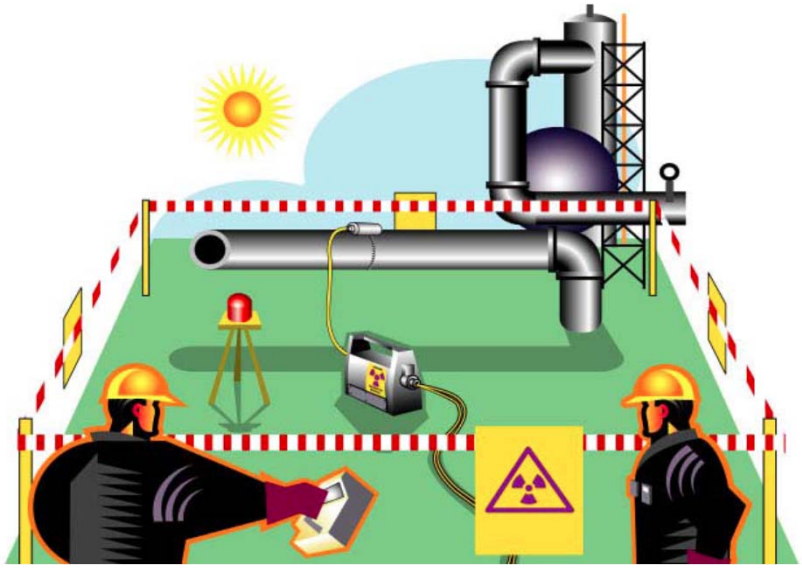
Industrial radiography incidents in Norway 2014



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Statens strålevern
Norwegian Radiation Protection Authority

www.nrpa.no

Content

- The Norwegian Radiation Protection Authority (NRPA)
- Industrial Radiography in Norway
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The NRPA (1938 →)

