DECOMMISSIONING AND DISPOSAL OF 22 FUEL FLASK TRANSPORT WAGONS

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ABSTRACT

AEA Technology is currently decommissioning a fleet of redundant fuel flask transport wagons on behalf of Nuclear Electric. The project is in two stages: the systematic dismantling of 3 wagons to provide information to determine a disposal strategy; decommissioning and disposing of the fleet. The first stage is complete, and a case for free release of the bulk of each wagon was based upon the results. The case was approved by the regulatory authority and decommissioning of the remaining 19 wagons began in October 1989. The work is on schedule, and will be completed to time and cost in April 1991. On completion, 540 te steel will have been disposed of by free release, and sold to the scrap metal market.

BACKGROUND

In the UK, irradiated fuel is commonly moved between power plants and the Sellafield reprocessing plant by rail. The fuel is contained in transport flasks which are loaded onto specially designed wagons known as Flatrols.

The original fleet of 22 wagons is now redundant and has been replaced with new rolling stock. It was known that some of the redundant wagons had become very slightly contaminated during their 20 years operational life which complicated their disposal. The contamination is due to sweat-out of activity from the painted surfaces of the mild steel flasks which had previously absorbed activity during immersion in contaminated fuel pond water. The levels of contamination on the Flatrols are very low and have complied with IAEA transport requirements during their long and reliable operational life.

The wagons consist of a central flask-carrying well 3.2 m long, which is suspended at each end from a platform 5.5 m long. These three sections constitute the flatbed, which has an overall length of 15.8 m and weighs 27.5 te. The flatbed is mounted on two pairs of bogies to form the Flatrol wagon which has an all-up weight of 37.5 te.(Fig. 1)

However, before a disposal route could be identified and agreed with the appropriate UK regulatory authorities a detailed knowledge of contamination levels was required.

The project was carried out by AEA Technology on behalf of Nuclear Electric and was completed in two stages:

- Stage 1 -To systematically dismantle three Flatrols to determine the nature and extent of the contamination and to use this information to develop a disposal strategy and agree a safety case with the UK regulatory authorities.
- Stage 2 -To decommission and dispose of the remaining nineteen Flatrol Wagons.

The project was started in 1988 and the first stage completed in 1989; the second stage was started in late 1989 and is on schedule to be completed to time and cost in April 1991.

DECOMMISSIONING AND EXAMINATION OF THE FIRST FLATROL WAGON

Based on the information available from records the wagon likely to have the highest contamination levels was selected for detailed dismantling and examination.

The following strategy was adopted:

- Deliver the wagon to the Winfrith Technology Center; separate the flatbed from the bogies; transfer the flatbed to the decommissioning facility; return the valuable bogies, after monitoring, to the owner for reuse.
- Dismantle the flatbed, with direct probe monitoring at every stage.
- From the direct probe surveys, select a representative number of pieces for gamma spectroscopy in order to identify the radionuclides present.
- Chemically decontaminate all contaminated pieces and determine the total activity on the wagon.

Before dismantling, the entire flatbed was washed with high pressure water to remove loose material and the washings collected for radiochemical analysis. The results showed no contamination above background, implying that all contamination was fixed to the wagon.

The flatbed was systematically dismantled using, as far as possible, cold cutting methods (pneumatic chisels, grinders and electric nibblers); flame cutting was used where cold cutting was not possible.

Each piece was monitored, numbered, and recorded on a manifest sheet.

CONTAMINATION ON THE FIRST FLATROL

Direct probe monitoring showed the contamination on the first wagon was limited to the central well area. Fig. 2 shows schematically the location of contamination on the stainless steel cladding of the well, and Fig. 3 shows the girderwork revealed after removal of the cladding. Contamination on the girderwork is located mainly at the joints

