Official Monitoring of the Quality Assurance in the Manufacture of Spent Fuel and High – Level Waste Transport and Storage Casks

Uve Günther, Dr. Manfred Baden, TÜV Rheinland Group, 10882 Berlin, Germany
Thilo Nitz, Federal Institute for Materials Research and Testing (BAM), 12200 Berlin, Germany
• System of surveillance of the quality assurance according to the German technical rules Traffic (TRV006)

• Practical application:

Manufacturing of TN 85 Transport – and Storage Casks with German design approval certificate Europe weide
Purpose of the surveillance

• the series sample of a packaging must be conform to the authorized design

and

• deviations must be avoided, at least surely detected to allow an evaluation
Basis of the production

Design approval certificate of the German Federal Office for Radiation Protection (Bundesamt für Strahlenschutz-BfS)

Entire description of the packaging by

- Drawings
- Part Lists
- Material test sheets

07/11/2007
Basis of the Quality Assurance

TRV 006 (Technical Rules Traffic)

with requirements on

- Manufacturers
- Quality Assurance

corresponding to the safety importance of the components

Experts of TÜV Rheinland Industrial Service (BAM/T1) are consulted by the German Federal Institute for Materials Research and Testing (Bundesanstalt für Materialforschung und –prüfung-BAM) for the independent surveillance of the whole process

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Class 1
Components that have a **direct influence** on integrity/leak tightness of casks, subcriticality and shielding

Class 2
Components that have a **indirect influence** on integrity/leak tightness, subcriticality and shielding

Class 3
All other components
Conditions of the TRV 006 for the demonstration of the relevant characteristics of processes and materials

**Class 1:**
- first qualification and monitoring of the manufacturer and also sub-suppliers by BAM/T1 in relation to the QM system and the manufacturing processes on the basis of specifications,
- manufacture and documentation on the basis of manufacturing and test plans (MTP´s)
- checking and approval of all relevant documents by BAM/T1
- nonconformance reports have to be accepted by BAM (and BfS for subcriticality / shielding)

**Class 2:**
- as class 1 components, but without monitoring by BAM (except non-conformances)

**Class 3:**
- self-regulation by manufacturer

07/11/2007
The main tasks of experts of TÜV Rheinland BAM/T1 are:

Verification and certification of manufacturers qualification

Examination and approval of manufacturing- and test plans (MTP) and the belonging specifications and drawings of the licensee as well as of the component manufacturers

Surveillance of the manufacturing within the framework of the MTP’s

Assessment of non-conformities in cooperation with the competent authorities

Final check of the manufacturing documentation and certification that the realisation compiles with the approved design
Practical application: Manufacturing of the TN 85 Transport – and Storage Casks

Transport of high level waste from the French reprocessing plant to a German interim storage facility and the following interim storage

Design approval certificate of the German Federal Office for Radiation Protection (Bundesamt für Strahlenschutz-BfS).

Licensee is the French company AREVA TN international (TNI)

Manufacturing Europe wide

Official Monitoring by TÜV Rheinland’s experts (BAM/T1) consulted by the German Federal Institute for Materials Research and Testing (Bundesanstalt für Materialforschung und –prüfung-BAM)
Description of the cask TN85

Top shock absorbing cover with aluminium flange

Primary lid

Copper basket

28 Canisters of vitrified residues

Cooling fins

4 trunnions

Bottom shock absorbing cover

2 concentric seals

Lateral transport shock absorbing ring

Forged body

Lead/steel plate/resin compound
Manufacturing of the cask components and assembling Europe-wide

Forged shells from a French manufacturer

Bottoms and lids forged by an Italian manufacturer

Screws from a French and a German manufacturer

Metal gaskets from a French manufacturer
Manufacturing of the cask components and assembling Europe-wide

Trunnion from a Czech manufacturer

shell-bottom welding performed by a French Manufacturer

Assembling of the cask components including the pouring of resin in two production lines by one Belgium and one French manufacturer
Verification and certification of manufacturer’s qualification

The qualification of manufacturers class 1 components was monitored by BAM/T1 in the form of audits.

The audits were held jointly by TNI and BAM/T1 on the basis of bilaterally accepted programs.

They focus on the quality management system and the general conditions at the manufacturers, especially on:

- Human resources and infrastructure,
- Product realization,
- Measurement, analysis and improvement.

