

Safety assessment of the CENTRACO installation

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CONTENTS

1. SUMMARY	2
2. DESCRIPTION OF SOCODEI AND THE MAJOR NUCLEAR INSTALLATION, CENTRACO	2
3. CONSTRUCTION LICENCE	3
4. OPERATING LICENCE	3
5. IMPROVING SAFETY CONDITIONS AND RADIOLOGICAL PROTECTION AT CENTRACO	4
6. CONCLUSION	5

1. SUMMARY

Following an initial examination of the safety standard documentation on the basic nuclear installation called CENTRACO, for which the operator applied for an operating licence, the technical advisors of the Nuclear Installations Safety Directorate (the Institute for Nuclear Safety and Protection and the Standing Group) deemed that aspects related to health physics and safety were not correctly treated. The Nuclear Installations Safety Directorate therefore did not grant the requested start-up licence. This licence was obtained after wide-reaching design changes were implemented and the updating of the safety standard documentation was examined by the technical advisors of the Nuclear Installations Safety Directorate.

2. DESCRIPTION OF SOCODEI AND THE MAJOR NUCLEAR INSTALLATION, CENTRACO

SOCODEI, whose name stands for industrial effluents and waste packaging company, was set up in 1990 by EDF and Cogema to design, finance, construct and operate installations for compacting and packaging low-level waste. This waste is from nuclear power plants, fuel cycle installations, research facilities and "small waste producers" (hospitals and industrial facilities).

On 22 April 1994, SOCODEI submitted an application to the ministry for industry for a licence for a basic nuclear installation, named CENTRACO. This installation is designed to process low-level waste by melting or incineration to produce packages ready for sending to the Aube Disposal Facility. The melting unit is designed to have an annual processing capacity of 1500 t of scrap metal. If necessary, this capacity can be extended to 4500 t per year by operating in continuous mode (3x8 h). The incineration unit is designed to process 3500 t of solid waste per year and 1500 t of liquid effluents per year.

CENTRACO produces two types of waste package for disposal:

- "cold-inerting" packages: 400-litre metal drums containing ash and clinker produced by incineration, solidified with a hydraulic binder consisting of lime and silica.
- metal ingots: cylinders with dimensions similar to those of a 200-litre oil drum.

When the composition of the metals is suitable, the metal produced by melting metal waste is used to manufacture pipes (4-10 cm thick) with a diameter of approximately 1 m. These pipes are either used to make 400-litre cold-inerting metal drums or biological shielding used in concrete canisters. In particular, these canisters are used by EDF for packaging irradiating waste.

CENTRACO processes foreign waste separately to identify the products resulting from processing.

The installation returns the waste packages or the canisters fitted with biological shielding to the waste producers. However, solely for the benefit of French clients, SOCODEI can send packages to a low or medium-level waste disposal facility (Aube Disposal Facility).

CENTRACO is located at the southern-most tip of the Marcoule nuclear site, in the Rhone valley, near Orange.

The total amount of radioactivity is low: considering that all the interim storage space for waste awaiting processing and packages of treated waste is full and, taking the specific activity of the waste as being the average specific activity of this waste over a ten-year period, the total activity at CENTRACO is of the order of 200 GBq (5 Ci) for the equivalent activity of the worst-case radiotoxicity group as defined in the decree of 20 June 1966 (Group 1). The radiological impact for the environment of a major accident is therefore slight. However, the radioactivity present in the installation is sufficient for the personnel to run the risk of being exposed to significant amounts of radiation and to dispersed radioactive material. Therefore, it is necessary to protect some workstations using biological shielding and to contain the atmosphere of the rooms in which operations involving radioactivity being dispersed in the atmosphere are carried out (grinding of waste after incineration, cutting of metal waste etc.).

3. CONSTRUCTION LICENCE

The application for the construction of the CENTRACO plant was supported by a preliminary safety analysis report in accordance with French regulation (decree of 11 December 1963).

This document was examined by technical advisers of the safety authority, i.e. the Institute for Nuclear Safety and Protection and the Standing Group of experts on major nuclear installations other than reactors and long-term radioactive waste disposal facilities (General Nuclear Facility Standing Group). The Institute for Nuclear Safety and Protection's assessment was presented to the General Nuclear Facility Standing Group at the meeting held on 9 November 1994.

Following this meeting, the Standing Group approved the construction of CENTRACO. Nevertheless, the Standing Group brought to light the fact that it was necessary to make modifications to the project for protecting workers from exposure to external radiation and radioactive dust dispersed in the atmosphere and for controlling fires. Furthermore, SOCODEI had to obtain prior approval from the French National Agency for Radioactive Waste Management for the waste packages produced.

The Interministerial Commission for major nuclear installations met on 7 February 1996 to examine the draft decree for the construction of CENTRACO. Following this meeting, a licence was granted to SOCODEI under decree No. 96-761 of 27 August 1996 to construct a major nuclear installation named CENTRACO, in Codolet (county of Gard). CENTRACO was designated No. 160 in the list of major nuclear installations.

4. OPERATING LICENCE

Construction work on the plant started in 1994.

