Waste conditioning strategy in Orano

PREDIS / EURAD ROUTES / ERDO joint webinar
Waste Acceptance Criteria

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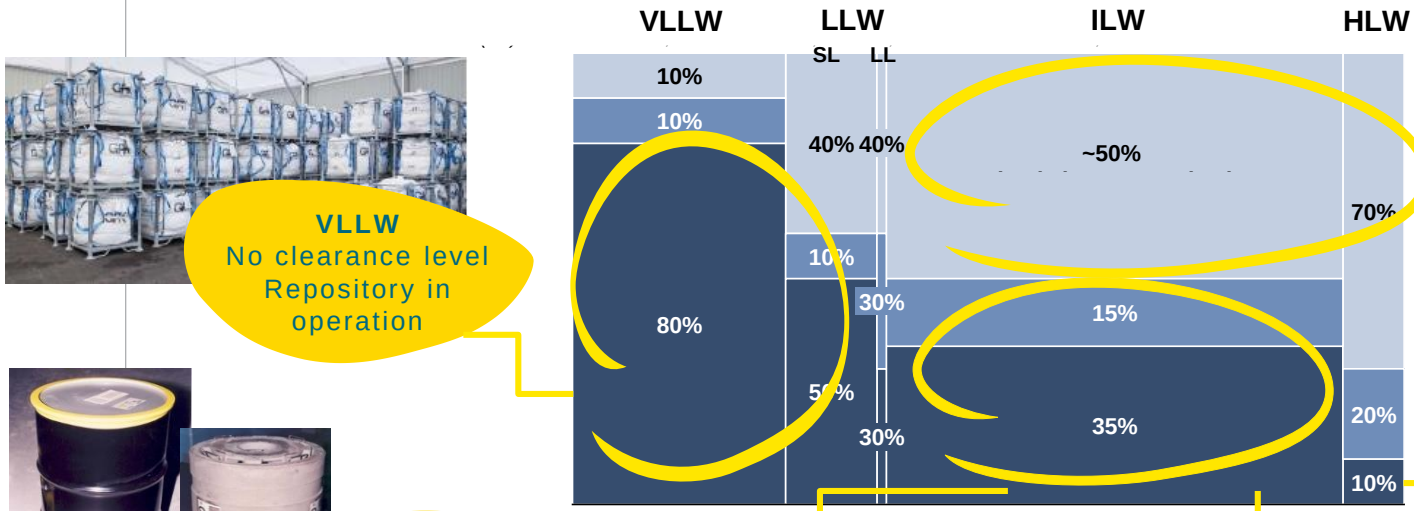
Orano Waste Management
Main stakes

Since the cost disposal increases with the depth of repositories, the waste conditioning approach may be different for the different categories of waste

Costs repartition between:

Disposal Transport Conditioning



VLLW
No clearance level
Repository in operation

HLW
No repository available yet
Volume reduction → universal glass canister

LLW & SL-ILW
Repository in operation
No technical difficulties…
…except for some specific inventories

LL-ILW
No Repository available
Metallic waste from fuel → compacted in universal canister
Technological waste → cementation
LEGACY WASTE (graphite, sludge,…) → …

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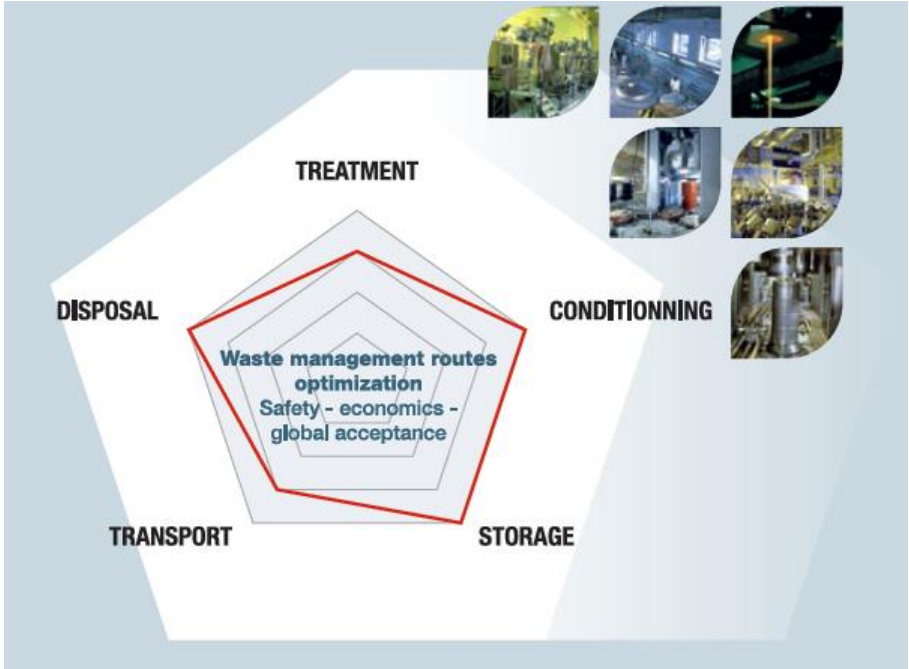
Orano Waste Management
Main principles

