

EXPERIENCE WITH SYSTEMS FOR COLLECTION, TRANSPORTATION AND STORAGE OF RADIOACTIVE WASTES

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Abstract

EXPERIENCE WITH SYSTEMS FOR COLLECTION, TRANSPORTATION AND STORAGE OF RADIOACTIVE WASTES.

Transnuklear (TN) has developed a system for the collection and transportation of low level radioactive wastes called Mostram Collect. This system is in service in several nuclear power plants in the Federal Republic of Germany. For intermediate and final storage of radioactive wastes, TN has designed the Mostram Protect system, consisting of different types of heavy shielded, cast-iron containers. A number of these containers are also in service.

EXPERIENCE WITH THE MOSTRAM SYSTEM

In the past, solid and bulky low level wastes (LLW) in nuclear power plants (NPP) have been collected in plastic bags or in drums and have been stored until transportation to external conditioning plants in 20 ft³ containers.¹ Liquid LLW, some containing oil and cleaning chemicals, have been stored in 200 or 400 L drums. However, this system was not sufficient because of the risk of radiation exposure of personnel, fire safety and contamination in the NPP. Other aspects that also proved to be less than satisfactory included transportation and handling in conditioning plants.

¹ 1 ft³ = 2.832 × 10⁻² m³.

Faced with these problems, Transnuklear (TN), together with Rheinisch-Westfälisches Elektrizitätswerk (RWE), developed a new system called Mostram Collect, a mobile collection and transportation system for low level radioactive wastes. This system comprises the following special containers and related equipment:

- (1) Multipurpose containers for bulky wastes (MZB-N);
- (2) Multipurpose containers for liquids (MZB-T);
- (3) Flats for voluminous components (MZB-P);
- (4) Multipurpose containers for maintenance purposes, e.g. tool boxes (MZB-S);
- (5) Transportation equipment;
- (6) 20 ft transportation container.

The system has been in service, since 1984, at the following NPPs in the Federal Republic of Germany (FRG): RWE Biblis-A; RWE Biblis-B; GKN Neckarwestheim; KKG Grafenrheinfeld; KKV Unterweser; KKS Stade; KKP Philippsburg; KBR Brockdorf; KMK Mühlheim-Kärlich. Preparations are under way to introduce them at other NPPs. The system was found to work well in its first period of service at the RWE Biblis NPP during the 1984 maintenance period.

RADIATION PROTECTION EXPERIENCE

During this maintenance period, 122 MZB-N multipurpose containers were available at Biblis-A and -B, with about 30 of these having been placed in predetermined positions at the plant. It was found that radiation exposure decreased considerably, the cumulated dose rate being calculated to have decreased between 1983 and 1984 by 6 man·rem.²

FIRE SAFETY

Standard collection systems use plastic bags with a volume of 80 L. These bags give no protection against fire and can be penetrated very easily.

The Mostram MZBs, on the other hand, are constructed from tightly welded stainless steel plates with wall thicknesses of 3 mm. The top can be closed by a lid, or optionally, by a special flame-extinguishing cover. In particular, the MZBs have double walls. Figure 1 shows a cutaway of a Mostram MZB-N for the collection of mixed bulky wastes.

²1 rem = 1.00×10^{-2} Sv.

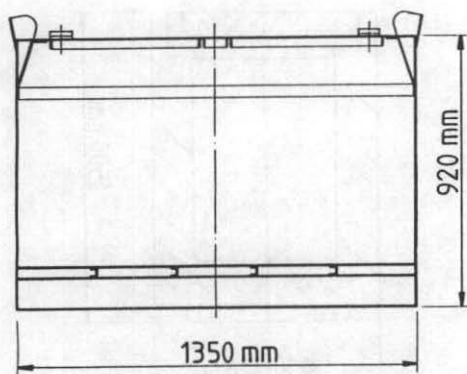


FIG. 1. The Mostram MZB-N container.