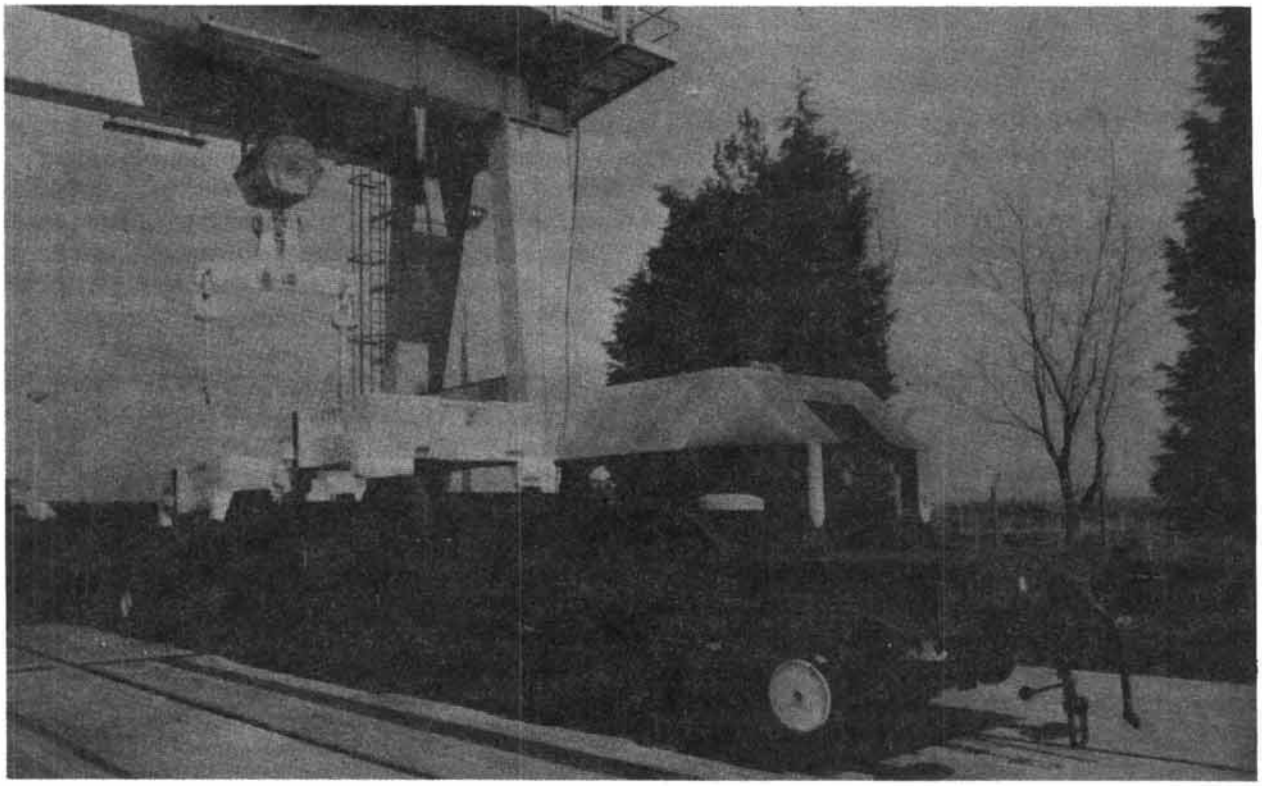

Fig. 1. A flatrol wagon.

