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Links between operating experience feedback of industrial accidents and nuclear safety
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- The BARPI, the ARIA database and the ARIA website
- From the industrial accident to the experience feedback
- Operating experience feedback in industrial and nuclear facilities
- Conclusion
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The BARPI

- Bureau for analysis of industrial risks and pollutions
- Attached to the Directorate General for Risk Prevention (DGPR) of the Ministry of sustainable development
- Created in 1992 in Lyon
- A team of 15 persons that register accidents:
  - in all fields of technological risks
  - mainly in France, but also abroad (foreign accidents are listed mainly due to the seriousness of their consequences or their “value” in terms of experience feedback)
- The BARPI collects, analyzes and publishes information on industrial accidents
The ARIA database

- ARIA: Analysis, Research and Information on Accidents
- Database collecting accident typology, causes, circumstances, consequences, administrative and technical measures taken...
- Over 40,000 accidents and incidents listed (France: 34,000)
- All fields of technological risks: ICPE, TDG, water pollutions, hydraulic dams, mines and quarries, pressure equipments and natural gas distribution...
- ...and a few nuclear events
The ARIA website

- www.aria.developpement-durable.gouv.fr

- Since June 2001, professionals and the general public have access to the results of analysis of technological accidents:
  - 40,000 accidents summaries
  - numerous publications in French and English

- To encourage sharing of information, the accidents are presented anonymously (no mention of the operator’s or plant’s name)
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Collecting information on industrial accidents – 1/3

1. Accidents selection through multiple channels:
   - daily reports issued by ministries
   - reports of fire and rescue services
   - inspectorate
   - environnemental newsletters
   - press alerts
   - …
Collecting information on industrial accidents – 2/3

2. Data input using a custom-made interface:
   1. sources of information
   2. site characteristics
   3. **type of event** and substances involved
   4. consequences
   5. intervention and mitigation measures
   6. causes and circumstances
   7. actions taken – administrative impacts and criminal proceedings
   8. actions taken – technical aspects
Collecting information on industrial accidents – 3/3

3. Accident review by the BARPI’s agent in charge of the industrial activity involved:
   - cross-checking of information
   - gathering of more information from the press and the control / investigation authorities

4. Consultations of:
   - classified facilities inspectorate
   - industry trade groups

5. Online posting
Sources of information and outputs

- Inspectorate (paper or electronic report)
- Fire and rescue services
- Industry trade groups
- International organisms
- Water police
- Press
- Publications: studies, annual inventory, articles in specialized magazines
- Accidents indicators
- Specific studies for the ministry, operators, consultants, associations…
Produce analyses to inform decision-making

- **Redaction or revision of regulation:**
  - specific analyses are produced by the BARPI and transmitted to the office in charge of regulation writing
  - this allows to compare the proposed safety requirements with the number and consequences of accidents in the sector

- **Danger analyses:**
  - consultation of the ARIA website by operators and consultants
  - a chapter on experience feedback is required in some authorisation procedures
Publications

- Detailed sheets of accidents: about 200 illustrated technical reports available online and on CD-ROM
- Annual inventory of technological accidents
- Analyses about:
  - specific topics: ammonia-based refrigeration, chlorine, hydrogen, pyrotechnic substances…
  - or activities: waste treatment, surface treatment, fine chemistry, warehouses, fuel depots…
- Articles published in technical magazines
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A nuclear exception?

- A specific context:
  - specific regulations
  - dedicated control bodies, TSOs, international organizations…
  - a nuclear event scale
  - …

- Nuclear events are recorded and analyzed by ASN & IRSN, and not by DGPR / BARPI

- Experience feedback:
  - a major component of nuclear safety, and an example to follow
  - incidents to a large extent specific to the nuclear field
And yet some similarities

- **Common issues:**
  - chemicals / chemical processes used by fuel cycle facilities and chemical industries
  - risks tied to equipment ageing

- **A few examples:**
  - risks involving hydrogen
  - ammonia (900 entries in ARIA)
  - 25 June 2011 – Feurs / 12 September 2011 – Centraco: 2 deadly melting furnace explosions
A repetitive accident:

*Fire in a container of radioactive waste – ARIA 33181:*
On 4 June 2007, a fire broke out in a container holding 90 bags of radioactive waste located in the waste packaging workshop of the uranium conversion site COMURHEX Pierrelatte. The fire was extinguished by the plant firefighters in 45 minutes. The most likely origin of the event is an exothermic chemical reaction between incompatible products. The operator occasionally uses cellulose-free wipes impregnated with 58% nitric acid. Nitric acid is an oxidizer which, when mixed with combustible material, may trigger fires.

Retrieving experience feedback from the accident, and comparing with other ARIA accidents:

- Fire = yes & Substance involved = nitric acid (27 accidents)
- Fire = yes & Uncontrolled chemical reaction = yes & Accident summary contains ‘waste’ (38 accidents)
- Fire = yes & Uncontrolled chemical reaction = yes & Substances poorly stored or conditioned = yes (26 accidents)
3 other accidents

**ARIA 36899**: upon shift start, an emulsion containing nitric acid was found ablaze. The day before, a technician had recovered the emulsion and placed it into a pitcher thinking it could wait until the next day. The normal procedure called for conducting an analysis by the laboratory, which would then make a decision regarding destruction. The investigation revealed that the large quantity of waste collected originated from a rather rapid cooling of the residual acid tank during a four days downtime.

**ARIA 30769**: a fire kindled wooden pallets and plastic packaging containers of chemicals deposited in a waste storage area of a pharmaceutical plant. It is assumed that the origin of the fire is linked to the presence of reagents such as hydrides whose decomposition releases hydrogen.

**ARIA 5608**: a fire broke out in a bagging workshop at the base of a row of pallets containing fungicide. The use of microperforated bags, which replaced hermetic paper bags just a few days earlier, was determined to be the cause of the fire. These microperforated bags could lead to sufficiently high temperatures resulting in the self-ignition (100°C) of the carbon sulphide, produced from the degradation of manganese dithiocarbamate.
Using the ARIA database to improve experience feedback – 3/3

- The analysis of these 3 accidents, all arisen in chemical, non-nuclear, facilities widens the scope of potential situations to consider, including:
  - sudden changes in the amount or characteristics of waste generated
  - other chemical substances involved, such as hydrides
  - type of packaging used

- By suggesting alternative ways for the fire to start, these new elements could help to conduct risk analyses of potential fires involving a chemical such as nitric acid as oxidizer and combustibles
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- Despite 2 very different contexts:
  - classified facilities: ~ 1,000 accidents / year vs. nuclear safety: ~ 1,000 incidents / year (in France)
  - different regulations
  - separate inspection bodies
  - peculiarities of nuclear safety and nuclear facilities…

- … the 2 fields of industrial accidents and nuclear incidents can hopefully benefit from each other

- In particular, operating experience feedback from nuclear installations other than NPPs can surely benefit from the vast diversity of accidents arisen into industrial facilities