Lessons learned for emergency response from chemical accidents

Kostas Koutelos
JRC - MAHB

Mutual Joint Visit Workshop for Seveso Inspections on
External Emergency Planning-Coordination between authorities
16-18 October 2024, Ravenna, Italy

European Commission

MAHB 3-part study of lessons learned for emergency response from eMARS incidents (1990 – 2015)

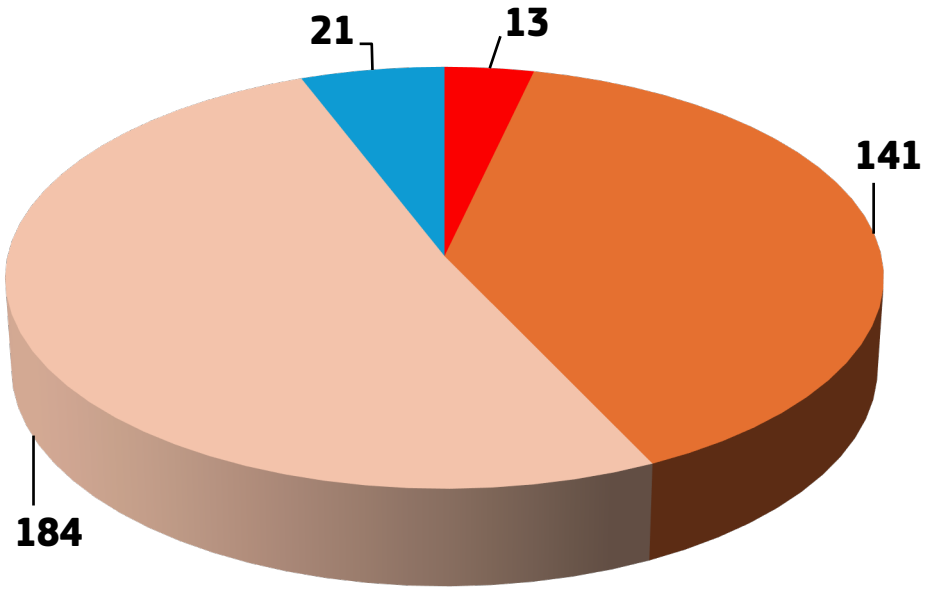
Lessons learned from

- Evacuation, sheltering and containment efforts
- Emergency response involving impacts on firefighters as well as their protection and preparedness
- Emergency response failures and successes

European Commission

Study highlights

Number of accidents with firemen effects
N=53 (1990-2015)



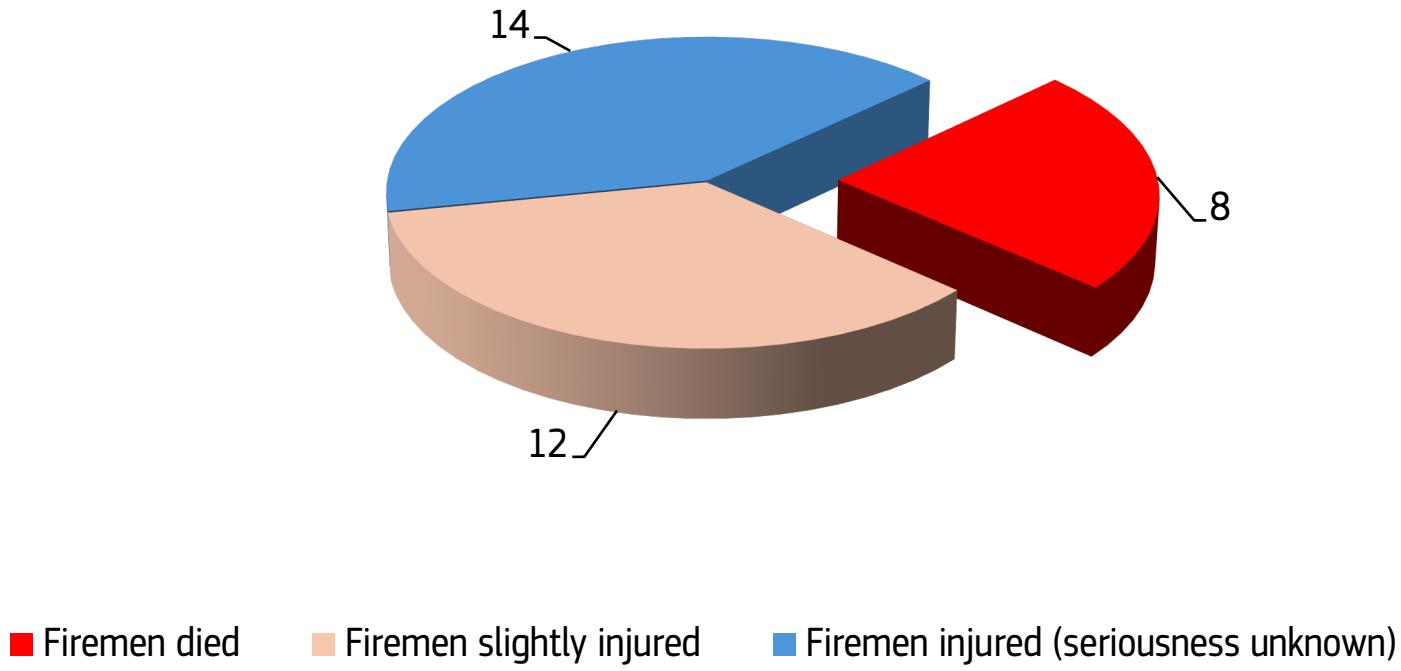
53 out of **753 incidents** (5%) in eMARS had firefighter impacts

