



Siempelkamp

Nukleartechnik

Utilization of External Capacities as an Integral Component of Concepts for Residues and Dismantling Using the Example of the CARLA-Plant

Thomas Kluth, Siempelkamp Nukleartechnik GmbH, Krefeld, Germany



Strategy



National energy politics will generate a veritable wave of decommissioning projects in near future.

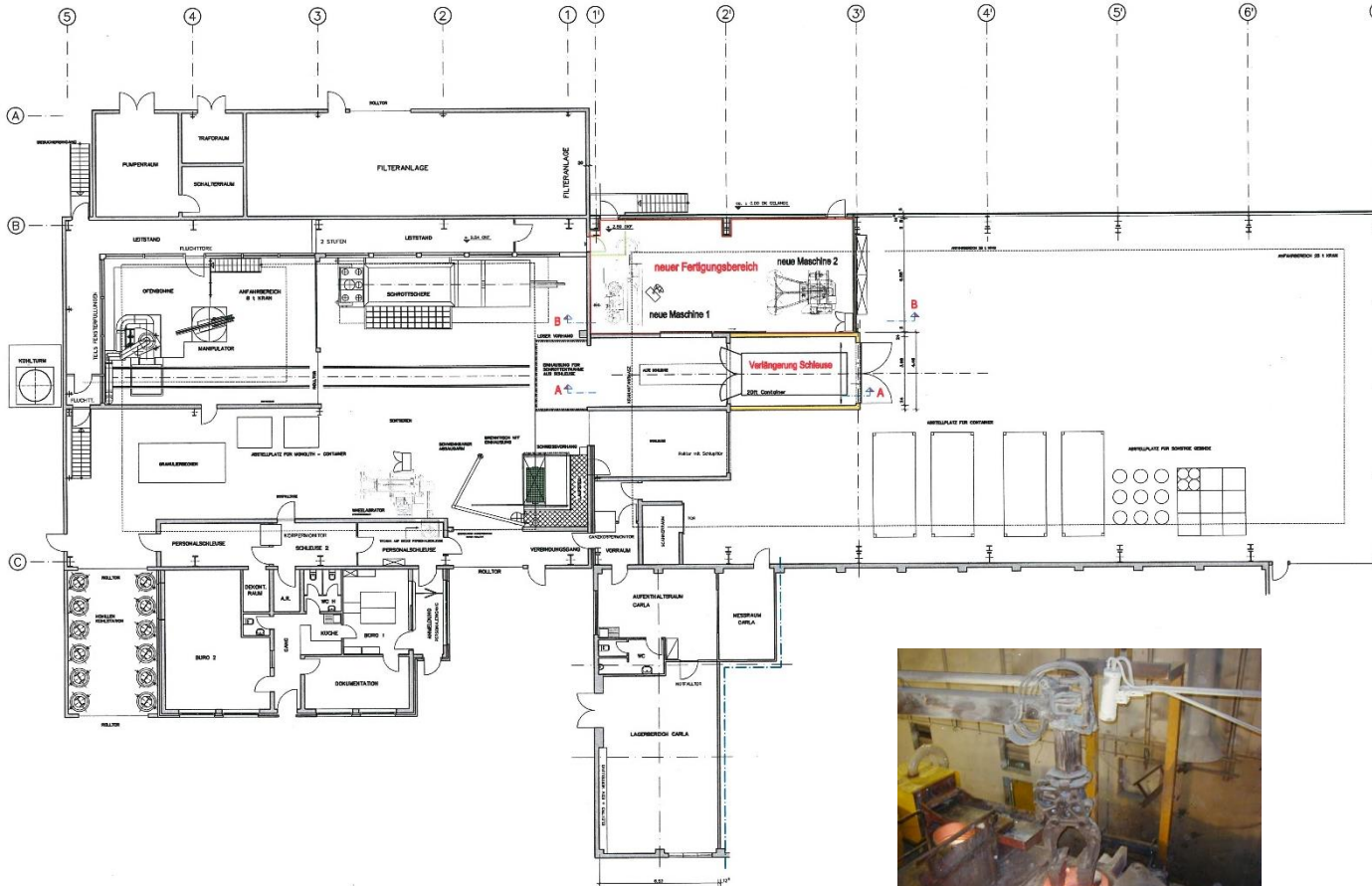
This can only be managed by consequently implementing the pool of experiences having been established up to now.

