **HNS Spill Modelling**

Monitoring through remote measuring instruments and research technique

- Aerial surveillance: planes and helicopters (not in case of dangerous situations); drones
- Use of markers to make the substance visually detectable foliating on sea surface: NO applicable in case of explosion hazard or unknown substances.

→ **Substance Marking** → **Sampling Techniques and Protocols**
→ **Remote Sensing Technologies**

In situ monitoring through measuring instruments and research technique

- Trace gas sensors / explosimeter and gas detection (in case of explosion or fire risks or toxic vapours/aerosol formation or unknown substances)

- Acquisition of physicochemical parameters of surficial waters by multi-parametric probe (T, fluorescence, pH, conductibility, etc.) Specialized personnel could be required

  → **Hazard: Portable gas detectors for first responders** → **Sampling Techniques and Protocols**

Water sampling

- Sampling of sea surface (surficial waters and/or sea surface microlayer) using specific methods to obtain samples of split floating substance as free as possible of marine environmental matrices; in field and/or in laboratory: physicochemical properties determinations and/or analysis (e.g. GC-MS, GC-FID, GC-PD, IR, etc.). Specialized personnel could be required; especially for high viscosity fluids

  • Water sampling by "niskin" bottles (or other methods) and storage of samples for laboratory or in field measurements. Il case of deep or sub superficial spill consider the use multi-parametric probe for localization of the substances in water column (Specialized personnel could be required

  • Sampling of solid floater on surface and sub-surface layer of water column (e.g. with specific nets, etc., ROV, divers)

  → **Sampling Techniques and Protocols**

  → **HNS Detection and Analysis Methods**

  → **Remotely Operated Vehicles**

Air sampling

- Trace gas sensors: detectors for toxic substances (on board and in environment); explosimeter and gas detection to detect explosion or fire risks;
- Oxygen deficiency: electrochemical oxygen sensor

  → **Hazard: Portable gas detectors for first responders**

RESPONSE OPTIONS

Action on vessel → Emergency Boarding

- Stop the release of substance from its source → **Sealing and plugging**
- Recovering operation of the residual load → **Cargo Transfer**
- On board: collect spillage, where practicable, using sorbent material for safe disposal if applicable.
  → **Sorbents**
- Towing & boarding → **Emergency Towing** → **Place of Refuge**
- Evacuate the downwind area and evaluate interdiction to navigation or other exploitation of marine resources (for FE, FED).
- Prevent the formation of dangerous vapours (inject an inert gas, ventilate and/or dehumidify the atmosphere).

  → **Response Considerations: Toxic Substances**

  → **Response Considerations: Flammable and Explosive Substances**

  → **Response Considerations: Reactive Substances**

  → **Response Considerations: Corrosive Substances**

Action on pollutant

- Containment techniques with physical barrier (in particular for insoluble/ poor soluble liquids):
  - Using special barriers developed for solids and liquids, in shallow water
  - Oil spill booms; often in association with sorbents (slicks or floating solids)

    → **Containment and Recovery**
  - Contain by water barriers, in presence of vapour or smoke; for FE/FED

→ **Using Water Curtain**

- Recovery techniques:
  - Sorbents (booms, sheets, pillows…)
  - By pumping operating with various type of skimming.
  - Trawl nets or net bags towed by boats; for high viscosity chemicals or small floating solids

  → **Containment and Recovery**
- Cleaning technique:
  - Chemical dispersant; only for "dispersible" F substances (evaluation based on the value of cinematic viscosity) and only in very limited scenarios → **HNS Response in the Water Column**
- Standard intervention techniques on wildlife (avifauna, marine mammals, marine reptile) in consequents of oil spill could be applied in case of some of floater spill, on the base of physio-chemical characteristics and behaviour → **Wildlife response**

Controlled release technique

- Controlled release of substance still stored on board (not advisable – evaluate for offshore, only after a rigorous evaluation)

Option Zero

- Evaluate non-intervention strategy (not advisable – evaluate for offshore, only after a rigorous evaluation)

  → **No intervention**

POST SPILL

- Chemical and ecotoxicological analysis on sea surface layer and/or undiluted substance;
- Chemical analysis (e.g. bioaccumulation) and biological (e.g. biomarkers) on involved fauna to evaluate toxic effects (even on the coast, if involved)

  → **Sheet Environmental restoration and recovery**

EXAMPLES OF FLOATERS THAT POSE HEALTH AND/OR MARINE ENVIRONMENTAL HAZARDS		
SEBC Group	**Main characteristics**	**GHS pictograms**
Vegetable and animal derived oils ($F_{(p)}$ -Liquid)	Formation of persistent biodegradable surface films, dissolved oxygen consumption and alteration of gas exchange. Some oil may polymerize. They undergo to weathering processes (emulsification). Determine limitations of the use of the sea. *Incident: Kimya, 1987; off coast of Anglesey, Wales. Cargo: bulk liquid* *Incident: Allegra, 1997; off the coast of Guernsey, English Channel. Cargo: 15, 000 tonnes of palm oil (solid)*	 No classification: data conclusive but not sufficient for classification
Aniline oil (FD-liquid)	Very toxic liquids; when heated, vapours may form explosive mixtures with air; risk of hazardous polymerization. Very harmful for aquatic life (high acute toxicity and long-lasting effects). *Incident: Herald of Free Enterprise, 1987; Zeebrugge, Belgium. Cargo: package*	
Butyl Acrylate (FED-liquid)	Highly flammable and polymerizable; vapours (heavier than air) forms explosive mixture with air. Slightly acutely toxic for aquatic organisms. It undergoes to weathering processes (emulsification). Risks of involvement of the coast. *Incident: Sam Houston, 1982; off New Orleans, USA. Cargo: package*	
Xylene* (FE-liquid)	Highly Flammable liquid, explosive, not biodegradable. Toxic to aquatic organisms with moderate potential to bioaccumulate. *Incident: Ariadne, 1985; Mogadishu, Somalia. Cargo: package*	

Paraffin wax ($F_{(p)}$ solid)	Appear as yellow-white aggregation on sea surface. Very high risk of involvement of the coast also with effect on wildlife. Paraffines undergo to weathering processes; in case of sunken emulsified product also benthonic habitats could be affected (suffocation, inhibition of feeding and other non-specific toxic effects). It determines limitations of the use of the sea. *Incident: unknown source, Tirrenian Sea, 2018.*	 No classification: data conclusive but not sufficient for classification