QUALITY ASSESSMENT OF IMMOBILIZED WASTES

BARBARA M. RZYSKI
ACHILLES A. SUAREZ

Department of Nuclear Fuel Cycle

IPEN-CNEN/SP

ABSTRACT

A final repository concept for LLW and ILW is being studied in Brazil. It is thus now possible to assess in a systematic way the requirements on the waste packages in each step of the treatment, conditioning, storage, transport, disposal and the quality control procedure needed to show that the requirements are fulfilled.

The methodology to perform this assessment is discussed in this paper. The results of this methodology is proposed as a basis for the licencing of the disposal of different waste packages in Brazil.

INTRODUCTION

The nuclear era in Brazil started in the mid-fifties together with the first Atoms for Peace conference in Geneva. The relatively small amounts of wastes, generated since then, permitted that the delay and decay practice as well the simple storage under radiological control be enough till recently. With the installation of the brazilian nuclear power program it was recognized the need to develop methods of better conditioning the radioactive materials. At same time, the studies concerning the most convenient waste disposal practices and the development of a repository conceptual design make possible a systematic and complete assessment of the requirements on the waste packages and of the quality assurance and control measures necessary to guarantee that the requirements are fulfilled.

Some general ideas about such assessment are being considered and are presented in this paper.

QUALITY ASSESSMENT

The general properties proposed to be investigated for the assessment of the requirements on the different waste types and according

to the different phases of the waste management are displayed in Table I. According to each type of wasteform, solidification process considered and handling sequence, the steps to be performed are shown schematically in figure 1.

Once the waste characteristics are determined, the immobilization process and solidification material be selected a search for the wasteform composition interval has to be made. At same time a complete description of the handling sequence of the waste with the identification of the required functions and properties has to be made in order that a proper evaluation of the wasteform can be accomplished. With this procedure is possible to reduce the process boundary conditions and to establish a protocol for quality control.

The selection of immobilization processes and packaging requirements in Brazil were made based on analysing past and currently experiences of the other laboratories through the world. Some of the criteria matches with the brazilian options and it is believed that the alternatives will be particularly promissing for low- and intermediate-level waste immobilization.

At Instituto de Pesquisas Energêticas e Nucleares (IPEN) some effort is being made to standardize procedures for waste form characterization as well for conditioning process control. At moment the immobilization process envisaged is cementation and some of the parameters considered for quality control are: water to cement ratio, salt content, homogeneity, compressive strength, porosity, setting time , leaching rate, matrix corrosion, gas permeability and hydration temperature.

Preliminary guidelines already exist as criteria for wasteform acceptance however, more criterious and elaborated procedures have to be provided having in mind the final repository concept.

Those guidelines have to be enlarged taking into consideration other immobilization materials as well other wasteforms properties following the methodology suggested in figure 1.

CONCLUSION

The methodology presented provides the tools for establishing, in a consistent and systematic way, the minimal requirements on the waste packages and the necessary quality control measures to prove that the requirements are fulfilled.

TABLE I - Some of the most important characteristics of products in LLW and ILW immobilization processes.

Waste/matrix compatibility	Ignition point
Density	Flash point
Waste/matrix proportions	Burning point
Content of solids	Phase separ. during burning
Viscosity	Burning rate
Water content	Radiation attenuation
Homogeneity	Dose rate
Penetration	Gas generation
Softening point	Swelling
Plastisity	Water absorption
Porosity	Solubility in water
Compressive strength	Leaching
Shock resistance	Corrosion
Thermal cycling	Ageing
Thermal conductivity	Effect of micro-organisms
Thermal expansion	

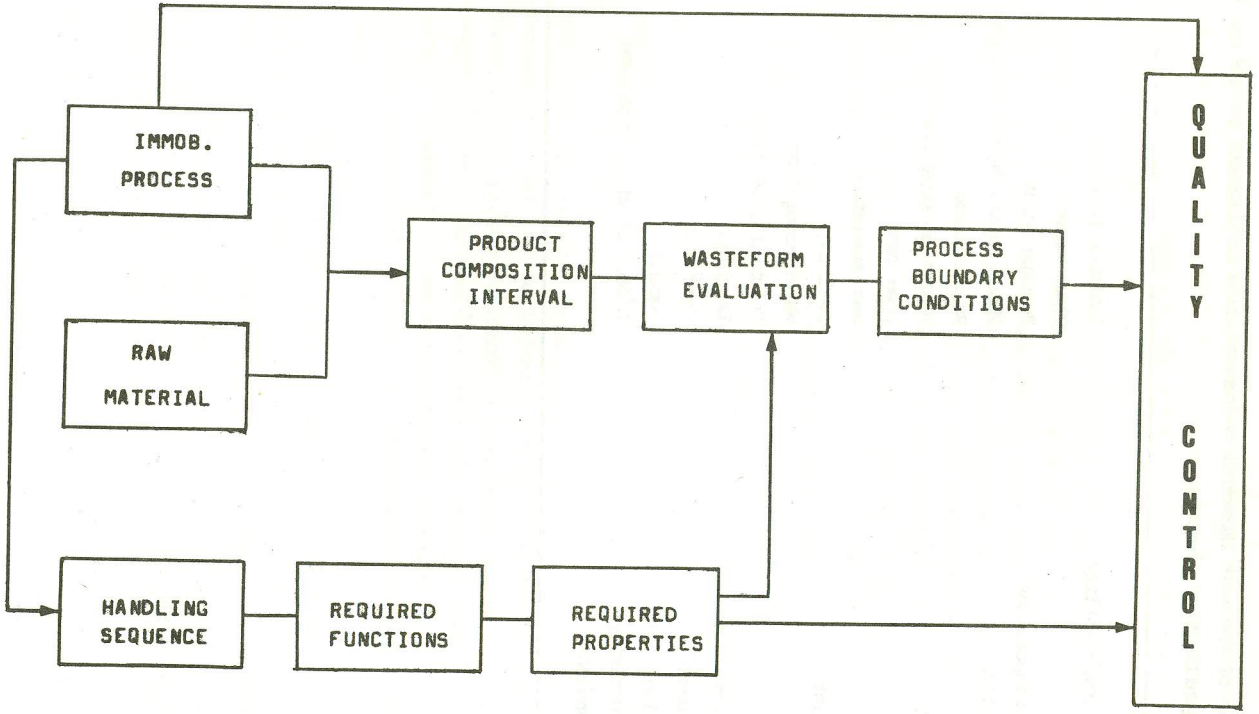

Figure 1 - Quality assessment proposal.