Modern dismantling strategies must facilitate a **flexible** interaction of dismantling and processing of residues.

The whole process of dismantling must become more **efficient**.

Increasingly involving external capacities like the **CARLA plant**, can contribute essentially to tackling this task.

Plant



Layout CARLA Plant



- **Licensed capacity: 4.000 t/a**
- **Free capacity: 2.000 t/a**
- **24 years of failure-free operation**
- **More than 29.000 t of metal have been safely processed**
- **At present transition from two to three shift operation**
- **Plant is operated customer specifically**
- **Accredited measurement laboratory**

Licence



- Licence acc. to § 7 of the German Radiation Protection Ordinance for the treatment of radioactive materials
- Licence acc. to Federal Immission Control Law for a melting facility
- Acceptance Limits:
 - 1.000 Bq/g in total
 - add. 10.000 Bq/g for H-3, C-14, Fe-55 and Ni-63
 - < 15 g/100 kg portion of fissionable nuclides
- Origin of material:
 - from the whole nuclear cycle worldwide

Sorting and Cutting



- **Sorting area for scrap and mixed waste.**
- **Cutting of components up to dimensions of 2,5 m x 2,5 m x 12 m.**
- **Broad range of mechanical and thermal cutting equipment available:**
 - **450 t hydraulic shears**
 - **Mobile hydraulic shears**
 - **Wire saws / cold cutting machine**
 - **Plasma burner and gas burner**
 - **Manual tools**

Decontamination



The CARLA was equipped with a new decont room:

- Operation of two suspension track blasting equipments for material up to:
 - Ø 900 mm, length 1.100 mm, unit weight approx. 400 kg
- Equipment with an inside pipe blasting device for:
 - Tubes with inside diameter 20 - 200 mm, unit length < 1 m

Melting



Treatment of

- **Ferrous metals**
 - carbon steel / iron
 - stainless steel
 - galvanized steel
 - coated steel
- **Non-ferrous metals**
 - aluminium
 - copper
 - brass
 - lead
- **Compound material**
 - two-component-material
e.g. stainless steel / lead

Melting



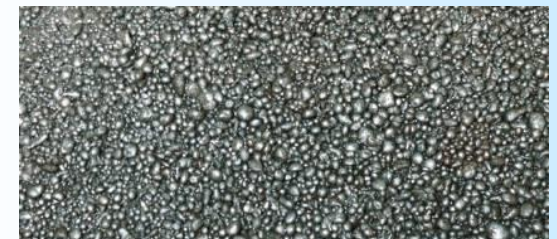
- Melting in a **3.2 tons** MF-induction furnace
- Homogenisation by electromagnetically induced circulation
- Casting to **1 ton** ingots



Granulating



- Producing of granules
- Pouring of the liquid iron through a high pressure water jet
- Generating of granules with diameters between 1 - 8 mm for the manufacturing of heavy concrete containers



Melting



Max.gross weight of containers: 24 t

Preferred materials:

- generally: surface contaminated metals
- for recycling: carbon steel
- for sale after release:
stainless steel,
copper, brass,
aluminium, lead

Preferred nuclides in fingerprint:

- U, Pu, Am, Th, Pa, Sr, Cs, Ag, Eu, C, H (high decontamination effect by melting)
- Fe, Ni (high release limits)
- Co (short half life time)

Sampling & Analysis



- In-process sampling of all resulted materials (here as an example for dust, slag and metals)
- Sample geometry corresponding to the calibration standards
- Analysis in the SNT laboratory, accredited according to DIN EN ISO/IEC 17025 by gamma-spectrometry
- Provide a comprehensively radiological documentation
- Retain samples of all fractions have to be stored