European Commission

Severity of impacts

Number of accidents with firemen effects

N=11 (2016-2021)

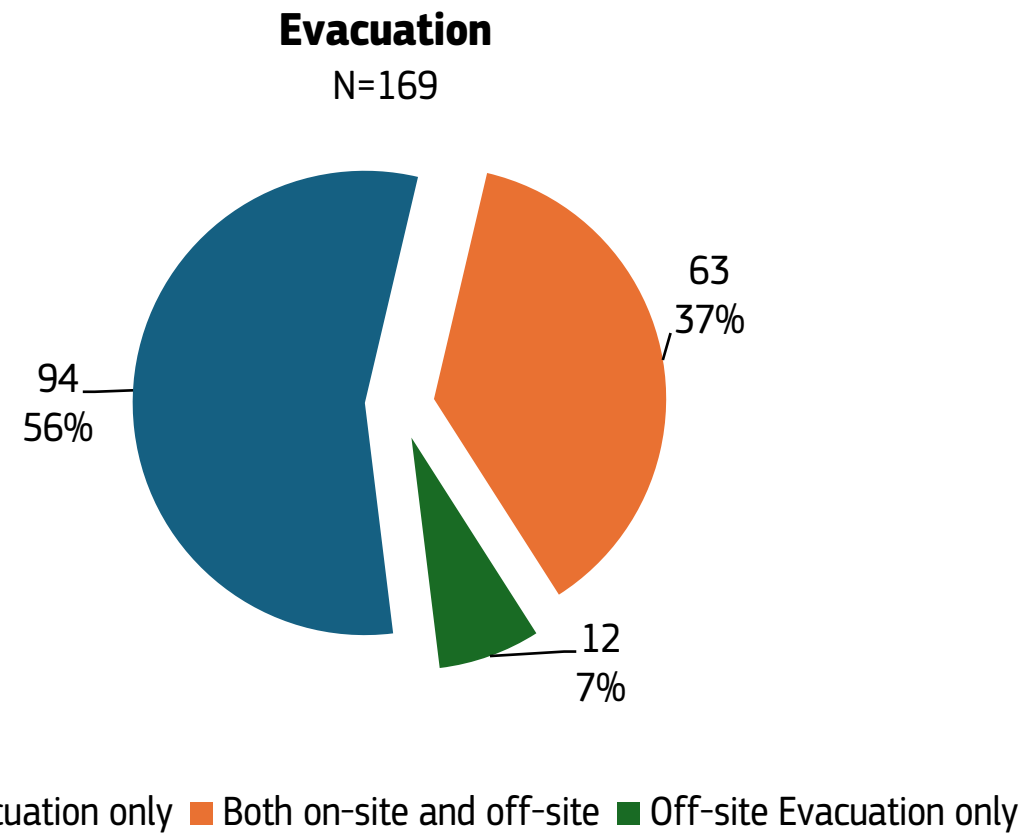


Injuries and fatalities as reported in eMARS from 2016-2021 in 11 out of 211 cases