A period of 2 years has been defined by BAM.
Examples for the qualification of manufacturing techniques under the supervision of BAM/T1 are:

**Forged cask shell**

On the basis of the requirements of the material specification

Additional requirements regarding the homogeneity of the mechanical characteristics

Additional assays regarding the sub-zero toughness behaviour
Examples for the qualification of manufacturing techniques under the supervision of BAM/T1 are:

Shell-bottom welding

On basis of a standard ASME WPQR

with additional assays concerning residual welding stress

and dynamic fracture toughness.
Examples for the qualification of manufacturing techniques under the supervision of BAM/T1 are:

- **Resin pouring**

  by test pouring under realistic conditions (aluminium profiles).

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Preliminary examination of quality documents of the component manufacturing (class 1) as well as of the cask assembly

The preliminary examination of all documents was performed by BAM/T1 in terms of approval compliant manufacturing.

For the project TN85 more than 700 quality documents of TNI and their manufacturers were examined and released prior to the start of manufacturing.

This process was a challenge for all the involved parties.

Kick-off meetings for the final updating of the documents were necessary.
Build-up of an independent manufacturing surveillance (components class 1 and ask assembly)

For this purpose a Europe wide net of independent inspectors (T2) was created to act on behalf of the consulted experts BAM/T1.

Prerequisites for the personal nomination and assignment of T2 inspectors are:

- Membership in an accredited surveillance organisation,
- Proven qualification and professional experience of the inspectors,
- Individual instruction
- Clearly defined field of action
- Duty to inform BAM/T1 in case of quality problems.

For the project TN85 the number of 30 T2 inspectors were approved and assigned.
Surveillance of the actual manufacturing process

Regarding the holding points in the MTP inspectors T1/T2 act as independent surveillance party that has to certify the manufacturer’s results for the acceptance of the tests.

The licensee informs the BAM/T1 about the dates of the tests by notification.

BAM/T1 decides on his own participation in the tests or the assignment of T2 depending on the specific quality situation or safety relevance of the tested components.

Therefore a number of notifications have to be dealt with every day by TNI and BAM/T1.
Surveillance of the actual manufacturing process

Main areas for the surveillance are:

- Material acceptance tests
- Non-destructive tests
- Dimensional checks
- Compliance with process parameters
- Assembling tests like leak tests, and overload tests et al.
Non-conformities: Dependent on the influence on the approved design they are classified in 3 categories

**Type 1:** Undesigned lasting non-conformities with the approved design (parts list, concept drawing, material specification)

The licensee proves, in an adequate report (FTD A1) that the non-conformities are not safety relevant.

If necessary, repair measures and corrective actions to avoid recurrence, have to be proposed, to be approved, and to be proven after execution.

The acceptance has to be obtained from BAM, T1 and, if necessary, from other authorities.
Non-conformities: Dependent on the influence on the approved design they are classified in 3 categories

**Type2:** Non-conformities within the framework of the MTP (for example change of manufacturing sequence or a deviation to an intermediate dimension)

The licensee proves, in an adequate report (FTD A2), that the approved design is not affected and obtains the acceptance from BAM/T1.
Non-conformities: Dependent on the influence on the approved design they are classified in 3 categories

**Type 3:** Planned changes of a design approved under the transport law, need the acceptance of the authorities.

The licensee applies for that by FTD A3 at the German authorities.
Final inspection and verification of the manufacturing documentation

The manufacturing documentation comprises the verification proving that class 1 and 2 components have been manufactured and assembled in conformity with the design.

BAM/T1 checks for compliance with the requirements, completeness and correctness. With his acceptance certificate, he confirms the conformity with the approved design according to the transport law, taking into consideration the approved changes (FTD A3) and the tolerated non-conformities (FTD A1).
Final inspection and verification of the manufacturing documentation

After a successful verification of the documentation the identification plate of the cask will be stamped with BAM/T1 and the date of the next periodic inspection.

The acceptance certificate of the consulted expert BAM/T1 forms, at the same time, the basis of the certificate of conformity under the atomic law by BAM.
Summary

The good use made of the German rules and regulations TRV 006 for the official surveillance of the manufacturing of type B packaging were shown.

The increasing globalization of manufacturing requires, more than ever, a centralized independent regulatory surveillance, as under the given responsibility of BAM, ensuring the design conformity of the packaging.

The net of independent quality assuring surveillance created for this purpose, in addition to the quality assurance of the licensee has proven to be worthwhile.
On September 27, 2007, the design conformity of the first cask of the TN85 series was certified and stamped.

On October 2, 2007, BAM certified the conformity of the cask for the license under the atomic law, as basis for the emplacement in a German interim storage facility.