5 « golden rules »

- Avoid waste at source
- Maximize sorting and decontamination
- Reduce volumes
- Condition at the earliest
- Initiate the right R&D at the right time

Innovate for legacy waste and already planned inventory

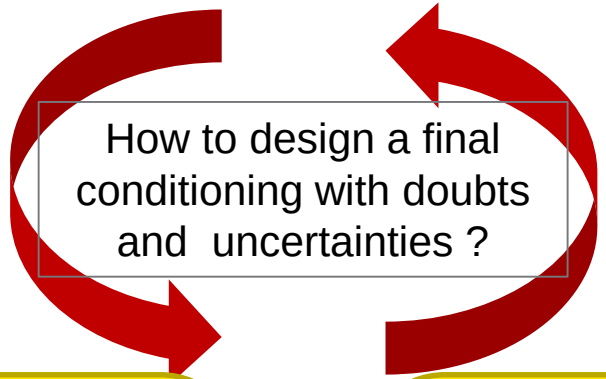
- by adapting existing routes with the aim at increasing performance
- by creating new routes only when necessary



The chicken and the egg

Waste conditioning Operator

Difficult to condition without set WAC



Waste Disposal Operator

Difficult to set the WAC early in the disposal design phase before reviewing all the safety options

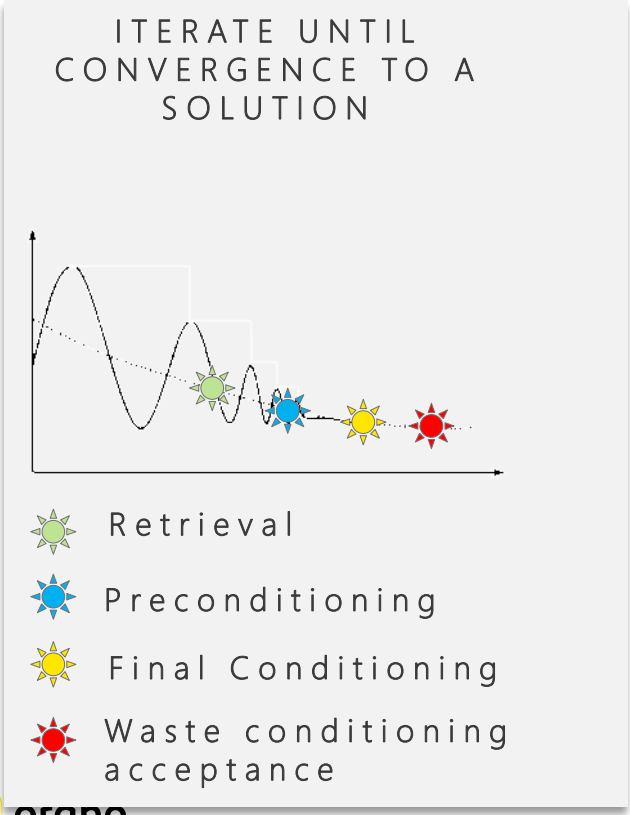
EARLY FINAL CONDITIONING

- Overall cost savings
- No postponement
- Hope that final disposal will accommodate already packaged waste - if no risk of reconditioning (bitumen !)
- Make assumptions on future WAC in order to define a robust solution
- Early cash out

DELAYED FINAL CONDITIONING

- Keep options until emergence of new technologies
- Postpone the problem
- WAC may have been set at the end of the waiting phase
- Could be more expensive overall
- Delayed cash out

How to keep on moving in the future ?