Environmental surveillance, Tromsø

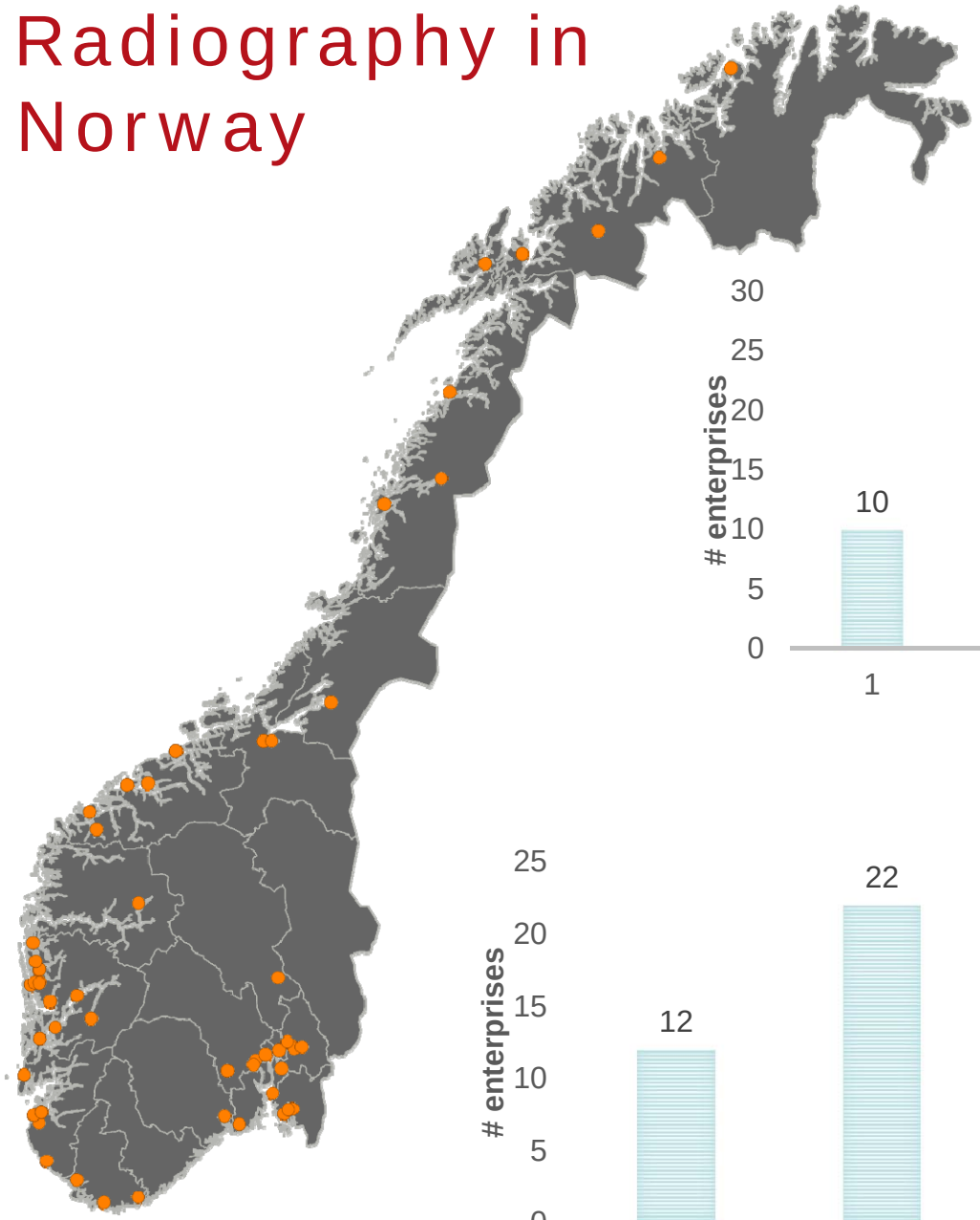
Emergency Preparedness, Svanhovd

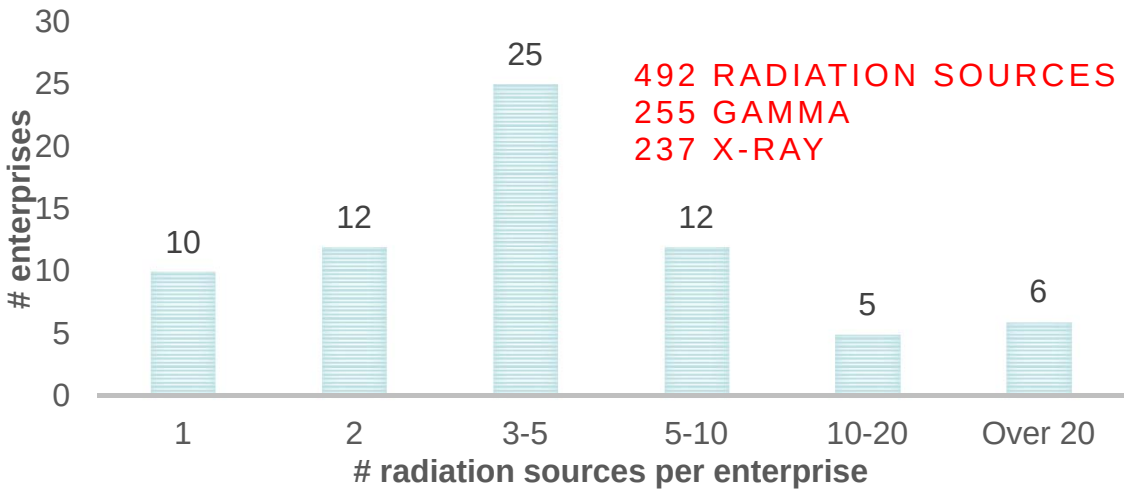
Main Office, Østerås

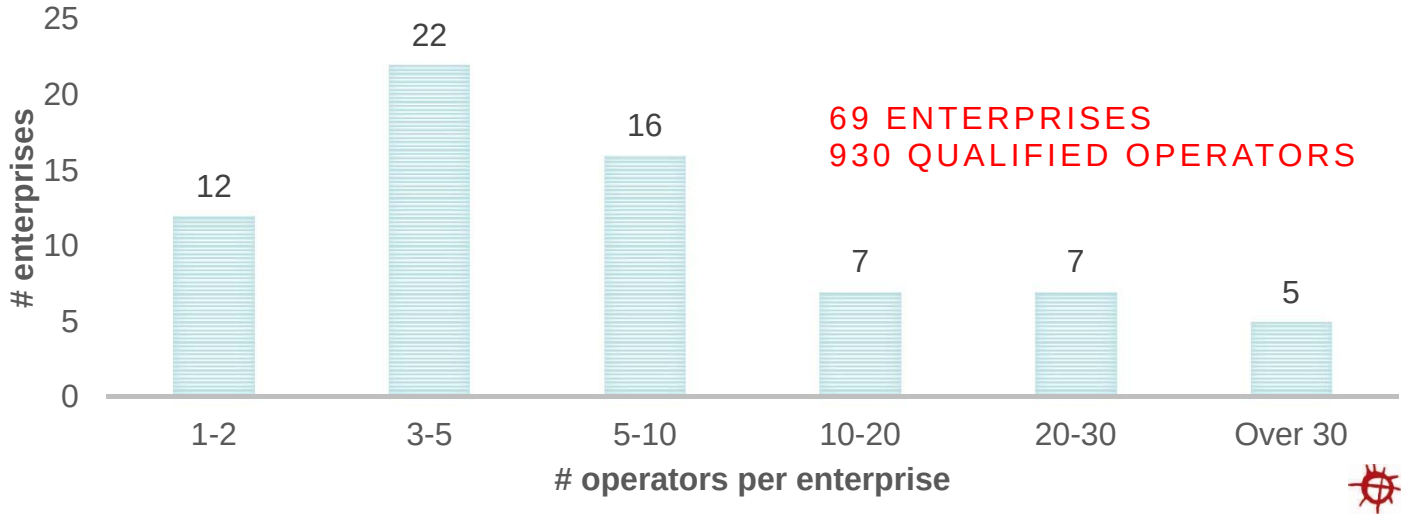
NRPA

- **NRPA is the regulatory body (competent authority) according to regulations**
- **NRPA regulates and inspects all types of ionizing radiation sources and fissile material in the medical, industry and research sector**
