Cleaning and dismantling of a high activity laboratory (abstract & presentation slides)

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Saclay

Abstract

The high activity laboratories have been built at the end of the 50'. The particularity of this facility was that about 14 different laboratories worked in 14 different fields (biology, production of Cs and Cf sources, metallurgy, mechanical testing …). Because of the optimisation of the nuclear research, the CEA decided to close progressively this facility and to transfer the different experiments in other places.
This action began in 1997 and is planed to end in 2010. 6 laboratories have been closed from 1997 to 2001 and the dismantling of the shielded cells has begun since 2002. Therefore, several laboratories have been cleaned of the materials and experiments. Nevertheless, the main particularity of this subject is that some experimental activities have been pursued during the cleaning and dismantling of other laboratories.
For example, we describe the dismantling of the laboratory that performed metallurgical and mechanical characterization of irradiated materials. This laboratory occupied 20 lead cells and 2 glove boxes. The exploitation of those cells has been stopped progressively (12 at the end of 2001 and 5 at the end of 2003). The end of the of last 3 cell exploitation is planed to end 2005. Since the end of 2001, 9 lead cells have been cleaned. Their dismantling is planed for next the two years. In parallel, we will clean all the other cells. During this phase we will have also to transfer all the irradiated samples (about 5000) that are still in the laboratory to the waste treatment facility of the CEA centre or to the new laboratory which has been presented during the previous Hotlab meeting in Saclay.

The paper gives details for background about ended operations: Organisation, Waste production, Specific designs which improve radioprotection, waste destinations and costs, Difficulties and feedback experience of dismantling.

Keywords: *Dismantling, Hot Cells, Mechanical testing facilities*

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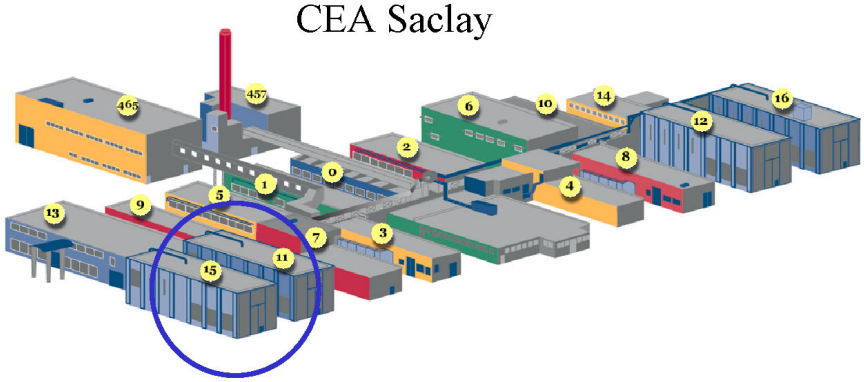
Laboratory of high activity
CEA Saclay

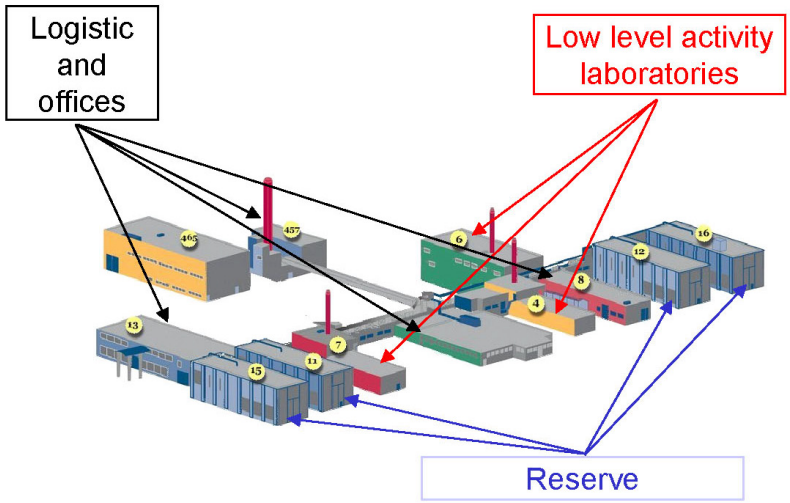


- Built in the mid 50'
- 16 different laboratories working in different fields (biological, chemistry, source production, mechanical characterization…)
- Activities of the different laboratories have been stopped progressively since 1994

