

Trawsfynydd Ion Exchange (IEX) Resins Campaign

8

(Final stage)

Summary of Assessment Report

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Background

This Assessment Report describes the findings of the assessment by NDA Radioactive Waste Management Directorate (RWMD) of the proposals for the final full campaign of packaging Ion Exchange (IEX) resins at Trawsfynydd (Campaign 8) using the Resin Solidification Plant (RSP). The proposals are based on the application of the previously implemented process for packaging IEX resins in the RSP, as applied in the previous seven campaigns. Campaign 8 covers the remaining bulk resins stored in Resin Vaults 2 and 3 (RV2 and RV3) together with a transfer of resins from the Water Treatment Plant to RV3.

The packaging of IEX resins from Trawsfynydd has been the subject of numerous interactions between Magnox and both RWMD and its predecessor Nirex. Consequently, the current submission is based largely on demonstrating consistency with an existing endorsed process, an approach successfully adopted for a number of the previous campaigns. In order to address expectations at the Final stage, the current assessment has taken credit for previous assessments of the packaging of IEX resins.

RWMD Reference Basis for Assessment and Endorsement

Disposability Assessment considers the compatibility of the proposed packages with the requirements for safe long-term management, including storage, transport, emplacement and potentially extended storage underground, and disposal. The current reference basis for this assessment of disposability is the conceptual designs for a Geological Disposal Facility (GDF) derived from the generic Disposal System Safety Case (DSSC). Further information on the Disposability Assessment process is available elsewhere¹.

Where appropriate, and in accordance with Principle 8 of the Disposability Assessment Aim and Principles (RWP60), RWMD may assess and endorse proposals that do not immediately or directly result in the production of a disposable product. In such cases, the product should clearly represent a step in the production of a disposable product and the intermediate product should not compromise the ability subsequently to produce a disposable product.

The general requirements placed on ILW packages for disposal in a GDF are embodied in the RWMD Packaging Specifications.

¹ NDA, *Guide to the Letter of Compliance Process*, NDA Document WPS/650, March 2008.

Scope of the Assessment

This Assessment Report details the outcome of the assessment of the consistency of the proposed packages to be produced under Campaign 8 with the existing Final stage endorsement of the packaging of IEX resins at Trawsfynydd. This is the first interaction regarding these wastes.

Since the packaging of IEX resins at Trawsfynydd will be the subject of a forthcoming Periodic Review, a formal Assessment of Disposability for the packages to be produced under Campaign 8 has not been produced at this time. Instead, the Periodic Review will encompass all packages containing IEX resins, including those produced under Campaign 8. Consequently, the assessment considers only the consistency of the proposals with RWMD expectations for the Final stage. The following documents have been considered:

- relevant Magnox company standards and other controlling documentation;
- the governing Production Quality Plan (PQP);
- the methodology for data recording as deduced from relevant documents;
- relevant examples of forms to be included in the proposed package records;
- the Waste Product Specification (WPrS) for packages produced under Campaign 8.

The ultimate aim of dialogue on these proposals is to ensure that any issues have been addressed and that a full suite of necessary and relevant documentation is in place.

Packaging Proposals

Nature of the waste

Campaign 8 covers the remaining bulk resins stored in Resin Vaults (RV) 2 and 3. For efficiency, as a prelude to this packaging campaign the resins stored in RV2 have now been transferred to RV3 prior to retrieval for packaging in combination with the remaining resins in RV3. It is also understood that further transfers of miscellaneous sludge (degraded resins) and resin from the Water Treatment Plant to RV3 also have taken place.

The waste for packaging comprises up to 35.4m³ of inorganic and organic IEX materials, and sand. This volume includes an unknown quantity of finer material (<355 µm), principally degraded inorganic IEX materials, that would not be packaged in the RSP; finer material being excluded during processing using a hydrocyclone.

Waste processing and packaging

The waste would be retrieved and immobilised into Type 1803 drums by polymer encapsulation in the Resin Solidification Plant (RSP). This process remains as considered in numerous previous assessments and is not described in detail. It is noted that the polymer formulation remains unchanged from that used in Campaign 7.