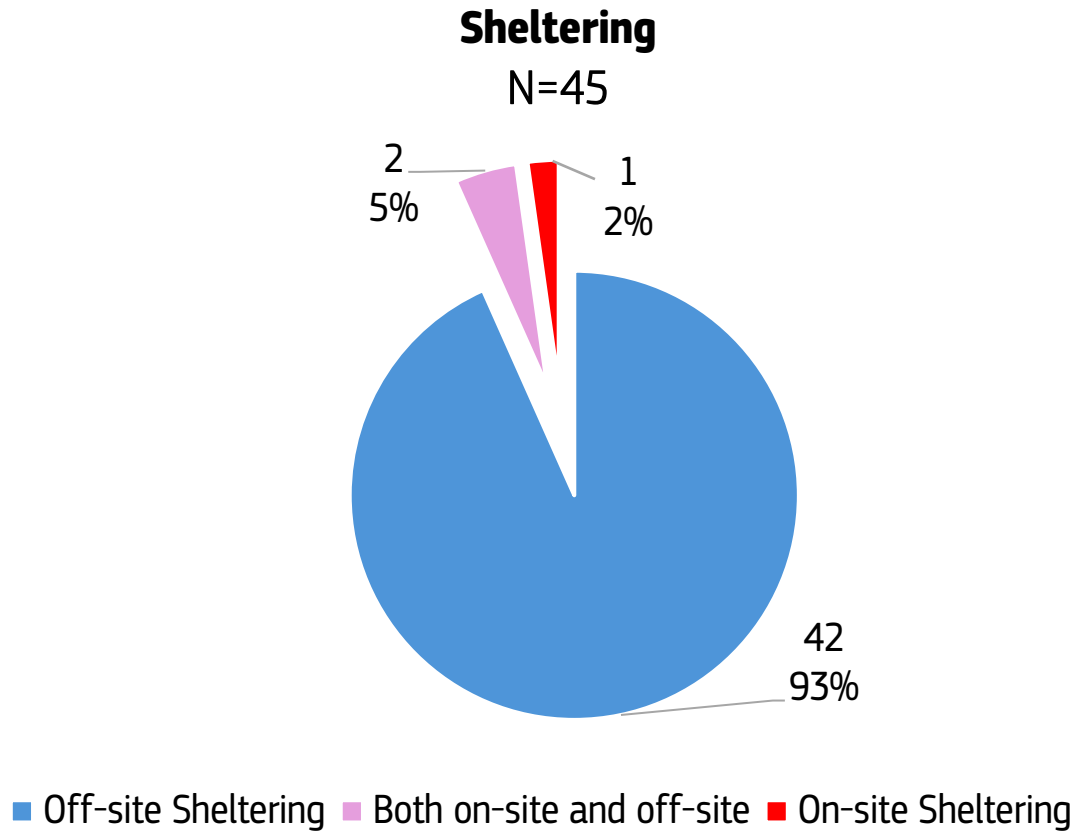
Factors contributing to fire fighter impacts

- A sudden, unexpected explosion during firefighter response
- Insufficient firefighter knowledge about the hazards
- Inadequate personal protective equipment
- After-effects. e.g., shockwave effects (collapse of structural elements, projectiles, etc)
- Inadequate supply of public water
- Availability and reliability of onsite firefighting means
- The presence of large quantities of combustibles hindering response
- Inability to maintain good firefighter communication & coordination

Incidents requiring evacuation and shelter-in-place



Incidents involving evacuation



Incidents involving shelter-in-place

European Commission

Highlights of failures and successes in response

- Identifying and planning on **realistic scenarios** is the starting point
  - **Reviewing past accidents** is an essential input to this process
  - **Small sites** that meet Seveso (high hazard) criteria are capable of serious accidents
- **Training and coordination with other responders** is critical
  - **Responders can put themselves and others at risk** if they don't know what they're doing. Failure to involve relevant external responders in training can have serious consequences
  - In several cases, responders created a significant impact due to insufficient training

