

## **D&D: Dismantling and Release of Large Components at the GNS Premises in Duisburg on the Example of a CASTOR S1 Container – 13536**

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### **ABSTRACT**

There are a lot of metallic large components for the transport of radioactive waste in Germany. Some of these large components like for example the Castor S1 with 82 Mg are so old, that the transport via streets is not possible because the permission is not valid anymore. The application for a new permission is economically not reasonable. Out of this reason the large components need to be decontaminated and recycled to use them again in the economic cycle. Decontamination of large components by cleaning/removing the surface for example with beam technology is a very time-consuming release procedure. Manufacturing a specialized machine for decontamination and creation of a new surface was the intention of this project. The objective was to save interim storage and final repository volume and costs as well as developing a process that is nationally and internationally usable. 90% of the volume/mass of waste could be released and therefore possibly re-used.

### **INTRODUCTION**

Sat. Kerntechnik GmbH received the inquiry for issuing an offer for the decontamination of contaminated large metallic components like Castor S1 Container from GNS. Five castor containers (ca. 400 Mg) are stored in the GNS premises in Duisburg.

The intention is to find an economic useful way to decontaminate and deconstruct them so that they can be released from radiological control and be recycled. A Castor type S1 is 4.5 m high, has a diameter of 1.9 m, a max. weight of 82 Mg and an inner surface of 270,000 mm<sup>2</sup>. The necessity of a concept to work inside the Castor in narrow space without harming the employees is clear. After several trials and a market research the decision felt for developing a special “overturning machine”, which skims the inner surface of the Castor container for 2-3 mm. Like this it is ensured to get a new and clean surface. The needed release measurements from radiation protection are conducted on a complete new surface and are 100% usable. The preventive decontamination of the outer surface takes place after release measurements for unrestricted use of the inner surface,. The preventive decontamination happens through a high pressure abrasive grid blasting method. With this tool the outer surface and color coating of the castor container vanishes. The release measurements for radiation protection can be made for the whole Castor like this.

## DESCRIPTION

Due to the wide experience of the company and after checking all technical possibilities, the development for a special “overturning machine” was decided. The requirements for this complicated procedure with a length of 4.5 m and a diameter of 1.6 m were set in cooperation with an engineering office and manufacturer. The special machine was built with these requirements.



Figure 1: “overturning machine” with a sample pipe

The Castor container was clamped on the machine after removing the lid. The next step was to put a milling fixture in the correct position on the edge of the castor container.

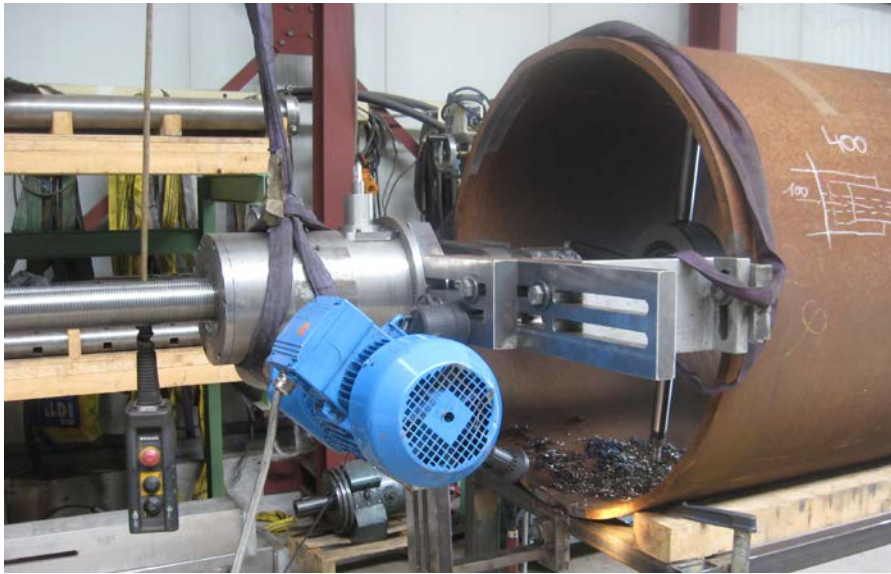


Figure 2: pipe with swarf

Two or three millimeter of the inner surface were removed with a restricted pressure. The removed and falling swarf could be contaminated and were therefore removed with an exhaust device.



Figure 3: pipe from inside

After finishing the inner decontamination, the outside surface was decontaminated with an abrasive grit blast. With a high pressure of circa 6bar steel shot or sand was shot on the metallic outer surface of the castor container. Through this process the color coating and outer surface was removed.



Figure 4: abrasive grit blasting



Figure 5: example of a blasting cabin

The radiation measurement and release took place after decontaminating the castor container from inside and outside. The last step was the deconstruction of the Castor container. The container without lid has a weight of circa 70 Mg. The crane at the GNS premises in Duisburg can lift up to 30 Mg. To transport the Castor container and deliver it to a disposer the piece has to be deconstructed or divided in more parts. The bottom of the castor will be removed first. The pipe will be divided in half by a diamond drop saw afterwards. The two parts of the pipe will again be divided lengthwise. The results are four different pieces each below 30 Mg. As explained the deconstructions are carried out with a diamond wire saw. For this a special diamond wire usable for cast iron is put around the castor container. The wire saw is equipped with a 15 m wire.



Figure 6: diamond wire saw

## **DISCUSSION**

There are different possibilities to decontaminate and deconstruct a castor container. Because of the wide experience and technical experience of both companies the solution with the better economic and technical reasons were chosen. The decontamination of the inner surface with hand used machines (for example grinding machine) was not reasonable because the health and safety of the employees are too difficult to ensure. With this method the employee would need to be on an operating platform inside of the Castor container. The decontamination effect is not as big as with a machine and the time consume would be much more. In addition the hand used machine like a grinding machine only removes 1 mm of the surface and some experience working in containers is necessary. Another advantage of the described method is a reduction of dose for employees.

The chosen process is a good combination of surface decontamination with a special “overturning machine” and conventional disassembling technique.

## **CONCLUSION**

Sat. Kerntechnik and GNS tested different possibilities of decontamination and dismantling large metallic components. The different methods of nuclear technology were tried with equally prepared samples. For large components like the Castor S1 the abrasive grid blasting and special over turning machine is the solution with the best effect, less costs and best time.

The saving of interim storage and final repository volume and cost is ensured and the process is nationally and internationally usable. A recycling inside and outside of nuclear areas is possible after the decontamination of the metals and the final repository acceptance criteria are met.