It is recognised that the shielding provided in the Type 1803 drums is of variable thickness and typically would be tailored to a campaign to optimise waste loading whilst meeting relevant dose-rate constraints (in particular Trawsfynydd operational requirements). In the case of Campaign 8, Magnox has proposed that the waste would be packaged using the drums that have been tailored to RV2 resins as packaged in Campaign 7, namely a shielding thickness of 92mm.

The Type 1803 drums are not currently included in the list of packages for disposal at a GDF. Consequently, it is currently assumed by Magnox that the Type 1803 drums would be over-packed into 4m boxes for transport and disposal. In keeping with previous assessments, this assessment has been based on the assumption that six drums would be over-packed into each such box.

Assessment Inventories and Number of Packages

The assessment inventory has been developed by RWMD, based on the reported sampling and analysis of the previous contents of RV2 and RV3. It is recognised that there remains some uncertainty as to whether these relatively old data fully represent the remaining waste. However, more recent dose-rate surveys indicate that the activity is somewhat lower than previously observed, confirming that the older data are conservative. The reported errors/uncertainties in the reported data have not been considered in defining the average inventory (some reported values are not significantly different to zero, or are reported as 'less than' values). It is intended that neglecting this information contributes to a conservative estimate of the total inventory and therefore of the average waste package inventory.

A maximum inventory has been defined based on the higher of the reported specific activity data and the variability between waste package dose-rates observed in previous campaigns.

Based on the currently proposed target formulation, the waste loading would be 228 litres per drum. This would necessitate the use of up to 156 Type 1803 drums for the complete packaging of the assumed volume of waste. The number of drums does not allow for the diversion of finer material and in practice the number of packages produced would be lower. On the basis of six drums per 4m box for disposal, 26 boxes would be required for the over-packing of the drums arising from Campaign 8.

Assessment of the Submitted Documentation

Documents were submitted by Magnox to demonstrate that the packages to be produced under Campaign 8 would be consistent with the existing endorsement. This documentation was supported by wider Management System documents to provide a clear picture of how Campaign 8 would be controlled and waste package records generated.

Overall, it has been concluded that Campaign 8 would be consistent with the existing endorsement and that the Management System arrangements would be sufficient to implement the process as it has been understood previously. It is further concluded that, recognising that Campaign 8 represents the culmination of, and last operation of, a long-standing process, it is not appropriate to seek wholesale changes to the arrangements. Notwithstanding this position, it is also concluded that retrospective adjustment of package records would be required to align them with current expectations as codified in Magnox Company Standards. This activity would be managed as a whole for all IEX resin campaigns and will be considered further by RWMD through the planned Periodic Review.

It is recognised that this is a pragmatic view based on continuity and consistency with an existing process. The conclusions of the assessment of the submitted documents and other information are summarised below.

Wasteform Properties

The principal basis for considering whether Campaign 8 would be consistent with the existing endorsement is a comparison of the composition of the waste with that endorsed previously. The assumed waste compositions for the previous packaging campaigns, and hence as covered by the existing endorsement, have not been fully collated in any reference made available to RWMD. However, much of the material present in RV3 clearly corresponds to materials that were packaged in previous packaging campaigns, as follows:

- 48wt% is the remainder of the original RV3 material packaged under Campaign 2;
- of the material later loaded to RV3 after Campaign 2, a contribution of 12wt% is sand, which was present in RV1 material packaged under Campaigns 3 and 5;
- 14wt% is the remainder of the RV2 material packaged under Campaigns 4, 6 and 7;
- 2wt% of the waste is the late A-51/IE-95 addition from the Waste Treatment Plant. Both of these materials were present in RV2 and IE-95 was present in RV3 when previous campaigns were undertaken;

Hence, approximately 80wt% of the RV3 waste is demonstrably equivalent to materials that have been packaged previously. The remaining 20wt% is (un-analysed) IEX material loaded to RV3 after Campaign 2. In the absence of detailed information, it has been accepted that analyses of contemporaneous materials such as the waste loaded to RV2 would provide a suitable analogue for this remaining fraction.

The original development of the polymer encapsulation process did not identify any limits on particular IEX materials and the success of the previous seven campaigns demonstrates that the process can accommodate material of variable composition. Based on the inherent flexibility of the polymer encapsulation and the comparison of the composition of the RV3 material with previous campaigns, it has been concluded that Campaign 8 will fall within the scope of the previous campaigns.