European Commission

Highlights of failures and successes in response (2)

- **Emergency equipment and resources** form the backbone of the response
  - **Critical needs** should be identified with **backup options** immediately available
- The response effort relies heavily on **good communication** with responders/public
  - **Technology needs to be tested regularly** and backup systems should be in place in case key elements (sirens, wireless networks, etc.) become disabled
- Emergencies often **require decisions to be made quickly** and timing is everything
  - Decisions that may be needed should already be **anticipated in the planning**
  - Each potential decision should be assigned a **clear decision-making process** (who makes decisions, what information is needed)
  - They should have well-defined criteria that recognise the **criticality of timing and how to deal with uncertainty**

➢ Decision-making needs to keep up with the fast pace of the evolving accident

Actors and effective coordination

Chemical Facility Management

Initiates emergency protocols and provides critical information to responders.

Emergency Medical Services (EMS)

Deliver urgent medical care to individuals a fected by the chemical incident.

Local Government/Authority

Coordinate overall response efforts and allocates necessary resources.

Press

Relays information to the public

Local Fire Department & HAZMAT Teams

Lead containment and neutralisation of the event to prevent further escalation.

Local Police

Ensures public safety and manages evacuation routes during emergencies.

Environmental Protection Agencies

Monitor and mitigate any environmental impact due to chemical spills.

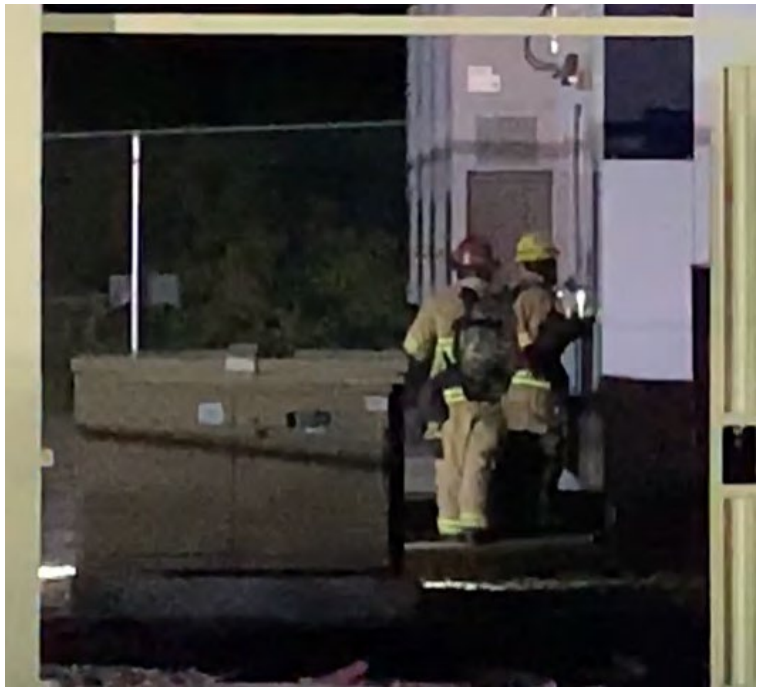
Disaster response volunteers

Support the response efforts.

Importance of training on accident scenarios stemming from emerging technologies

*Source: Four Firefighters Injured in Lithium-Ion Battery Energy Storage System Explosion – Arizona, Mark B. McKinnon, Sean DeCrane, Stephen Kerber, UL Firefighter Safety Research Institute

Importance of training on accident scenarios stemming from emerging technologies (2)



Following this incident, as well as other similar events, the National Fire Protection Association (NFPA) revised the standards to address safety concerns specifically related to Battery Energy Storage Systems (BESS).

*Source: Four Firefighters Injured in Lithium-Ion Battery Energy Storage System Explosion – Arizona, Mark B. McKinnon, Sean DeCrane, Stephen Kerber, UL Firefighter Safety Research Institute

Thank you for your attention

All MAHB bulletins and other resources can be found at:
https://minerva.jrc.ec.europa.eu/EN/content/minerva/f30d9006-41d0-46d1-bf43-e033d2f5a9cd/publications

EU Science Hub
Joint-research-centre.ec.europa.eu

European Commission