



Optimization of alpha contaminated waste transportation in France

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Alpha waste generated during MOX fuel manufacturing at MELOX (1/3)

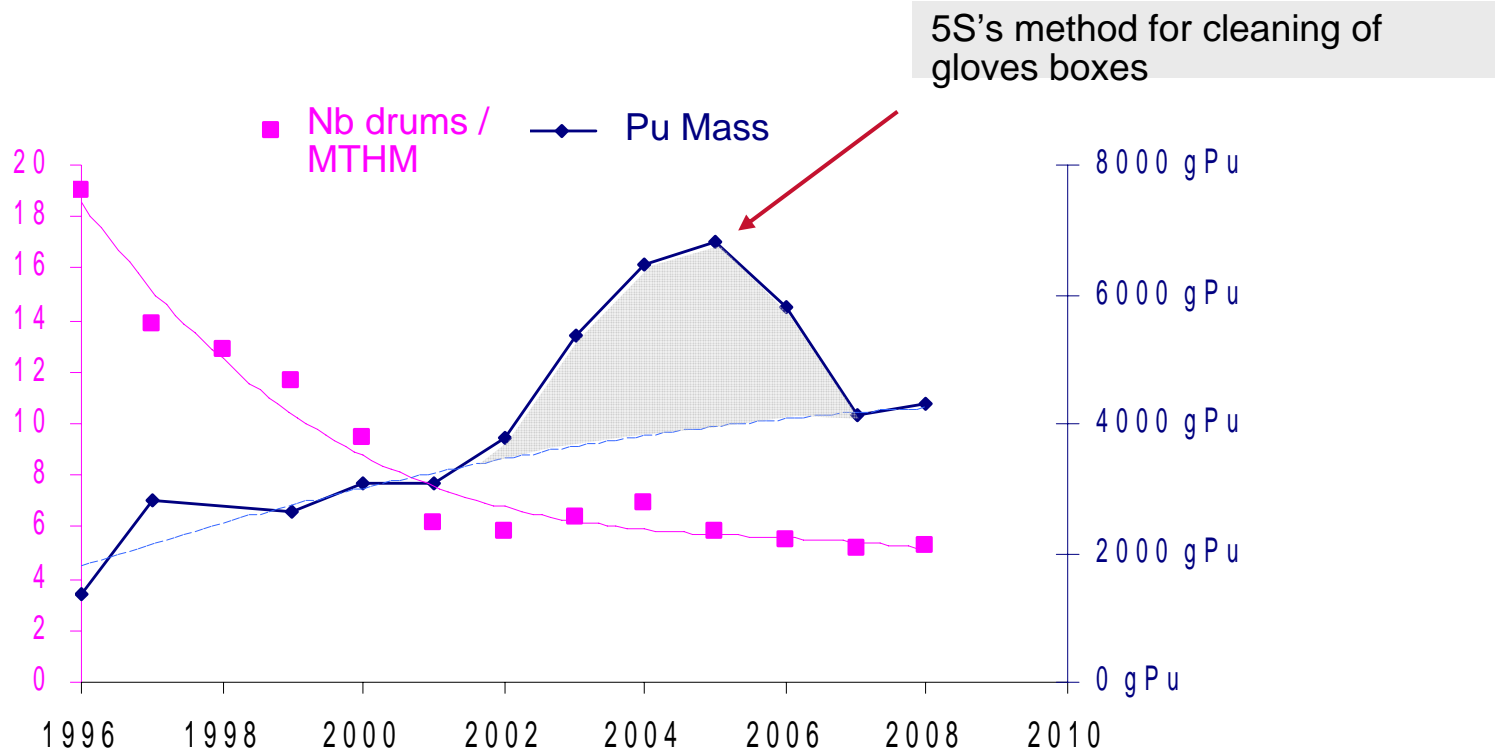


LOGISTICS

Alpha waste generated during MOX fuel manufacturing at MELOX (2/3)

