Dismantling and Release of Large Metallic Components at the GNS Gesellschaft für Nuklear-Service mbH Premises in Duisburg on the Example of a CASTOR® S1 Container – 14165

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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

There are a lot of metallic transport containers for high-level radioactive waste in Germany. Some of these large components like e.g. the CASTOR® S1 with 82 Mg are very old and have lost their permission. The application for a new permission is economically not reasonable. Therefore, these large components need to be decontaminated and recycled to use them again in the economic cycle.

Normal decontamination methods, e.g. high pressure technologies, do not create a new surface. In this project a new special machine for the decontamination of the container's inner surface was planned and built. In detail a milling machine for creating a new surface was designed.

The objective was to save interim storage and final repository volume and costs, as well as developing a process that is nationally and internationally applicable. More than 95 % of the volume/mass of waste could be released and therefore possible re-used.

MATERIALS AND METHODS

Fig. 1 – CASTOR® S1

The specifications of the large transport containers are as follows:

Type:	CASTOR® S1
Height:	4.5 meters
Diameter:	1.9 meters
Max. weight each:	approx. 82 Mg
Inner Surface:	270,000 mm²

Decontamination method for inner surface:
Removing the surface of about 2 mm with the inner milling machine.

Decontamination method for outer surface:
High pressure abrasive grid blasting method

Cutting method:
Diamond wire saw technique

OBJECTIVES AND RESTRICTIONS

The radiological control measurements as well as the release should be made by using a newly created surface.

Recontamination of already decontaminated surfaces had to be avoided in any case. National and international usability had to be ensured.

In any case, the health and safety of the employees involved needed to be ensured at any time of the process, e.g. by reaching a reduction in dose by using a remotely controlled milling machine.

After decontamination the CASTOR® shall be cut into smaller pieces of less than 30 Mg of weight.

RESULTS

Special milling machine (not operated directly by operators)

The requirements for the complicated procedure of decontamination of the inner surface with a length of 4.5 meters and a diameter of up to 1.6 meter were set in cooperation between our engineers as well as the manufacturer of the final machine.

The special milling machine is locked in the CASTOR® via a fixture system and enables the correct positioning of the milling head.

2 - 3 mm of the inner surface is removed with restricted pressure. The removed and falling swarf might be contaminated and therefore needs to be removed with an exhaust device.

Fig. 2 – Milling machine in mock-up

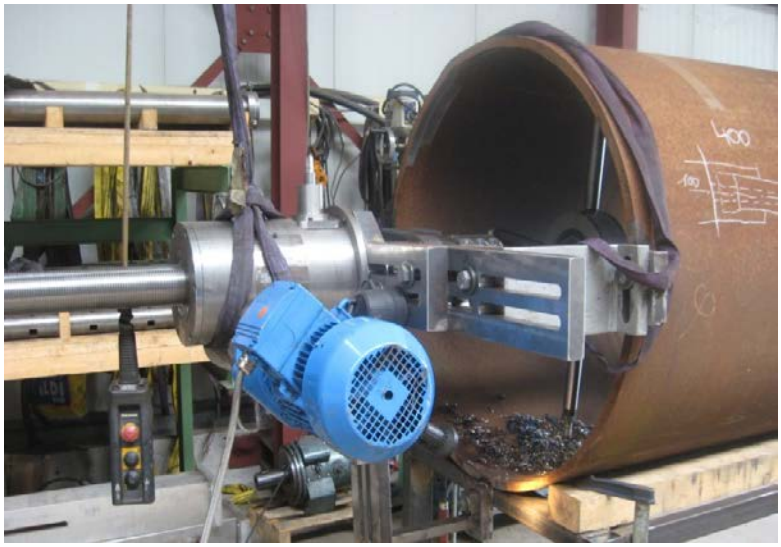

Fig. 3 – Pipe with swarf

After having finished the inner surface decontamination, the outer surface is decontaminated with a high pressure abrasive grit blasting method. Color coating is removed and the outer surface is decontaminated.

Finally, radiation measurement and release take place after complete decontamination.

Fig. 4 – Milling head

FURTHER HANDLING

The last step is to deconstruct the CASTOR® container. The CASTOR® with a weight of approx. 75 Mg (without lid) needs to be divided in smaller pieces of less than 30 Mg to enable the available crane equipment to lift.

The bottom of the CASTOR® is removed with a diamond saw and the remaining pipe is divided into two parts (two smaller pipe segments).

Fig. 5 – Diamond wire saw

DISCUSSION

There are different possibilities to decontaminate and deconstruct a CASTOR® container. Because of the wide experience and technical knowledge of GNS Gesellschaft für Nuklear-Service mbH and sat. Kerntechnik GmbH a solution with the best economic and technical value was chosen.

The special milling machine replaces manual decontamination, reduces human work and thus ensures health and safety of the workers including dose minimization.

The chosen process is a good combination of surface decontamination with creating a new inner surface with a special milling machine and the usage of conventional disassembling techniques.

CONCLUSION

Several different possibilities of decontaminating and dismantling of large metallic components have been tested. For large components like the CASTOR® S1 the abrasive grid blasting and special milling machine is the solution with the best effect, less costs and best time including consideration of health and safety. The saving of interim storage and final repository volume and cost is ensured and the process is nationally and internationally applicable. After the above mentioned processing the CASTOR® container can be further handled within the conventional economic cycle.