Future possible orientation in 2010

- **Cells to be destroyed :** 0, 1, 2, 3, 5, 9, 10 and 14.
- **Reserve :** The cells 8, 11, 12, 13, 15, 16 after decommissioning will be conserved as reserve for future non nuclear activities.
- **Low activity laboratories :**
  - cellule 6 : chemical analysis
  - cellule 4 : reserve
  - cellule 7 : radioactive source storage

Future possible orientation in 2010



=> No more high activity level laboratory

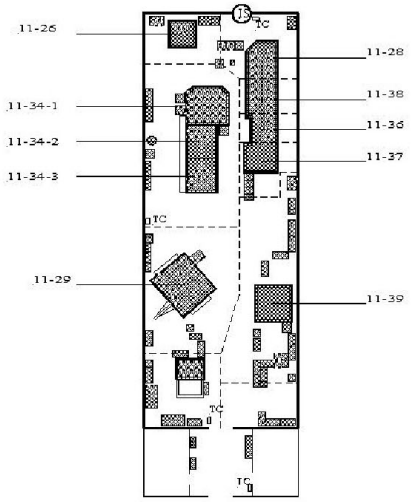
Aim of the project

Actual view of cell 11

"Future" view of cell 11 or cell 15

- Beginning of the project : 2002
- End planed for end 2006.

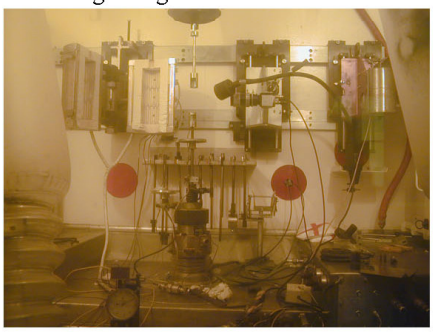
Laboratory of mechanical characterization of irradiated materials : no fuel
Cell 11



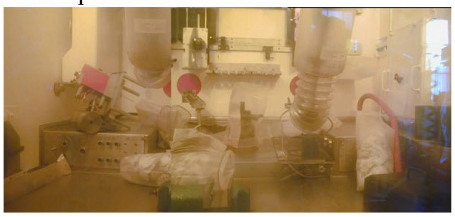
- Activities have been stopped progressively since 2001.
- Decontamination of cells 11-29 & 11-39 has been realized in 2003

Cell 11-29 (Tensile tests)

