

Waste management**Prevention and Minimization of Waste Production**

THE SOUND MANAGEMENT of both radioactive and conventional waste and of the environment starts by reducing the waste production in all three phases of the life cycle of nuclear installations: design, operation, and decommissioning. SCK•CEN develops new processes and technologies to reduce the production of radioactive waste.

Objectives The general objective of the programme Prevention and Minimization of Waste Production is to contribute to reducing the volumes and costs of nuclear waste. It also aims to provide reliable data and models to the design engineers with a view to determining the final plant characteristics. In the long term, these objectives will be extended to other nuclear applications. Medium-term objectives are

- to demonstrate a process for the removal of boron from PWR waste and to purify boric acid for recycling;
- to define and assess adequate treatment and conditioning techniques for exotic materials such as aluminium, beryllium, lead, tritium, radium, and other isotopes if necessary;
- to define and assess an effective deactivation process to be applied to activated metals;
- to demonstrate and apply existing technology and technology developed in house to the recycling of contaminated materials;
- to define and assess new soil-restoration techniques.

Boron recovery from reactor effluents At most PWRs, evaporation of the Low-Level Liquid Waste (LLW) guarantees high decontamination factors and thus low releases of radioactivity. However, the boron concentration in these effluents limits the volume-reduction factor; the boron-containing evaporator concentrates thus represent an important fraction of the nuclear waste.

SCK•CEN therefore developed a process involving the separation of boric acid from evaporator concentrates. This process separates and purifies solid boric acid by volatilization with

superheated, followed by desublimation at a temperature slightly above the dew point of the steam.

In 1997, SCK•CEN and Královopolská-RIA (Czech Republic) collaborated to develop and propose a boron-recycling installation for the nuclear power plant of Mochovce.

Treatment of metallic sodium Although processes for the treatment of contaminated sodium coming from liquid-metal fast-breeder reactors and R&D programmes already exist, they are not optimized in terms of safety and waste conditioning.

SCK•CEN therefore developed and patented a dedicated, safe treatment process, fully compatible with acceptable immobilization techniques. It has signed a contract with EdF, which sponsors the research since there is a lack of safe techniques on the market. The first version of the design of the fluidized-bed reactor has been finished and the reactor has been ordered. Further efforts have been made to finalize the flow sheet and to prepare the process control and the preliminary safety report. Qualification tests are going on with both the liquid-metal spray nozzle and the gas-injector system. The pilot plant is being constructed in the Technology building. We intend to perform the cold feasibility demonstration test in the first semester of 1998 and the hot demonstration in 1999.

Electrodestruction of organic waste Organic waste represents a problem in terms of conditioning and safety under disposal conditions. It can be destroyed by Ag^{2+} . In the past, we successfully elaborated a theoretical model describing the selectivity of the anode and designed an adequate electrochemical cell.

In 1997, we managed to solve the difficult question of the analytical speciation of the electrochemical mediator. For this purpose, we compared extensively the determinations obtained by three methods and carried out a successful statistical analysis of the results, which appeared to be coherent. We conceived a statistical experimental design to finalize the modelling of the process. Furthermore, we used a

Scientific staff

Johan BRAET
Aimé BRUGGEMAN
Sieglinde CATTOIR
René CORNELISSEN
Roger HARNIE
Sven HARNIE
Luc NOYNAERT
Jef MARIEN
Benoit PETITFOUR
André RAHIER
Frans SMAERS
Veerle VAN ALSENOY

Supporting staff

Eric AEGTEN
Gerard CASTELYN
Alfons FONTEYNE
Dirk QUIRIJN
Sally SCHRAEYEN
Domien SMETS
Eric SNOECKX
Raf VAN AMMEL
Ronny VAN BAELE
Winand VAN DEN RUL
Robert VANDEVOORDE