

Experience in maintenance and decommissioning of in-cell equipment of an operating alpha, beta, gamma hot cell facility.

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Radiometallurgy Laboratory (RML) at the Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam consists of seven concrete shielded α, β, γ hot cells, each having a floor area of 5.5m x 2.1m and wall thickness 1200 mm, designed to handle up to 3.7×10^7 GBq activity (gamma, 1 MeV). The hot cells are maintained in inert gas (nitrogen) atmosphere for handling reactive and pyrophoric fuels. The cells are equipped with remote handling devices and alpha-tight fuel transfer systems to carry out various non-destructive and destructive examinations for metallurgical characterization of the mixed carbide driver fuel of Fast Breeder Test Reactor (FBTR), core structural materials and various test fuel and structural materials irradiated in FBTR. The hot cells have been continuously in operation for the past twenty years during which multitude of post irradiation examination (PIE) campaigns have been undertaken including those on the mixed carbide driver fuel, control rods, nickel reflector subassemblies of FBTR and a fuel subassembly with MOX fuel and D9 alloy clad and wrapper proposed to be used in the 500 MW Prototype Fast Breeder Reactor (PFBR).

The remote handling devices and hot cell equipment facilitate advanced techniques including laser based dismantling, helium leak testing, eddy current testing, X-radiography, neutron radiography, gamma scanning, fission gas analysis, metallography and tensile testing. During the use of these hotcells, a few obsolete systems as well as accumulated consumable and hardware wastes have been packed out and new systems installed to increase the capabilities and to meet new requirements. In general, all the systems have performed well so far with minimum interruptions for remote maintenance. The concept of modularity adopted for in-cell equipment has paid rich dividends during these campaigns. Minimally invasive techniques which involve the use of custom-built man-entry systems have also been adopted occasionally to carry out major repairs as well as dismantling and decommissioning of old equipment with minimum man-rem expenditure. Due to the increasing failure of components caused by ageing and extreme radiation levels in the hot cells, these techniques need to be refined further to embark on a major refurbishment of the hot cell facility, to adapt it for advanced fuels.

This paper describes salient design features of the hot cell facility and case studies of major campaigns for repair / replacement / decommissioning and disposal of various in-cell equipment/ hardware. Experience gained and the safety measures employed during such campaigns will also be highlighted.

Key words: Hot cells; remote operation; fast breeder test reactor; fuel subassembly; post irradiation examination; decommissioning; refurbishment.

Summary

This paper describes salient design features of the hot cell facility established at the Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam and case studies of major campaigns for repair / replacement / decommissioning and disposal of various in-cell equipment/ hardware. Experience gained and the safety measures employed during such campaigns will also be highlighted.

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