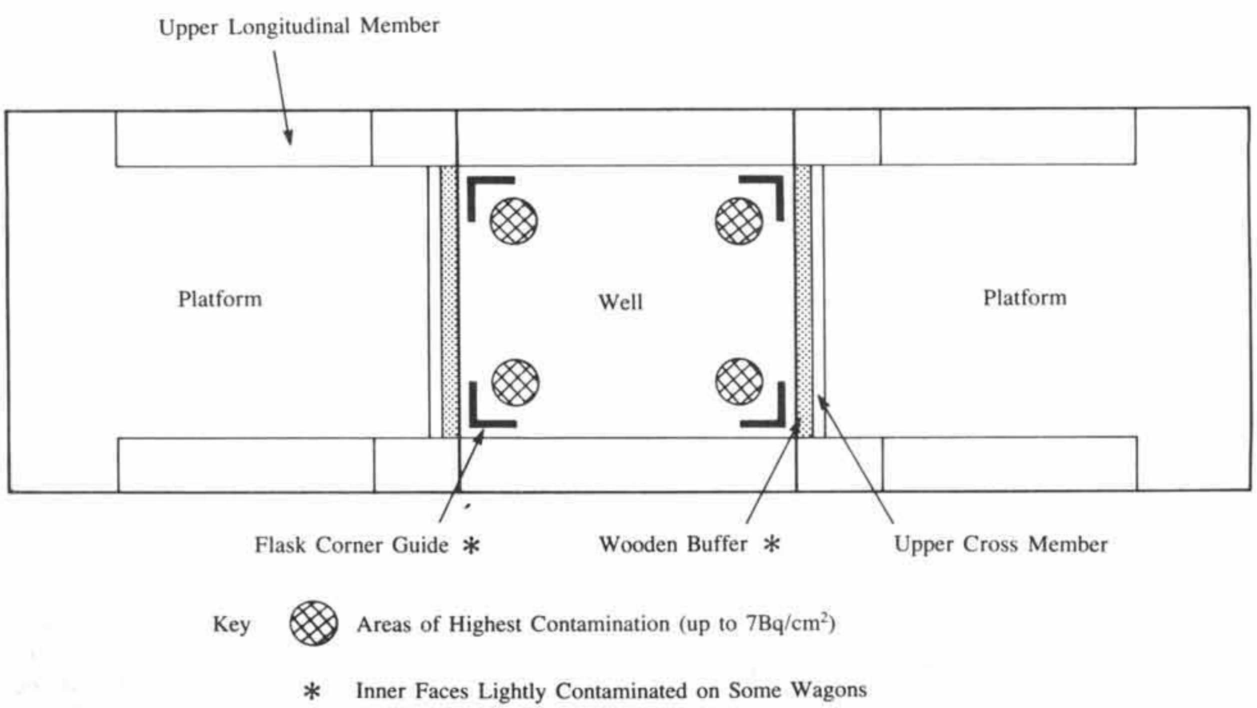

Fig. 2. Plan view of flatrol showing main components and contaminated areas in well section.

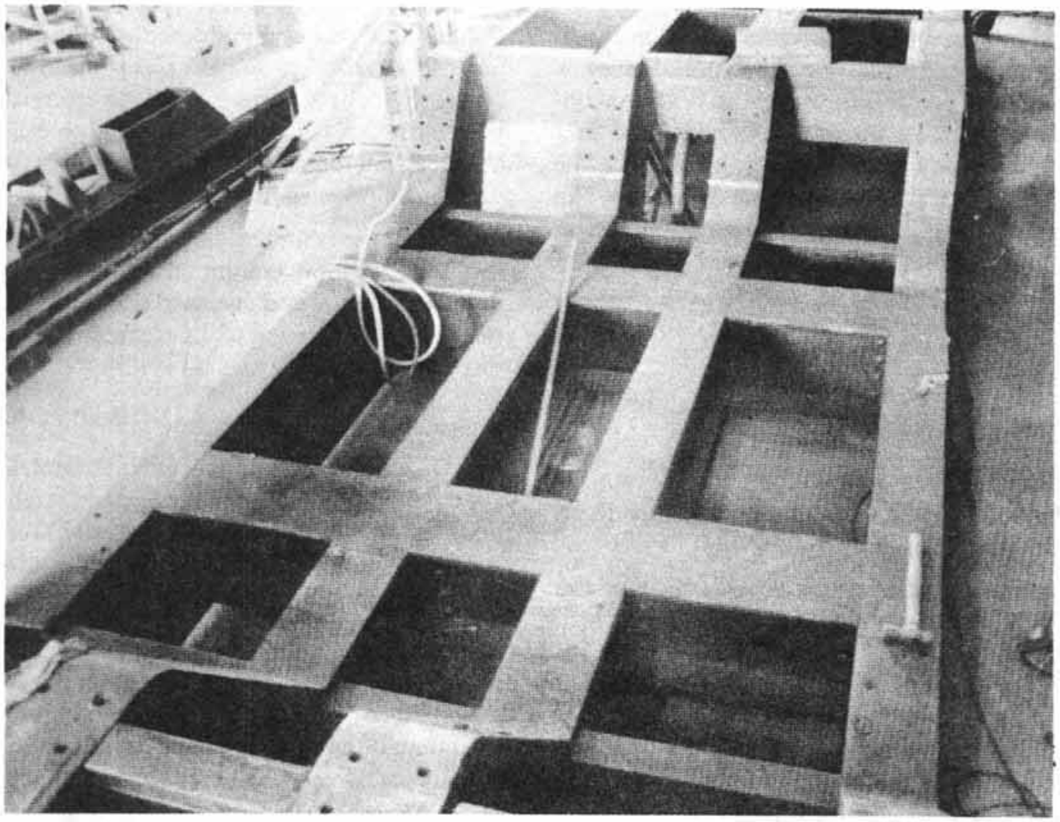

Fig. 3. Girder work beneath cladding. Contamination is confined to the well section, and located mainly at the joints.

between the four longitudinal members, and the six central cross-members.

Care was taken to expose all surfaces not normally available for routine monitoring, including the opening of box sections as it was envisaged that the traces of contamination could have been widely transported by weather effects.

Contamination levels were relatively low - the highest spot on the cladding was 50 cps (= $7Bq/cm^2$) and on the girderwork, 600 cps (= $80Bq/cm^2$).

Gamma spectrometric analysis of selected contaminated pieces revealed that caesium was the principal contaminant, with much smaller quantities of cobalt also present.