References



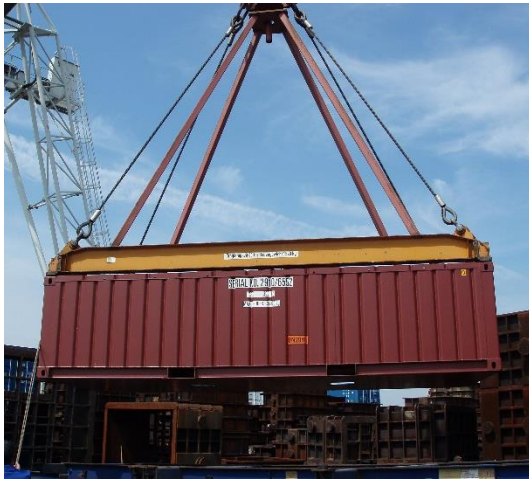
Material:

- **Ferrous metals** **27,250 t**
 - carbon steel / iron
 - stainless steel
 - galvanized steel
 - coated steel
- **Non-ferrous metals**
 - aluminium **725 t**
 - copper and brass **300 t**
 - lead **600 t**
- **Compound material** **125 t**
 - two-component-material
e.g. stainless steel / lead

Projects with customers from:

- Germany, UK, Netherlands, Italy, Belgium, Austria, Switzerland and France

Buffer and Decay Storage



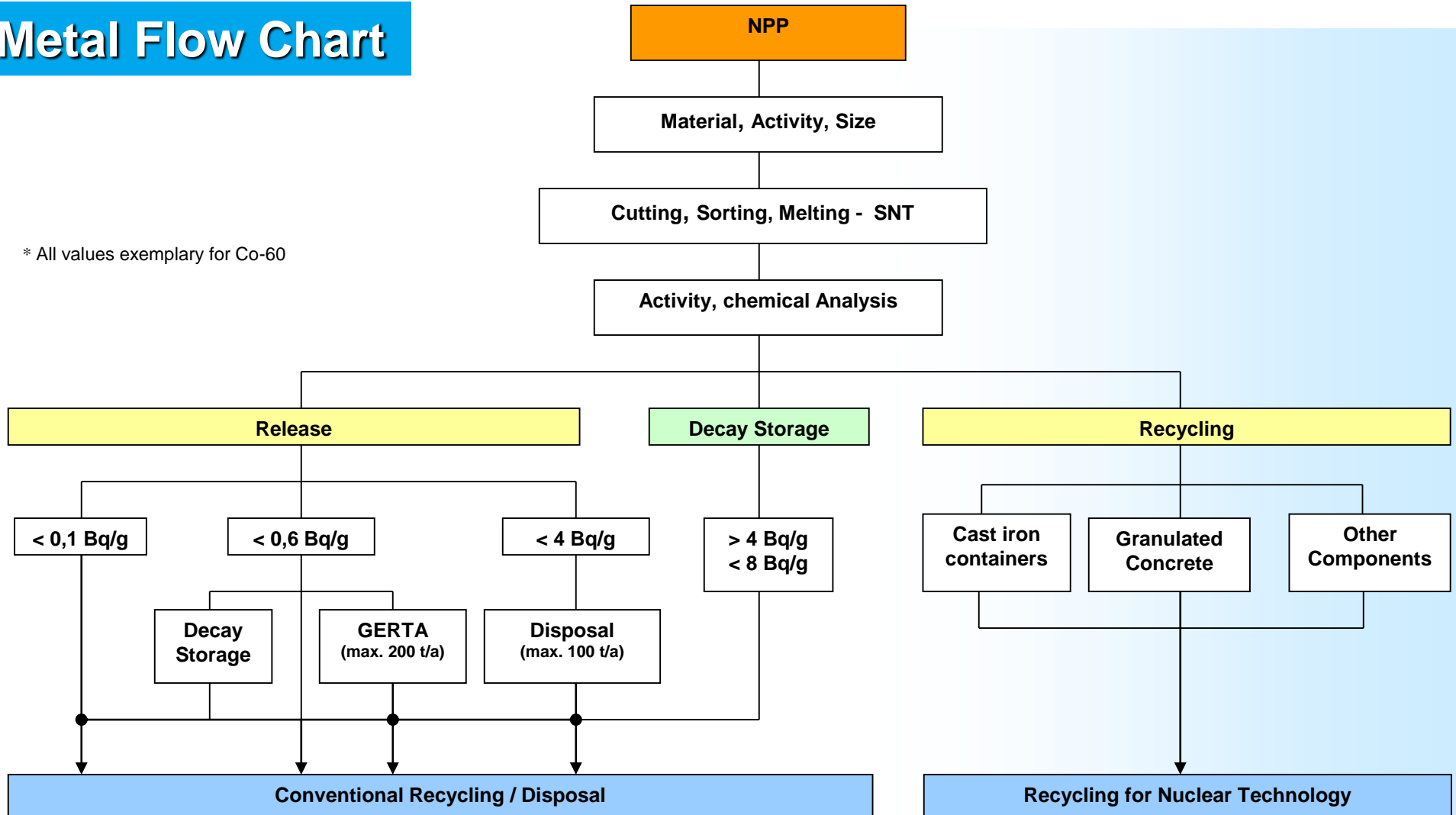
- Container storage yard for up to 130 pcs. of 20'- containers
- Licensed storage period for delivered material of 3 years.
- Buffer storage for resulting ingots over 5 years.
- Decay storage for 500 t of ingots with max. 8,3 Bq/g of Co-60 over 20 years.
- Storage of process waste for max. 0,5 / 1,0 years.