The material added in the re-load of RV3 and the transferred RV2 material both include oil. The overall oil loading could be up to about 170 kg, or an average of 0.33wt% for fully homogenised waste. Magnox has reported development work that demonstrated that the polymer encapsulation process could tolerate oil with a working limit of 1wt% oil, consistent with the expected loadings for Campaign 8. A further limited programme of development work has substantiated the oil loading limit for the current polymer formulation. RWMD has accepted that the submitted evidence demonstrates that the expected oil loading in Campaign 8 can be accommodated satisfactorily by the proposed wasteforms.

Data Recording

The necessary elements of a system to generate the 'package-level' records for packages based on the Type 1803 drums are in place. The proposed 'package case history file' reflects common practice at Trawsfynydd and demonstrates control of the contents of the 'package-level' records. Nevertheless, there is no obvious consideration of the requirements to generate 'campaign-level' records and the system is not obviously compliant with Magnox Standard S-413. As noted above, it is judged that these shortcomings can be addressed retrospectively, in parallel with the same requirement for all package records for IEX resins.

Package inventories are allocated retrospectively based on scaling fingerprints using an estimated Cs-137 inventory. This approach has been demonstrated by the various 'radionuclide inventory notes' that have been produced for previous campaigns.

Overall, the arrangements for producing records for Campaign 8 are consistent with those enacted for previous campaigns, although some of the documents have been revised or updated. The scope of the formal arrangements is not fully consistent with that expected under the new Magnox standard and further *post hoc* action will be required to address shortcomings for all IEX resin package records and to align fully with the standard. However, it is concluded that this action should be treated as a generic exercise and that the existing arrangements can be accepted for this final packaging campaign.

Management System

The necessary elements of a system to control the production of the packages are in place; largely reproducing those employed for previous campaigns with documents modified to refer to Campaign 8. Audits of the previous packaging campaigns have not identified significant issues with the control of the process, although shortcomings in the completion of records have been observed (as noted above). The process is to be controlled primarily through the use of a single-point formulation for the polymer encapsulant and a similarly well-defined quantity of waste. It is recognised that the successful use of the polymer is dependent on careful reproduction of the formulation and the arrangements and records have been implemented accordingly.

The arrangements do not explicitly recognise the relevant Magnox Company Standards as published at the time of reporting. This reflects the adoption of existing arrangements as the basis for the current proposals, recognising the benefits of continuity and consistency with previous campaigns.

The arrangements specific to Campaign 8 do not provide control of the longer-term management of records or the ongoing storage, monitoring and inspection of packages. However, it is also accepted that these requirements fall outside the remit of the packaging project and that the issues are generic.

Conclusions

The proposals from Magnox for the packaging of the remaining bulk Ion Exchange (IEX) resins currently stored in Resin Vault 3 (RV3) Trawsfynydd have been reviewed. The proposed process of immobilisation into Type 1803 drums using a polymer encapsulant follows the practices enacted in the previous seven packaging campaigns.

The assessment has concluded that Campaign 8 follows previous practice and would produce packages consistent with the existing Final stage endorsement for packages containing IEX resins. Therefore, the proposed packages are judged to fall within the endorsed envelope. Nevertheless, following previous practice, it is not intended that a separate Letter of Compliance would be issued for Campaign 8.

Waste packages based on the Type 1803 drums are not currently recognised by RWMD as final disposal packages and the existing endorsement is based on the understanding that the drums would be over-packed into 4m boxes for disposal. This endorsement is therefore based on the conclusion that the drums represent an appropriate step in the production of a disposable product. Further development and justification of the over-pack, or an alternative means of producing the final disposal packages, would be required for endorsement of the final product. Early progress on this matter is strongly recommended.

The assessment has identified a number of minor shortcomings and opportunities for improvement in the current documentation of the Management System and Data Recording arrangements. Nevertheless, it is accepted that the system is consistent with that applied in previous campaigns and that it is not appropriate to seek significant changes or updates to an established system that has already been used for seven of the eight planned campaigns.