

Incident in a brewery due to the installation of a new X-ray tube in a fill-level gauge

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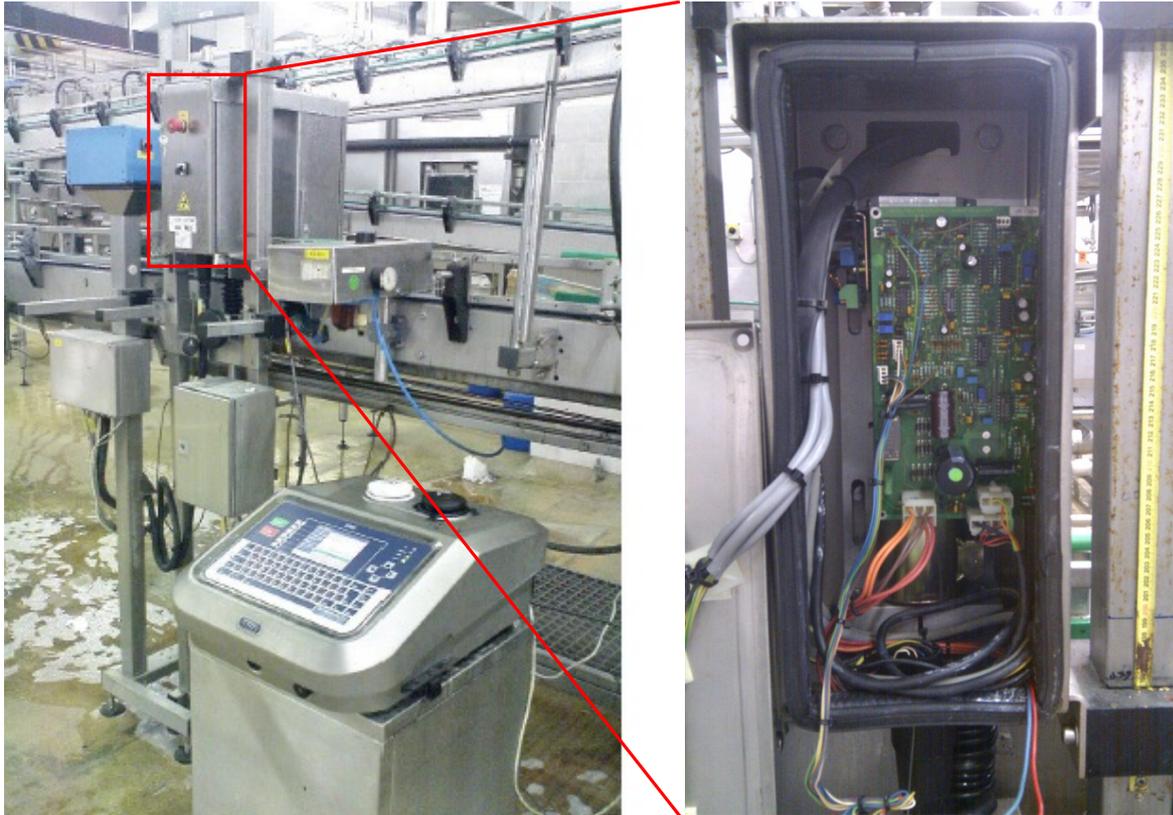
Description of the incident

An incident took place in a brewery, during maintenance of an X-ray gauging system for verification of can fill level. One of the maintenance workers installed a new X-ray tube, which was already mounted on an electronic circuit. This simply required the circuit board to be inserted in the right slot inside the housing.

The worker then tested the system after installation, and realised that the current and voltage settings were too high (eg 60 kV instead of 35 kV) so he adjusted them, switching the unit on and off a few times in the process. After adjustments he realised that the unit detector measured almost no signal, although the X-ray indicator was on.

Using a dose rate meter he could measure almost no reading at the detector position, but there was a significant dose rate at the position he was occupying. He switched the unit off immediately and contacted radiation protection experts. Further investigations showed that the tube had been mounted incorrectly (by the suppliers) on the circuit board, such that the tube window was facing a wrong direction (towards the worker instead of towards the line).

The worker was not wearing a personal dosimeter as brewery workers were not expected to enter any radiation fields (the company rules did not cover maintenance of the unit). A dose reconstruction was attempted, but the tube stopped working shortly after the incident occurred. Information was requested from the suppliers (in another country), but none was provided.



Photographs: the original gauging system on the can filling line (left), and inside the gauge cabinet (right): the X-ray tube is mounted on the rear of the circuit board.

Radiological consequences

A dose reconstruction was performed using output data for a similar X-ray tube. The effective dose was estimated to about 5 mSv, and the maximum equivalent dose (to an individual organ) was estimated to be 10 mSv.

Lessons learned and actions taken

Maintenance and repair of equipment that emits ionising radiation requires special consideration to ensure that the standard of radiation safety is not compromised. It is essential that a suitable radiation safety survey is carried out immediately after any such work to ensure that there is sufficient protection from radiation, and that any safety and warning systems are operating correctly. In terms of this particular incident:

- A programme of workplace monitoring was introduced after the incident and personal dosimeters for maintenance staff are under consideration.
- Due to an old age and unavailability of spare parts the level gauge in question was replaced by a new one.

- Basic radiation protection training for all workers working in vicinity of sources of ionising radiation was organised after the incident.
- Additional measures were taken by the brewery to prevent such incidents in the future, as it was considered that the company should not rely on suppliers to provide properly constructed and functioning parts.
- One of the problems identified was the difficulty of obtaining data from companies in other countries. In this case the absence of information from the tube supplier prevented a reliable dose reconstruction.