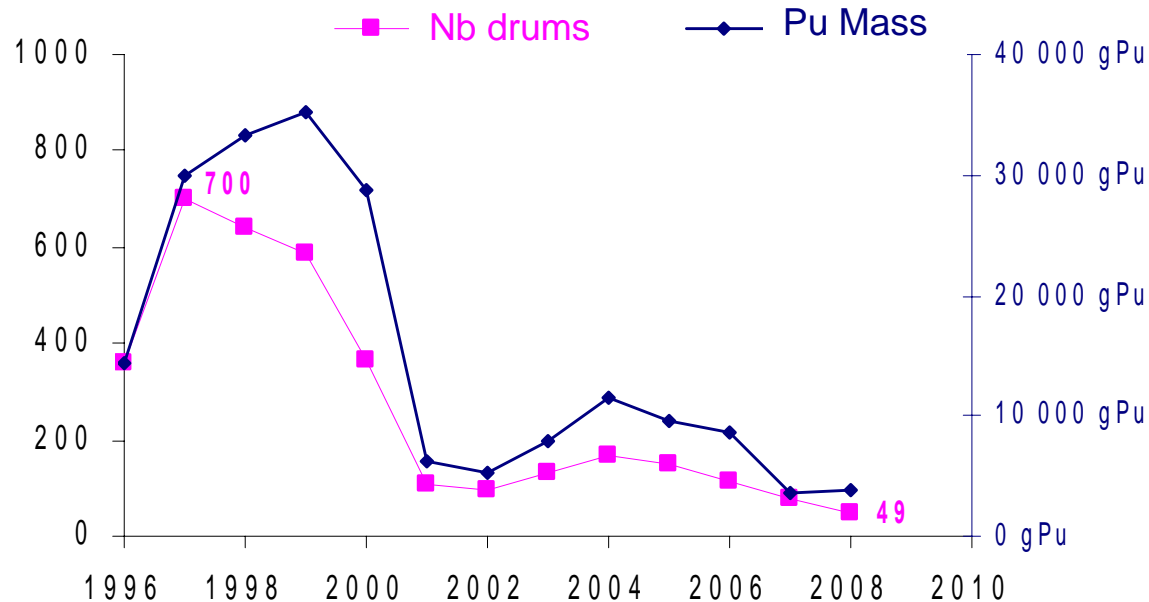
▶ Two types of alpha waste :

◆ Medium level waste



Alpha waste generated during MOX fuel manufacturing at MELOX (3/3)

◆ High level waste



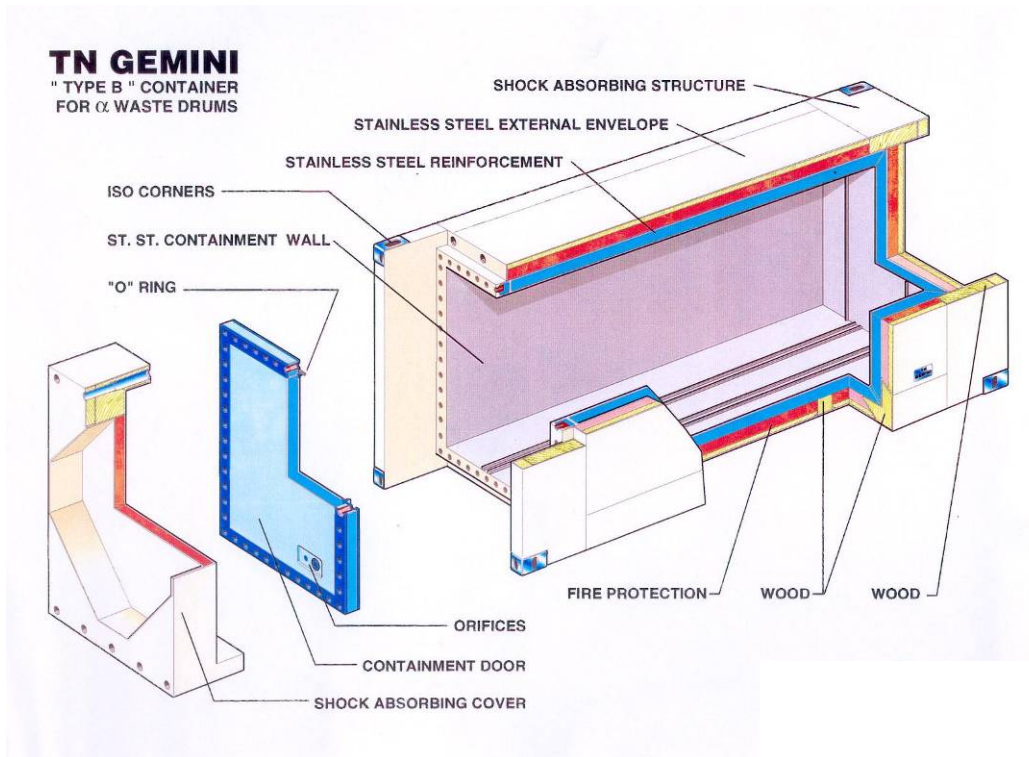
► Evolutions:

- ◆ Increasing MOX fuel production.
- ◆ Increasing quantity of plutonium and uranium oxides inside a drum.
- ◆ Increasing ^{238}Pu content → Increasing heat power per drum.

LOGISTICS

Waste transportation packagings (1/2)

- ▶ **TN GEMINI™**: a 20-foot ISO container like packaging, initially designed for medium level waste transportation



Waste transportation packagings (2/2)

- ▶ **RD26: a small light cylindrical shaped packaging, initially designed for high level waste transportation**



Up to 12 RD26 shipped together in a 20-foot ISO container

Transportation optimization (1/4)

Modular design of the TN GEMINI™ packaging

- ▶ Initially, the whole capability of the packaging was not authorized because there was no need for.
- ▶ In 2009, optimization of the payload of the packaging.
- ▶ **Criticality issue:**
 - ◆ Modelling updated thanks to computer code progress.
 - ◆ Realistic isotopic composition of Pu taken into account.
 - Less pessimistic reactivity coefficient
 - **Increase of the allowable quantity of fissile materials**
- ▶ **Radiolysis issue:**
 - ◆ Modelling updated thanks to computer code progress.
 - Less pessimistic temperature
 - Less pessimistic amount of gas generated
 - **Increase of the allowable heat power**



Transportation optimization (2/4)

Modular design of the TN GEMINI™ packaging

▶ A new licensed payload since April 2010:

- ◆ High level waste can be loaded in TN GEMINI™ packaging:
 - ➔ No more need for two types of package.
- ◆ MELOX is no more restricted by the certificate of approval:
 - ➔ Enables MELOX to optimize the content of the waste drums.



Transportation optimization (3/4)

Security issue

- ▶ **Until September 2009, category III materials had to meet the following requirements in France:**
 - ◆ Maximal mass of plutonium per shipment: 400 g,
 - ◆ Unlimited mass of natural or depleted uranium.
- ▶ **Optimized licensed payload of the TN GEMINI™ packaging:**
 - ◆ Up to 640 g of plutonium per shipment
 - ➔ Needs reinforced measures of security relating to category II materials.
 - ➔ Impossible to implement with the TN GEMINI™.
- ▶ **Deviation granted so as to transport waste in the same conditions as for category II irradiated materials in case of: Pu weight $\leq 0,1$ %.**
- ▶ **Since September 2009 in France, extension of category III materials to waste in which the weight percentage of nuclear materials is not higher than 0.1 %.**

Transportation optimization (4/4)

Consequences



- ▶ **A strategy of sustainable development leading to:**
- ▶ **Economic development with cost optimization:**
 - ◆ Profit for MELOX as consignor: decrease of the number of transports and of the generated waste drums.
 - ◆ Profit for AREVA NC La Hague as consignee.
- ▶ **An environmentally friendly logistics plan:**
 - ◆ Cancellation of 10 transports per year:
 - ➔ 25000 km, 9000 liters of fuel and then 25 tons of CO₂ saved.
 - ◆ Reduction of the number of maintenance operations:
 - ➔ Consumption of spare parts and the generation of effluents saved.
- ▶ **Social development:**
 - ◆ Reduction of the number of transports by public highway:
 - ➔ Recommendations of the French authorities met.
 - ◆ Reduction of the radiation exposure for workers.



Q&A