At the beginning

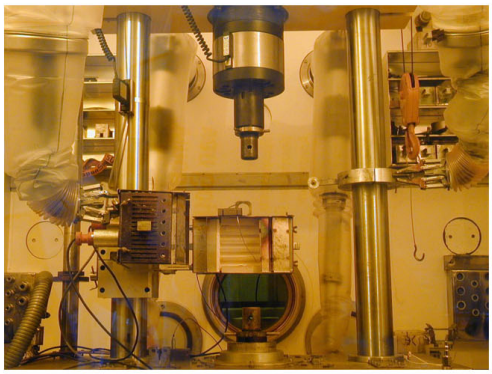


Waste production



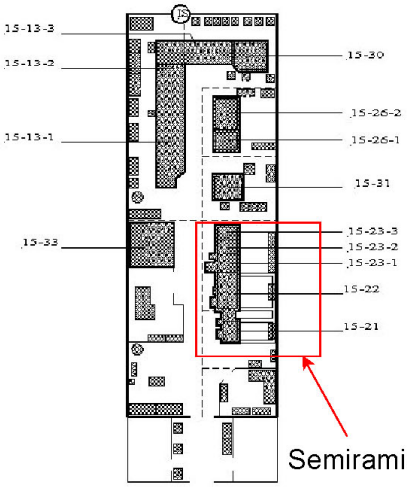
- ❑ Initial state wasn't too penalizing
  - ✓ α activity : 6900 Bq
  - ✓ Dose Rate : 180 µGy/h
- ❑ Easy accessibility
- ❑ Small devices inside the cell
- ❑ Decontamination : 3 weeks
- ❑ No problem encountered
- ❑ Final radiological state :
  - ➢ α emitters : < 0.21 Bq/cm²
  - ➢ β emitters : 20 Bq/cm²

Cell 11-39 (Toughness tests)



- Initial state wasn't too penalizing
  - ✓ α activity : 9200 Bq
  - ✓ Dose Rate : 2300 µSv/h
- Easy accessibility
- Decontamination : 5 weeks
- Heavy and large pieces
- Final radiological state :
  - ➢ α emitters : < 0.21 Bq/cm²
  - ➢ β emitters : 20 Bq/cm²
  - ➢ Mean final dose rate : 5µSv/h

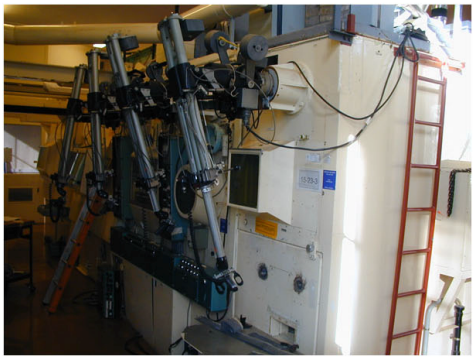
Cell 15



Semiramis (EPMA preparation)

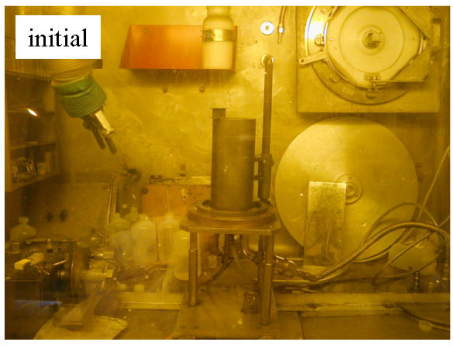
- ➢ Activities have been stopped since 2001.
- ➢ Decontamination of cells 15-31 ; 15-26; 15-21; 15-22; 15-23 has been realized in 2002-2003
- ➢ Irradiated fuel experiments in line Semiramis

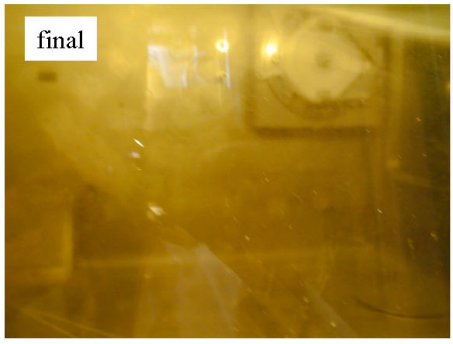
Cell 15 – Line SEMIRAMIS



- Line of 5 hot cells used for the preparation of samples for the microprobe
- Samples : UO2, MOX, Confinement glasses,...
- Cell 15-21 was previously decontaminated
- Initial radiological states go from very penalizing (15-22) to quasi clean (15-23-3)
- A lot of small pieces inside to evacuate
- Effluents forbidden and impossibility to evacuate wastes with a high activity level.
- Easy accessibility for 15-21&15-22. Impossible for the others.

