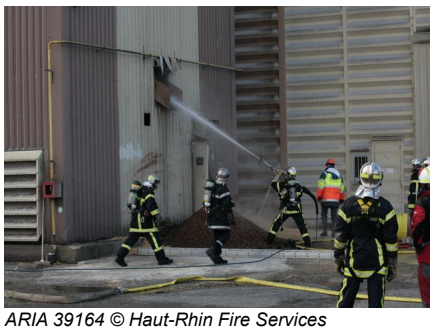
Anticipating emergency response difficulties

The handling of an industrial accident is often rife with obstacles, e.g. water supply constraints, inappropriate response protocol in light of product properties, inefficient information provided by bystanders, and undervaluation of the risk of loss. 6.5% of all accidents recorded at France's classified sites have experienced major difficulties during emergency responses. The sectors of activity most heavily affected are waste management (16% of all cases) and farming (14%). These installations exhibit a different configuration than those found in more highly technical sectors, like chemistry (6%), which adopt a more formal approach when preparing to cope with accidents and implement emergency plans (both internally and externally). Wholesaling activities (8%), including cereal silos, and warehousing (5%) are other activity categories that raise concerns during emergency situations.



ARIA 39164 © Haut-Rhin Fire Services

This fact sheet offers a sampling of the errors to avoid and serves to better anticipate response difficulties, by drawing from an analysis of 395 events post-2010.

1. Facilitating access to the site and hazardous zones

1.1. Gaining access to the facility even during periods of closure

Fire-fighters are often called to respond at unoccupied industrial sites (nighttime, weekends, etc.). They must therefore force open gates, use extrication tools, etc. The waste sector, while not alone, is frequently involved in such calls. Sites that are definitively closed also present problems *(ARIA 44917: On the premises of a company out of business, fire-fighters are blocked by boulders sealing the entrance).*

While taking into account the various safety requirements, a facility operator must ensure accessibility to emergency crews during his absence *(ARIA 42875 : After a fire, the site operator installs a system to close the gate with a chain and combination padlock, in addition to use of a call center).*

1.2. Incorporating response into the site and facility design

The damage caused by the accident itself or even the composition of on-site products may impede access (*ARIA 45977 : Structural instability and risk of collapse ; ARIA 46459 : Closure of the valves on an oxygen tank damaged by heat fluxes rendered impossible ; ARIA 42570 : The presence of corrosive products hinders response ; ARIA 47324 : At a waste treatment site, access constraints to a fire source located beneath a molten metal layer)*.

ARIA 41921 © DPA

Installation design may interfere with a successful response protocol, to the same extent as operating conditions *(ARIA 45578 : Difficulties experienced when extinguishing a fire on premises solely accessible via a hatch ; ARIA 45508, 48298 : Poor access to the street network, site clutter).*

It is therefore essential to take into account, from a “practical” perspective, the set of requirements leading to a quick response when designing facilities and installations, and then continue respecting these requirements on a daily basis during site operations.

2. Awareness among actors of the risks incurred

2.1. Understanding the potential hazards and accident scenarios

ARIA 45565 © AFP

Many mishaps during emergency responses are caused by a lack of knowledge of both risks and product dangers *(ARIA 43846 : During a fire outbreak at an ammonium nitrate plant, fire-fighters focusing on the toxic NH_3 risk failed to account for the explosion risk. The collapsed structural frame caused a detonation killing 15 people ; ARIA 46803 : In response to fire at a chemical products warehouse, fire-fighters resort to a water attack despite the presence of sodium cyanide, which reacts violently in contact with water. Two devastating explosions follow, resulting in 173 victims).*

In some instances, information is available but not adequately taken into consideration (*ARIA 42817: During an exothermic polymerisation reaction, in not heeding the site operator's warning, fire-fighters elected to use water cannons. The subsequent BLEVE caused 37 deaths).*

To ensure an efficient emergency response, in-depth knowledge of product dangers and accident scenarios is required, and such knowledge must be shared by the facility operator, on-site staff and first responders. This protocol means that technical and organisational measures are adopted ahead of time in order to avoid exacerbating the consequences of an accident. The allocation and preparation of response resources and crew protective gear, given the potential for working in hostile environments, then becomes more streamlined (*Dense smoke ARIA 37931 ; Risk of explosion ARIA 42917 ; Threat from projectiles ARIA 48421 ; Toxic atmosphere ARIA 38795, 38450 ; Radioactive risk ARIA 47678 ; Electrical risk ARIA 43023 ; Swampy terrain ARIA 40580).*

2.2. Training personnel to ensure a top-quality response

Employees' familiarity with the emergency response protocol is imperative. A well-executed internal response often slows propagation of the incident and may avoid the need to call for external backup. Conducting regular drills promotes optimal reactions when an accident strikes. In contrast, poorly prepared employees could hinder a response *(ARIA 48660: Failure to close a valve unfamiliar to site staff leads to the discharge of fire extinction water into a river).*

2.3. Coordinating early on with emergency responders

ARIA 41638 © Le Dauphiné

Even in the absence of emergency plans (internal, external, site-specific plans), emergency situations must be anticipated between operator and fire-fighters. Adopting protocols, implementing appropriate fire-fighting resources and safety devices, and prioritising techniques is decisive. The joint establishment of response procedures and execution of joint drills help avoid hesitation and coordination problems *(ARIA 46675: Misunderstandings between site operator and fire-fighters lead to lithium pollution via a confinement valve that had remained open)*.

The operator must also incorporate recommendations issued by emergency response services regarding the configuration of installations, e.g. compartmentalisation. The same applies to designing fire-fighting resources like detection, smoke removal, water supply sources (*ARIA 45508: Water supply constraints without a proper reserve, as specified in the Prefect's order).*

3. Relying on additional expert input as needed

During responses complicated by the configuration of installations or substances involved, the reliance on specific expertise may be beneficial in determining the right course and decisions. It could be include the GRIMP (recognition and intervention group in perilous environments) or the emergency situations support unit (or CASU) sponsored by the INERIS Institute, or an expert specialised in the given activity. Such is often the case with silos (*ARIA 42815: 5 days of planning are necessary to fully control a situation following a malt silo explosion).*

Interprofessional solidarity networks like USINAID for coping with chemical industry accidents, set up by the UIC trade organisation (French federation of chemical industries), or their foreign counterparts might also be viewed as a resource *(ARIA 43772: Implementation of the Belintra protocol after the explosion of a railcar containing acrylonitrile at the Belgian border).*

4. Safeguarding against inappropriate public reaction to an announcement

The behaviour of local residents or the general public could interfere with an emergency response, thereby exacerbating the consequences of an accident or triggering a subsequent accident *(ARIA 42653: Motorists damage fire-fighters' hoses; ARIA 40903: Explosion caused by the cigarette of someone in a crowd that had congregated around an oil pipeline leak results in 120 deaths in Kenya).*

It is key to anticipate, as best as possible, the concern shown by locals. Communicating with the public, like with neighbouring industries, is fundamental both before and during an event (real-time communication) in order to inform, explain and reassure.

ARIA 40903 © Capital FM

5. Coping with the unforeseeable

Despite the best efforts at anticipation, some uncontrollable elements still influence how response is handled. Weather conditions top the list in terms of exerting a major impact *(ARIA 41638: Frozen water in fire hoses and an intense cold snap prevent valves from working)*. These unforeseeable circumstances must, to the greatest extent possible, be acknowledged when defining response strategies and, subsequently, in the field by relaying accurate and timely information.