On 17 June 1996, one year before the expected start-up date, SOCODEI applied to the Director of the Nuclear Installations Safety Directorate for the operating licence for CENTRACO and submitted the intermediate safety analysis report of this installation in support of the request, in accordance with the regulation. Documentation supplementing the safety analysis report, the General Operating Rules and the On-site Emergency Plan for CENTRACO were sent in the following months. All these documents formed the safety standard documentation for this installation.

The Institute for Nuclear Safety and Protection assessed this documentation. Then, the Institute for Nuclear Safety and Protection's assessment was presented to the General Nuclear Facility Standing Group at the meeting held on 28 May 1997.

The Institute for Nuclear Safety and Protection concluded that radiological protection and safety levels were insufficient in the following areas:

- the projected dose results did not satisfy the European directive based on the ICRP Publication 60 recommendations (maximum annual exposure level of 20 mSv on average over 5 years) nor did it justify the operator's objective (maximum and average annual exposure levels of 15 mSv and 5 mSv respectively) as some workstations registered a provisional annual exposure in excess of 20 mSv,
- the objective of zero-exposure of operators to radioactive contamination in the atmosphere was achieved by wearing respirators at many workstations,
- the operator could not demonstrate that protection of the incinerator smoke processing facility against an overpressure in the furnace, caused by a direct release of smoke from the furnace into the external atmosphere, would sufficiently reduce the risk of this release (neither processed nor monitored) for it to be classified as within the "acceptability range" of between 10^{-5} /year and 10^{-7} /year. In fact, the operator subsequently demonstrated that with the smoke processing installation it envisaged, the probability of a direct release into the atmosphere occurring was 10^{-1} /year, which was indeed unacceptable.

On the basis of these elements, the Standing Group considered it was not possible to support the application for normal operation of CENTRACO lodged by SOCODEI.

Specific points that were not acceptable to the Standing Group were :

- the case for observance of the exposure limits for workers as regards future regulations, and the goals announced by the operator, were not substantiated,
- respirators would need to be worn in certain workstations,
- and the incineration furnace was equipped with an emergency vent for radioactive smoke leading directly to the outside atmosphere.

In the light of this pronouncement, the Nuclear Installations Safety Directorate did not grant an operating licence for CENTRACO. The Nuclear Installations Safety Directorate requested that SOCODEI improve levels of safety and radiological protection in the areas indicated by the technical advisers.

5. IMPROVING SAFETY CONDITIONS AND RADIOLOGICAL PROTECTION AT CENTRACO

To satisfy requests made by the Nuclear Installations Safety Directorate, formulated after the meeting of the Standing Group on 28 May 1997, the operator carried out studies on the improvements requested.

These mainly concerned:

- finding the workstations most exposed to nuclear radiation and ensuring that the doses at these places are ALARA,
- providing containment of the equipment liable to produce radioactive dust during operation,
- researching a system for processing incinerator smoke released directly into the atmosphere.

When these studies were completed, SOCODEI submitted its findings to the Institute for Nuclear Safety and Protection which considered the basic principles to be acceptable. Then, major modifications to the installation were carried out.

These modifications centred on:

- for the melting unit, provisions for operation by remote control, behind biological shielding in an atmosphere protected from radioactive dust. These modifications mainly consisted in:
 - for the unloading of road transport containers, setting up two receiving and unloading stations and a remote control room,
 - for the metal waste disassembly, cutting and sorting workshop, setting up a station for β and γ waste and a station for α waste,
 - for the metal waste treatment workshop (baking, cutting and shotblasting), setting up a remote control room,
 - melting furnace loading station, installing an airlock for transferring waste to the furnace loading conveyor (see diagram in Appendix 1),
 - for the melting workshop, installing additional biological shielding in the workstations,
- for the incineration unit,
 - implementing biological shielding and remote-control systems and the automation of operations involving exposure to ionising radiation,
 - modifying the incinerator smoke treatment system by adding an additional permanent air cooling system for smoke which should ensure that the smoke is cooled in the event of the main cooling system failing (water quench) and increasing the reliability of all equipment involved in incinerator smoke treatment.

The modifications of the incinerator smoke treatment system have made it possible to prevent direct release of incineration furnace smoke in the environment.

In early 1998, the operator submitted the updated safety standard statement to the Nuclear Installations Safety Directorate, taking into account the modifications and the requests that the Institute for Nuclear Safety and Protection had formulated in its 1997 assessment. The Institute for Nuclear Safety and Protection analysed all these documents and presented the result of its analysis to the General Nuclear Facility Standing Group at a meeting on 23 October 1998. Following this meeting, the Standing Group considered that the operator had satisfactorily met all the requirements:

- Projected dose results satisfactory: the individual dose goals for annual exposure (15 mSv) and average exposure (5 mSv) are met (see the diagram showing the improvement in projected individual exposure in Appendix 2).
- No permanent workstations require a respirator to be worn for more than two hours per day.
- No direct release of smoke from the incinerator furnace in the environment in the event of failure of the smoke cooling system.

After visiting the installation and discussions, the Standing Group endorsed the Institute for Nuclear Safety and Protection's favourable conclusions concerning start-up of CENTRACO.