Chemical decontamination of all contaminated pieces, followed by radiochemical analysis of the spent liquor was used to determine the total quantity of activity on the flatbed. The results showed that total beta activity was 37 MBq and total gamma was 1.1 MBq. This activity was confined to 8% by weight of the flatbed. (ie 2.2 te)

THE FIRST FLATROL - CONCLUSIONS

The work demonstrated that 92% by weight of the flatbed was uncontaminated and suitable for disposal as clean scrap steel. The remaining 8% by weight, all originating from the central well area could be classified as low level waste and could be sent for disposal at the UK's shallow land disposal site at Drigg in Cumbria. The relatively low value of scrap steel would not justify the cost of decontamination to unrestricted release levels.

DECOMMISSIONING OF THE 2ND AND 3RD FLATROLS

Two further Flatrols were decommissioned in the same painstaking manner as the first, with the objective of confirming the results and to gain further experience, so that a carefully costed decommissioning plan could be prepared for the rest of the Flatrol fleet. The strategy adopted for the first wagon was applied to the second and third with the emphasis on examining and demonstrating the uncontaminated nature of the 'clean' pieces.

EXAMINATION OF THE CLEAN PIECES

In the UK, 0.4 Bq/g is the limit below which material is regarded as non-active and suitable for free release. Therefore, all metal pieces from a wagon complying with this requirement could be sold on the conventional scrap metal market. However, it is necessary to gain approval from the relevant regulatory authorities first. (in the UK, Her Majesty's Inspectorate of Pollution) Such approval is granted on a case-by-case basis. To achieve this it is necessary to demonstrate conclusively that the material is below this limit. A number of pieces, representative of the uncontaminated areas of the two wagons were examined in a shadow shield whole body monitor, normally used for the routine monitoring of radiation workers at Winfrith. The monitor is capable of quantitatively measuring activity levels as low as 0.001Bq/g. Measurements showed that activity levels on the material were well below the 0.4 Bq/g limit.

THE 2ND AND 3RD FLATROLS - CONCLUSIONS

Work on the second two Flatrols confirmed the conclusions drawn from the examination of the first, ie:-

- ~90% of the flatbed is uncontaminated
- the ~10% that is contaminated is located exclusively in the central well region and is fixed
- all contaminated material can be classified as low level waste
- the uncontaminated parts have activity levels that have been shown to be less than 0.4 Bq/g and are suitable for unrestricted release

This stage of the project was completed in 1989.

DECOMMISSIONING OF THE REMAINING 19 FLATROLS

The information obtained during the decommissioning and examination of the first three wagons was used to draw up a decommissioning plan for the remaining 19. A vital part of the plan was to submit a robust case to the regulators for the unrestricted release of the uncontaminated parts of the flatbeds.

The case was based on evidence such as the Whole Body Monitor measurements and the application of a strictly controlled segregation procedure to ensure that contaminated and uncomtaminated material do not become mixed. The latter ensures that contaminated and uncontaminated pieces are assigned to low level waste disposal and free release, respectively.

The regulators approved the case in September 1989 and the task of decommissioning the fleet was commenced in October 1989; work is currently in progress, with each flatbed being carefully dismantled, the pieces segregated and disposed of as 'clean' scrap or low level waste, as appropriate. As a cross checking exercise, a number of pieces of each flatbed are subjected to examination in the Whole Body Monitor before the clean scrap from that wagon can be released.

When the contract is completed in April 1991, 22 wagons with a total weight of ~ 600 te will have been decommissioned and disposed of. Approximately 540 te of this will have been sold as clean scrap metal and 60 te disposed of as low level waste.

OVERALL CONCLUSIONS

On completion of the current contract for Nuclear Electric, approximately 540 te of clean steel, which has been associated with contaminated material, will have been sold as 'clean' scrap.

This has been achieved by applying quality assured procedures agreed with the regulatory authorities.

The work has been a valuable exercise in demonstrating the ability to free release significant quantities of uncontaminated material from the nuclear industry and at the same time conserving valuable space in the national low level waste repository.

BIBLIOGRAPHY

S. P. BURKE, M. G. A. PENGELLY, M. J. SANDERS "Free Releasing Scrap from 22 fuel Transport Wagons to the Scrap Metal Market; Quality Assurance Aspects" Waste Management 91 Session xxii February 1991.

ACKNOWLEDGEMENTS

This project was carried out by AEA Technology under contract to Nuclear Electric and the authors gratefully acknowledge their permission to publish this paper and for the valuable help provided in the initial stages of the work.

The authors also gratefully acknowledge the consistently splendid efforts of the Winfrith Technology Center Decommissioning Team which has enabled the project to run to time and cost.