- Leads the Norwegian Nuclear and Radiological Emergency Organization
- Monitors doses to the public, workers and patients, as well as to the environment
- Maintains an overview of the current knowledge regarding risks and effects from radiation

Radiography in Norway







Incident #1 – failed source link

- Description

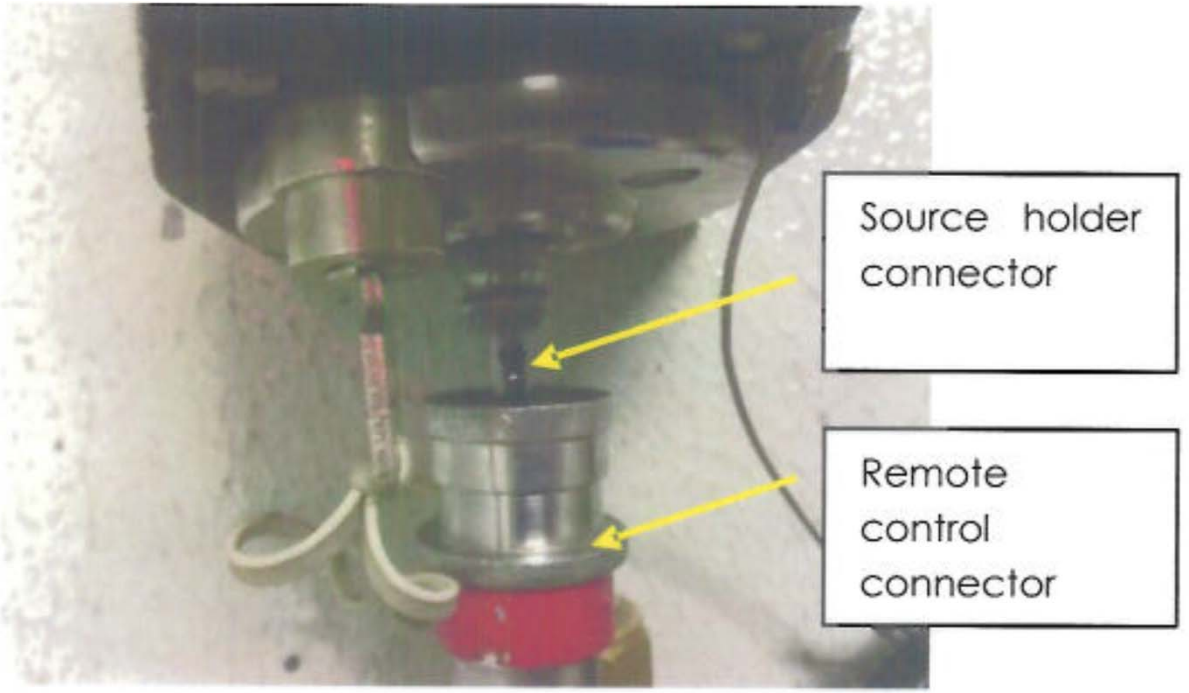
The situation at site:

- Radiography was carried out in a bunker by two radiography operators, using GammaMat Se-75 with associated equipment

Description cont.

The incident – “symptoms”:

- Not possible to lock the radiography container
- Source holder was fully retracted, but the source was still in the collimator



Picture 1

Description cont.

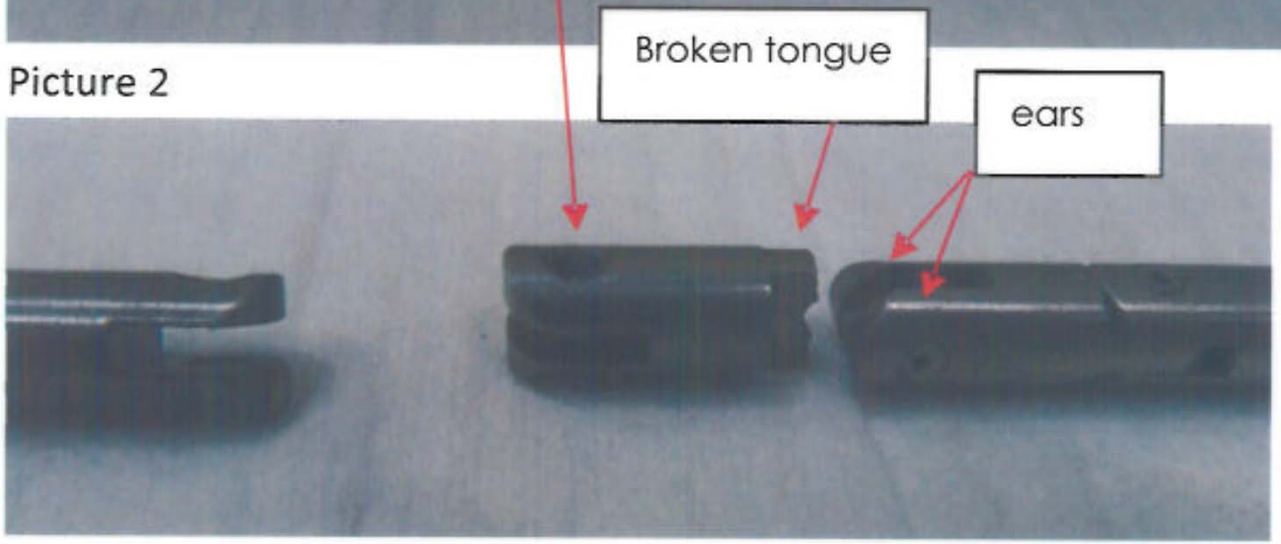
Handling of the situation at site:

- Notification procedures in the contingency plan was followed.
  - RPO and NRPA was notified.
- Adequate emergency preparedness equipment was available.
  - The source was covered with lead.
- The collimator was replaced with an end piece who fitted the emergency container. The source was cranked into the emergency container and returned to the distributer.

Investigations

- A link in the source holder was broken

Picture 2



Picture 3

Investigations cont.