However, the Standing Group recommended, on the grounds of the Nuclear Safety and Protection's suggestion, that the Nuclear Installations Safety Directorate request that the operator provide an experience feedback file relating to:

- radiological protection,
- containment of radioactive materials,
- control of risks due to human factors.

Furthermore, SOCODEI will have to obtain approval from the French National Agency for Radioactive Waste Management for packages to be sent to the Aube disposal facility prior to start-up.

Finally, the implementation of workshops, not yet installed in the CENTRACO installation (workshop for dismantling large metal objects and discarded ventilation filter disposal station) shall be subject to separate approval procedures on the basis of a safety analysis report.

At the end of 1998, approval was granted by the French National Agency for Radioactive Waste Management for cold-inerting packages consisting of 400-litre drums made of non-radioactive metal and for metal ingots to be disposed of at the Aube Disposal Facility.

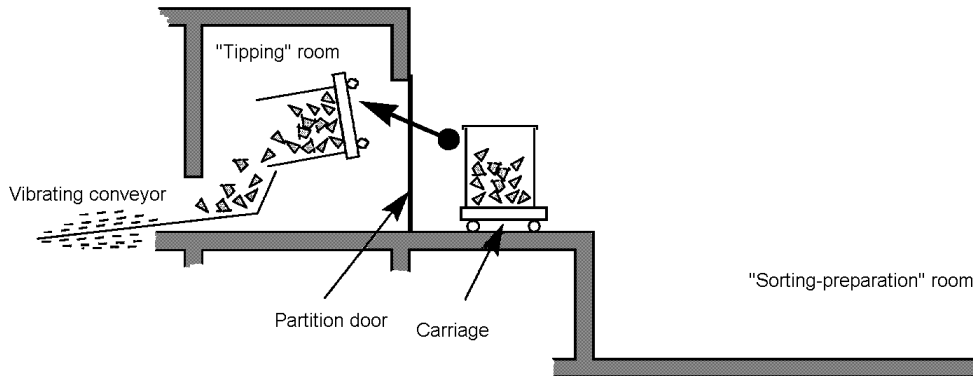
The Nuclear Installations Safety Directorate endorsed the recommendations of the Standing Group. A licence was issued for the operation of all the CENTRACO installations under the conditions stipulated in the safety standard documentation provided the foregoing requests are taken into account since January the 28th, 1999. The installation has been operating since February 1999.

6. CONCLUSION

The Institute for Nuclear Safety and Protection and the General Nuclear Facility Standing Group played a major part in drafting the operating licence application for major nuclear installation CENTRACO by only approving it after the implementation of the extensive modifications and the examination of the updated safety standard documentation. Indeed, during the initial examination, these technical advisers had considered some aspects of the radiological protection and safety of this installation to be not correctly treated.

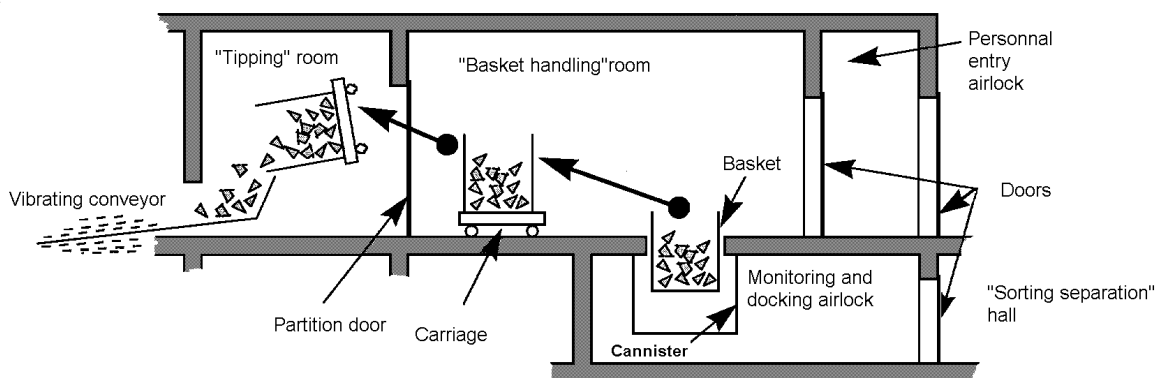
Appendix 1

Example of improvement of the containment of the atmosphere of equipment liable to produce radioactive dust during operation: construction of an airlock for transferring waste to the furnace loading conveyor.



Before modification:

When the door was opened, the radioactive contamination in the atmosphere of the "tipping" room was only contained vis-à-vis the preparation hall, where the operators were present, by the circulation of air from the hall to the vibrating trough.



After modification:

SOCODEI installed a "basket handling" airlock equipped with a docking system to avoid contact between the "tipping" room and the "sorting-preparation" hall where personnel are present. Containment of the atmosphere in the "tipping" hall is ensured should the ventilation system fail.

Appendix 2

Improvement of the individual exposure level in the CENTRACO plant following the Institute for Nuclear Safety and Protection's assessment.

The projected dose results are satisfactory: the individual dose goals for annual exposure (15 mSv) and average exposure (5 mSv) are met.