Storage capacity creates flexibility!

Recycling

Metal Flow Chart

* All values exemplary for Co-60



Recycling

Recycling Products

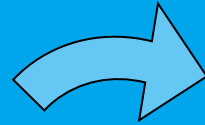
MOSAIK® casks	5,500 pieces
Cast iron containers	189 pieces
Granulate concrete casks	2,204 pieces
Taylor made containers	203 pieces
Total	8,096 pieces



Recycling



Radioactive metals of nearly all kinds from operation and decommissioning of nuclear plants throughout the world are delivered to CARLA for processing.



By processing in CARLA metals are decontaminated and qualified. Only approx. 5 % of radioactive waste is resulting for disposal.



95 % of the metals can be re-used after processing by SNT. Approx. 40% of them can be released and approx. 60 % will be re-used for new products in nuclear industry. Up to now, more than 27.000 t could be recycled by CARLA.



Of a given quantity of **29,000 t** of melted metals in CARLA:

- **15,000 t** have been re-used within nuclear industry
- **10,500 t** have been re-used outside nuclear technology after release
- **1,500 t** have been returned to the customers

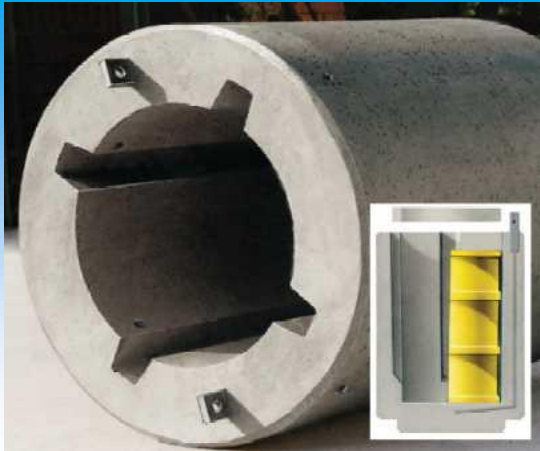
Advantages



The concept for residues of the CARLA plant

- **Avoiding waste, reducing the waste volume and facilitating a later re-use of the residues;**
- **Offering sufficient capacity, even for future peaks of demand;**
- **Increasing the flexibility of the operators regarding dismantling strategies like moving forward disassembly works to the post-closure phase or parallelly processing different project sections;**
- **Optimizing the whole material logistics in your plants;**
- **Boosting efficiency of your dismantling projects!**

Thank you very much!



Siempelkamp

Nukleartechnik

Siempelkamp Nukleartechnik GmbH

Siempelkampstraße 45
47803 Krefeld – Germany

Contact: Thomas Kluth

Tel.: + 49 (0) 2151 / 894-299

Fax: + 49 (0) 2151 / 894-488

E-mail: thomas.kluth@siempelkamp.com



www.siempelkamp.com