- The breakage occurred at the level of the tongue of the first link located after the source link

1. Se-75 source link: external envelope Stainless steel
2. Female connector: Stainless steel
3. Shielding links: Tungsten minimum density 17g/cm^2
4. Stainless steel link
5. Stainless steel link
6. End link: Tungsten minimum density 17g/cm2

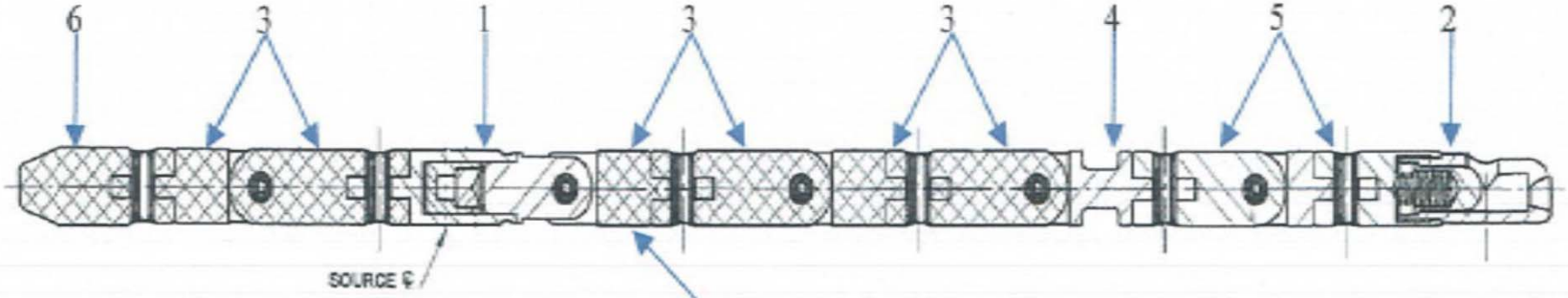


Figure 1

Tungsten broken link

Investigations cont.

- Manufacturer performed tensile tests on 10 randomly selected source holders
  - No breakage or malfunctions seen.
- Every single link of the source holder must pass a quality check at the time of each source exchange
- Source links that do not pass the test are replaced before the source is returned to the user

Manufacturer’s considerations

1. The pulling force reaches its maximum when the source assembly trigger the source holder locking mechanism

2. The source holder still closed the device in the second last retraction cycle

Consequently, the final link breakage occurred during the second last retraction cycle, just after the source had been locked.

Manufacturer’s conclusions

- The forces acting during the source exposure phase, under normal conditions of use, are unable to break the source holder

- Possible explanations/assumptions:
  - An incident on site has damaged the link without breaking it, but causing fatigue failure under repeated efforts to close the unit
  - A weakness introduces in the part during manufacturing.

- A definitive root cause could not be determined. This is most likely an isolated event.

Incident #2 - mix of drive cables
- Description

The situation at site:

- Radiography carried out in “open installation” (site radiography – not in a bunker) by two operators, using GammaMat Se-75 with associated equipment

- The incident – “symptoms”: Not possible to crank the source back to the radiography container after exposure

Description cont.

Handling of the situation at site:

- Notification procedures in the contingency plan was followed. RPO and NRPA was notified.
- Adequate emergency preparedness equipment was available.
- Source and equipment brought to a bunker near by. The source was manipulated into a transport container and brought to the distributer.

Investigations and considerations

- A mix between different generations of remote controls and drive cables was used during the incident.
- There exists two versions of the GammaMat remote control and components that are not interchangeable.
- The remote control must be assembled from *only* version 1 components or *only* version 2 components.

Conclusions

- With the mix of components, the remote control was properly attached to the radiography container, but the source holder could not be properly attached to the drive cable.
- Consequently, it was possible to push out the source, but the source came off the cable when trying to reel it back in.
- The fundamental cause: communication failure between manufacturer and distributer regarding the importance of not mixing components.

Follow-up actions

- Procedures have been changed to make sure it will not happen again.

- The distributer checked their records looking for remote controls where the drive cable had been changed, but found none.

NRPA conclusions

- Both incidents were handled in a satisfactory way with respect to radiation protection.
- No significant doses received by the personnel involved.
- The two incidents was taken very seriously by both the distributor and the manufacturer. The incidents were properly investigated and relevant follow-up actions made.
- The NRPA see no reason to advise against the use of GammaMat Se-75.