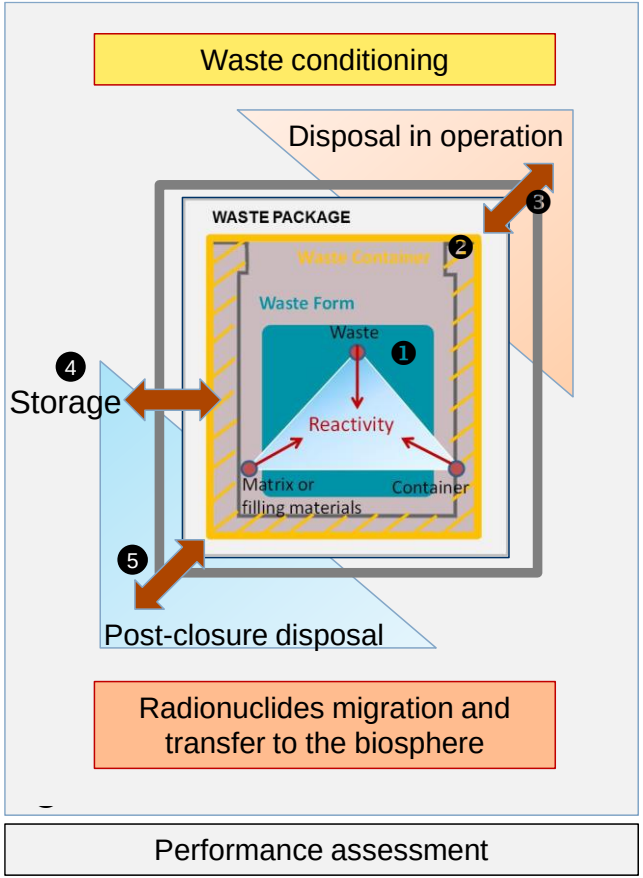


TARGETS

- **Reduce the risk with an incremental approach**
  - ✓ Evaluate the level of maturity at each step
- **Keep some flexibility in order to adapt without a complete reset of the scenario**
  - ✓ Keep options opened, and discard them progressively - especially for final conditioning
  - ✓ Define the final conditioning only if the level of maturity is sufficient
  - ✓ Anticipate the stop points where we have the possibility to introduce new options from R&D results in due time
- **Do not rush on engineering studies, and perform R&D in due time**
  - ✓ Use adequate competencies for R&D, and for engineering studies : its's different !
  - ✓ Keep time for tests and learn fast approaches : de-risking
  - ✓ Balance offensive and defensive R&D
- **Strengthen the competencies in conditioning**

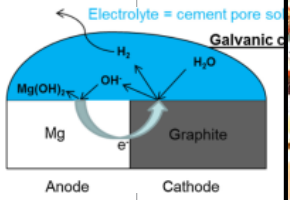
Robustness of waste conditioning design

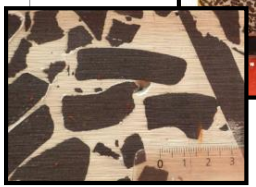
1. **Waste knowledge**
   - Waste characterization / inventories
   - Reactivity: exothermicity, corrosion, radiolysis…
2. **Waste Conditioning : waste form / waste package**
   - Control or suppress reactivity ?
   - Use a matrix or not ?
3. **Open communication with the disposal operators**
   - Include disposal operator expectations (or preliminary WAC) in the waste package design
4. **Behavior in storage**
   - Monitoring program
5. **Long-term behavior in disposal (post closure)**



Example: UNGG legacy waste (La Hague)

Mix of graphite & magnesium waste stored in two tanks





- **Reduce the risk with an incremental approach**
  - Different retrieval and conditioning scenarios studied one after one
    - Mix of waste in one package
    - Sort the waste in order to develop different cemented waste packages
  - Perform characterizations to increase the radiological and chemical knowledge of waste
- **Keep some flexibility in order to adapt without a complete reset of the scenario**
  - Development of a cement formula adapted to reactive materials (magnesium), to graphite, and to a mix of magnesium and graphite
    - Same cement formula in the different scenario
    - Process “retrieval and sorting” adapted to each scenario
- **Do not rush on engineering studies, and perform R&D in due time**
  - Priority on retrieval and sorting in order to store the waste in safe conditions
    - ✓ Opportunity to test the sorting performance with real waste
    - ✓ Opportunity to do new characterizations (increase waste knowledge)
  - R&D on cement formula still ongoing
- **Strengthen the competencies in conditioning**
  - Development and R&D studies carrying out along the project to increase the maturity of cementation process and waste behavior

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