

- **Conditioning of Balduf-filters and additional core scrap materials** at Grafenrheinfeld NPP.



Control of grab and camera

- Höfer & Bechtel produces **gamma-camera** for NUKEM – Productive use **for waste characterisation** at Chernobyl and Sosnovi Bor NPPs.
- **'Post-Scanning'** – Effective use of scan data by integration of plant identification codes (PIC) and pipe fittings.



Detail of a scan showing linked PICs

Conditioning of Balduf-filters, level control instrumentation and other core scrap materials from the spent fuel pond at Grafenrheinfeld NPP

Beside irradiated fuel assemblies used filters and additional rest materials are stored in the spent fuel pond before further treatment. At Grafenrheinfeld NPP these filters and materials should be retrieved, packed into 200l drums and brought to the drum store. In detail there were Balduf-filters, NTG-filters, level control probes and various buckets filled with small parts. First Höfer & Bechtel was ordered to develop a concept for the conditioning procedure and later to realize the disposal itself. ➤



Covering of a MOSAIK-cask

HÖFER & BECHTEL

> Minimization of the collective dose

Some of the core scrap materials showed high dose rates. Therefore one of the main aspects was to minimize the exposure to radiation of the working personnel, which was realized by an integrated shielding concept. So all compact units were lifted into a shielding hood before being transported from the spent fuel pond to the 200L drum. This hood had been built for Isar NPP by Höfer & Bechtel and was used for the conditioning procedure. Additionally the hood was equipped with a dose rate probe and a b/w camera for monitoring and documentation of the retrieval. The 200L drum was positioned in a MOSAIK cask while being filled and transported to the drum store.

Further treatment of some materials was done under water in the spent fuel pond itself, in the separation pond or in a handling pool which had been delivered by Höfer & Bechtel, too.

> Balduf-filters

Eight standard Balduf-filters had been stored in the spent fuel pond. These were grabbed by a special Höfer & Bechtel grabber and drawn into the shielding hood. Two additional non-standard Balduf-filters first had to be prepared by special handlings before being retrieved according to the defined procedure.

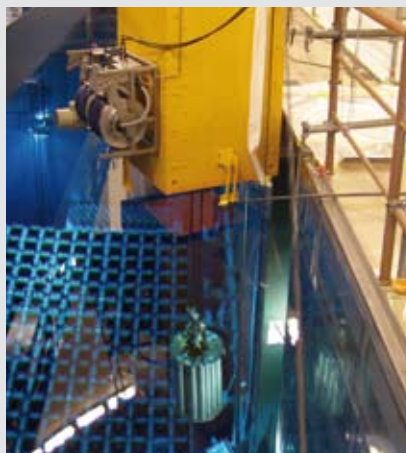


Reloading of level control probe sections into a transportable bucket

> Level control probes, NTG-filters and additional core scrap materials

Because the level control probes are about 5,6 m in length they had to be sectioned before loading them into the designated drums. So they were sheared under water by use of a hydraulic cutter. The sections were reloaded into a bucket, which was brought to the MOSAIK

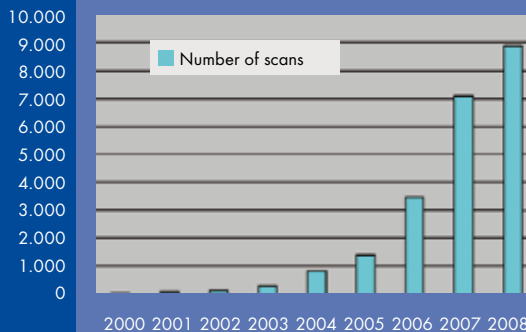
cask containing the designated drum. While being transported to the drum the bucket was lifted into the shielding hood. For the retrieval of the NTG-filters and the additional buckets with scrap materials another special Höfer & Bechtel grabber was used. Some of the scrap materials had been reloaded to more suitable buckets before being lifted into the shielding hood.



A grabbed standard Balduf-filter is feeded into the shielding hood

> Conclusion

The whole conditioning campaign including dry run took 5 weeks in time. A total of 18 drums were loaded and brought to the drum store. The actual collective dose was 4.8 mSv, which was considerably beyond the estimated value. The experiences of this conditioning campaign already were considered while developing a concept for the retrieval of Balduf-filters at Unterweser NPP.



> Höfer & Bechtel produces gamma-camera for NUKEM

In cooperation with NUKEM Technologies GmbH Höfer & Bechtel advanced a γ -camera-device, originally developed by NUKEM, for productive use and delivered it in three types.