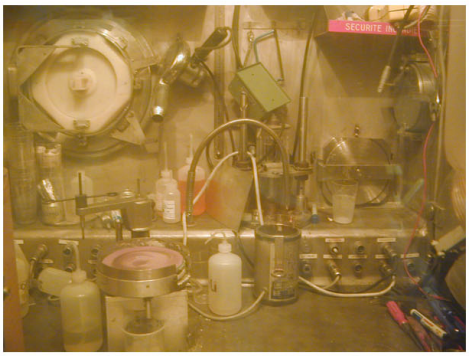
Cell 15-22





- Very penalizing initial radiological state :
  - α Contamination (c/s) : > 10000 c/s
  - β Contamination (c/s) : 5000 c/s
  - Estimated α Activity : 80000 Bq.
  - Initial α dose rate : 1600 µSv/h
- Accessibility : Mobile front wall.
- High activity wastes have been stored in a cask.
- 2 months have been necessary to obtain a radiological level compatible with a human intervention inside (orange level).
- 1 more month to finalize the total decontamination
- Final radiological state :
  - α emitters : ~ 200 Bq/cm²
  - β emitters < 280 Bq/cm²
  - Mean final α dose rate : 400 µSv/h

Cell 15-23-1



- Initial radiological state :
  - α Contamination (c/s) : 4500 c/s
  - β Contamination (c/s) : 4000 c/s
  - Estimated α activity : 34600 Bq.
- Accessibility : Impossible.

⇨ Decontamination realized only by telemanipulator

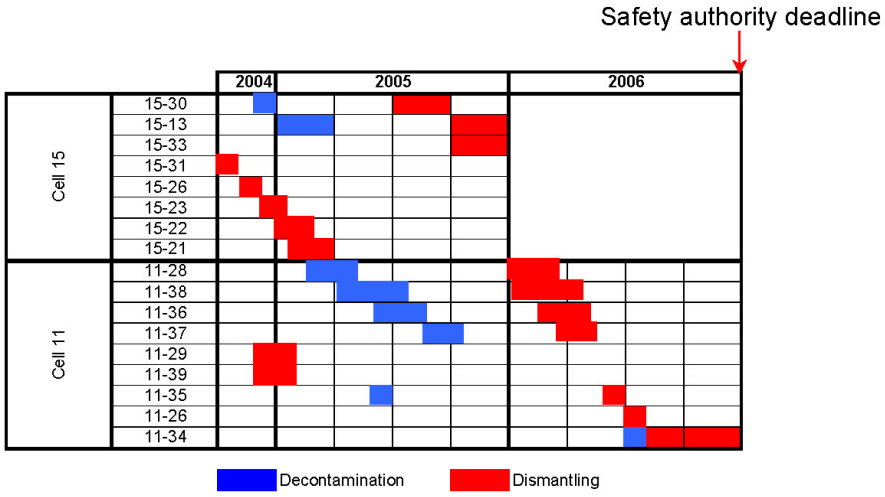
- ~3 months to obtain a mean satisfying radiological level.
- Final radiological state :
  - α emitters : ~ 2 Bq/cm²
  - β emitters < 35 Bq/cm²
  - Mean final α dose rate : 40 µSv/h

Partial conclusion

- The objectives for the final radiological states were :
  - unstable contamination : < 100 Bq/cm²
  - < 0,01 mGy/h measured under 300 mg/cm² in the middle of the cells
- These objectives has been achieved in time for all the cells excepted 15-22 and 15-23-1 (Semiramis). We decided to stop decontamination operations of these two cells because of :
  - Final results were acceptable for dismantling
  - Supplementary means would have obliged us to obtain an authorization from French safety authorities => Delay (>3months) incompatible with the project
  - Supplementary costs

Continuation of the operations : Planning

- Activities were stopped in 2 steps.
- Storage cell full !
- Total cost : ~4M€ (without waste treatment)



- Difficulties :
  - No construction plans.
  - For all the Cells to decontaminate :
    - Very penalizing radiological levels
    - Accessibility difficult
    - Large and massive pieces to evacuate in some cells
  - Evacuation of about 5000 irradiated samples stored in cell 11-34.
    - Obtaining customer agreement to send samples to waste is a hard job
    - A lot of cask rotations => Time consuming
    - Interferences between decontamination and dismantling.
  - Short delay