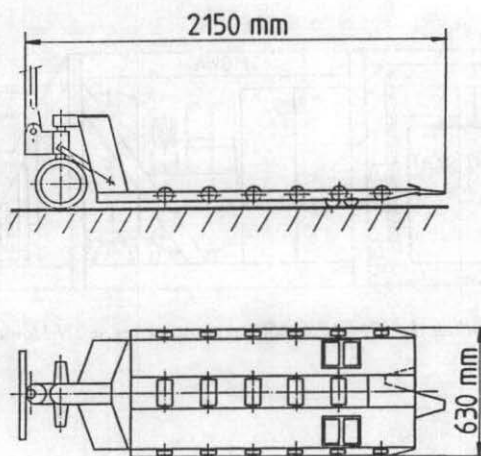


FIG. 2. The Mostram forklift.

type	outside diameter (mm)	height (mm)	wall thickness (mm)
TN-SAB/G 300	1060	1500	200
TN-SAB/G 400	1000	1240	120
TN-SAB/G 500	1060	1500	160
TN-SAB/G 650	1060	1500	120

FIG. 3. The Mostram Protect family.

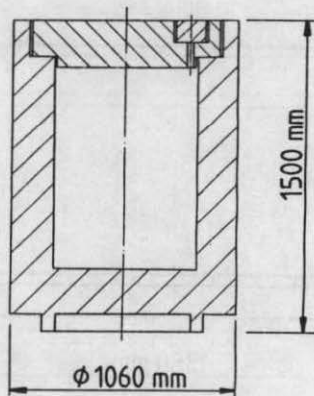


FIG. 4. The TN-SAB/G-300 container.

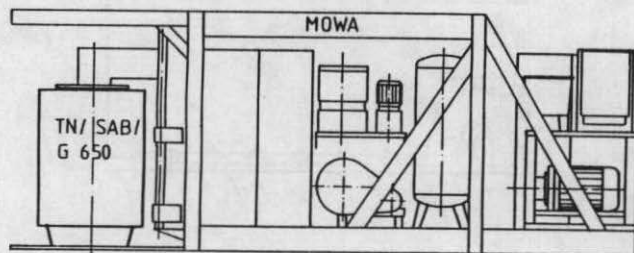


FIG. 5. Filling the TN-SAB/G-650 container using a TN-Mowa installation.

LIMITATION OF CONTAMINATION

Several lifting and transportation devices are available in the Mostram system. One is the Mostram forklift, based on a normal forklift (Fig. 2). By coupling two of these lifts, it is possible to transfer a MZB over area border lines in the NPP without passing the border line with one lift.

SAFETY OF TRANSPORT

Mostram MZBs will only be transported by road or rail in specially equipped 20 ft³ containers. Like the MZBs, these containers are double-walled. The MZBs are individually fixed inside the containers. As a result, the radioactive wastes are wrapped in four steel walls.

EXPERIENCE WITH THE TN-SAB CONTAINERS: MOSTRAM PROTECT

Transnuklear has also developed a family of nodular cast-iron containers, called Mostram Protect, which includes:

- (1) Type B packages for materials with activities up to 1000 Ci ^{60}Co .³
- (2) Packages with properties close to Type B packages for materials with lower specific activities.

The Mostram Protect family conforms to the new IAEA Regulations and, in addition, to the requirements of the planned final storage facility (the Konrad Mine) in the FRG. These containers were tested, according to IAEA Regulations, by the Bundesanstalt für Materialprüfung, in Berlin (West). Drop tests were carried out with and without shock absorbers.

Admission of the containers to the Konrad final storage facility requires that the integrity of the container should be maintained after exposure to a hypothetical fire accident in the mine (a fire temperature of 800°C for 1 h). Accordingly, TN tested a serial container of the TN-SAB/G-500 type which was filled with wet bead resin and with a moisture content of approximately 50%. After the test, the integrity of the container was checked using leak tests. Optical inspection showed no damage to the container and gasket temperatures were below limits. Figure 3 shows the members of the Mostram Protect family of containers, a number of which are now in service.

The TN-SAB/G-300 is a Type B container designed for underwater loading of core components (Fig. 4). It can be equipped with an inner lead shielding up to 100 mm in thickness. Activity up to 1000 Ci of ^{60}Co equivalent can be loaded into this type of container.

Another Mostram Protect container is the TN-SAB/G-650, its main application being for packaging evaporator concentrates.

Figure 5 shows such a container together with the TN-Mowa installation. Many of these containers are in service now in NPPs in the FRG and most of them are designed to meet Type B requirements.

The Mostram Protect family is made complete by transportation devices such as special crane adapters designed to meet the German KTA 3902/3903 Standard. For transportation by road or by rail, a 20 ft flat with special locks has been designed and is in service.

³ 1 Ci = 3.70×10^{10} Bq.