Mobile γ -camera with a special collimator system for minimized measuring periods in cases of low radiation intensities

γ -rays are electromagnetic waves like visible light is. The γ -camera uses these optical characteristics by - similar to a pinhole camera - collecting the rays, that passed a narrow collimator, on the electro-optical part of the camera. This electro-optical part consists of a scintillator behind which there is positioned the light collecting device (CCD). In result you get the γ -picture - a distribution of γ -intensities spread over the "photographed" area. This γ -picture is overlaid with the picture taken by a b/w-camera. The resulting "double-picture" visualizes the γ -intensity of the mapped objects.

The main task for Höfer & Bechtel was to assemble the camera including necessary components like electro-optical head, cooling device, electronic devices, b/w camera, personal computer and collimator system in a way, that fitted specific demands of the customers. According to NUKEM's specification a special collimator system was realized to reach short measuring times even with low radiation intensities.

> Camera for sorting of high active waste

Two γ -cameras were delivered to Chernobyl NPP and Leningrad (Sosnovi Bor) NPP, both RBMK reactors, for sorting of high active waste. Hot spots can be recognized by the camera and removed in the following process for best separation of different waste flows. Additional both γ -cameras were equipped with γ -spectrometers (NaI-respectively CdZnTe-detector) for determination of the emitting radionuclide. The Chernobyl- γ -camera furthermore is fitted with a Geiger-Müller-probe, so that by dose rate measurement the waste qualification can be optimized.

A mobile γ -camera device was delivered to NUKEM for its own purposes.

> Up to September 2008 Höfer & Bechtel has taken 8.900 laserscans. Scanning and modelling of the spent fuel cask pond at Temelin NPP (Czech republic), which was ordered by GNS mbH, is one of the newest projects.

> In August 2008 the geometries of 66 fuel channels at ISAR 1 NPP were checked by use of the Höfer & Bechtel channel measuring device. The condition of fuel elements and control elements at PWR Isar 2 had already been checked during outage in July 2008 by application of the Höfer & Bechtel - IBESE (device for inspection of fuel elements and control elements).

> By application of the two Höfer & Bechtel main cooling pump cleaning devices (HKMP) the main cooling pumps at Grafenrheinfeld NPP, Grohnde NPP, Gösigen NPP (Switzerland) and Emsland NPP were successfully cleaned in 2008.



Transport of Höfer & Bechtel HKMP II boxed in an appropriate container

> Beside Areva NP, Brunsbüttel, Philippsburg and Grohnde NPPs now also Isar 1 and Isar 2 NPPs use **CLOUDIA** explorer for the intelligent organization of scan data and additional linked data. At Brokdorf NPP the use of **CLOUDIA** explorer is currently planned.



For more than 30 years Höfer & Bechtel GmbH is a successful mid-sized company based at Mainhausen, Germany. A team of 40 staff members is developing and realizing high-tech solutions especially in nuclear technologies. Conception of appropriate processes and production of special equipment for handling, radiological measurement and protection purposes are part of our competences. By introduction into laser-scan technologies already in the year 2000 Höfer & Bechtel is one of the pioneers in this powerful sector. Premium IT-services complete our portfolio.

Since 1999 Höfer & Bechtel is certified according to DIN EN ISO 9001. Furthermore the company is accredited as a deliverer according to KTA 1401.

Höfer & Bechtel GmbH

Ostring 1 · 63533 Mainhausen
Germany
phone: +49 (0)6182 8903-0
fax: +49 (0)6182 3671
info@hoefer-bechtel.de
www.hoefer-bechtel.de
www.laserscanning-3d.de

> Post-Scanning – effective use of scan data

Summarizing the scans of various small and large scale scan projects, which were done with different objectives, some plants have a broad data basis available for documentation. The use of these data can be considerably increased e.g. by integration of plant identification codes (PIC), which has been realized by Höfer & Bechtel for Grohnde NPP and Brunsbüttel NPP.



Localization of a PIC within the scan

Using the Höfer & Bechtel **CLOUDIA explorer** the PIC can be linked to the scan data. Now the PIC is not only visible within the scan but can also be located in the pool of scans: After keying the PIC into the search window the associated scan is opened and focused to the PIC. In this

way the component which is characterized by the PIC can be reviewed in its real looking environment.

> Quality control as a welcome secondary effect

At Grohnde NPP the relevant PICs were imported out of the plant management system (BFS) into **CLOUDIA explorer**. Thus typing errors could be minimized. – About 15 years ago these PICs had been extracted out of Höfer & Bechtel P&ID-plans and inserted into the BFS by use of the Höfer & Bechtel software BIANCA A. – At Brunsbüttel NPP the PICs were collected from revised P&ID-plans. Additionally here the identification codes of pipe fittings were added to the scan data. In both cases the linking between the scan and the PICs was done on-site. Thus the relation between the PIC and the room identifier could be checked against the real situation and corrected if necessary.

Via **CLOUDIA explorer** the data can be made available all over the plant IT-infrastructure. By this broad access the benefit of the data can be furthermore increased.