

WASTE MANAGEMENT FACILITY, TROMBAY

WASTE MANAGEMENT DIVISION

Waste Management Facility, Trombay comprises of Waste Immobilisation Plant, Effluent Treatment Plant, Decontamination Facility and Radioactive Solid Waste Management Site:

1. WASTE IMMOBILISATION PLANT (WIP):

Waste Immobilization Plant (WIP) is mandated for management of Radioactive Liquid Waste generated during reprocessing of spent fuel at Plutonium Plant and in radiochemical facilities of Trombay. The plant was hot commissioned on Oct 31, 2002 and since then engaged in receipt and treatment of High Level Liquid Waste (HLLW), Intermediate Level Liquid Waste (ILLW), generated during reprocessing of Nuclear Spent Fuel from Research Reactor, as well as Low Level Liquid Waste (LLW), generated in house.

Partitioning of HLLW by solvent extraction system has been adopted at WIP, Trombay as a pre-treatment step to recover some of the useful by-products like Cs, Sr, U for reuse and to partition the radioactive components from bulk inactive elements resulting in enhancement of the waste loading into glass matrix to minimize the waste volume necessitate to dispose in Geological Disposal Facility (GDF). This could be demonstrated using indigenously developed novel extractants.

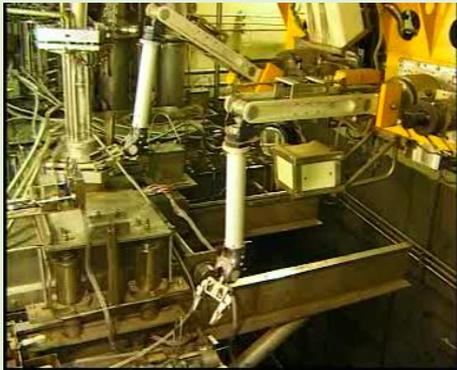
Cs137 recovered from HLLW after concentration is vitrified into non-dispersive glass matrix to produce Cs glass pencils and deployed for irradiation of blood. Recovery of Sr-90 (for milking of Y-90 for radio-pharmaceutical applications) and Ru-106 (for eye cancer treatment) are also demonstrated. Recovery of valuable radio-nuclide and their deployment of societal application realizes the **“Wealth from Waste”** philosophy.

The radionuclide rich stream, containing Actinides, Lanthanides, Sr-90 etc., is vitrified in barium borosilicate based glass matrix called Vitrified Waste Product (VWP) using Induction Heated Metallic Melter (IHMM) realizing **“Concentrate and Contain”** philosophy. VWP produced at WIP, Trombay are sent to SSSF, Tarapur for its interim storage for 25-30 years.

In view of association of very high level of radio-activity during management of HLLW, entire process is carried out inside the shielded cells using state of art Remotisation techniques for material handling as well as remote maintenance. These include master slave manipulators, servo manipulators, remote welding machine, in cell cranes, grapplers, product handling trolleys etc. These equipments are rugged and operated remotely for minimum maintenance as far as possible.

Intermediate Level Waste (ILLW) is treated using highly selective resin through Ion Exchange for selective separation of major radionuclides, such as Cs-137 and Sr-90. The effluent of Ion Exchange System is LLLW and further treated in-house as well as ETP. The eluate, concentrate stream of radionuclides, is HLLW and further treated in-house.

Various treatment techniques, such as evaporation, neutralisation, Ion exchange etc., are deployed for treatment of in-house generated LLLW prior to transfer to Effluent Treatment Plant achieving decontamination factor more than 10^8 .

	
<p>Pre-treatment by Solvent Extraction System</p>	<p>Waste Concentration System</p>
	
<p>Vitrification Cell</p>	<p>PHIX Facility for ILW Treatment</p>

Successful demonstration of partitioning of HLLW, realizing recovery of valuable fission products, at WIP, Trombay has shown a new path way to entire globe for management of HLLW aiming to minimizing the foot print of repository as well as considering nuclear waste as resource material.

2. Effluent Treatment Plant (ETP):

Effluent Treatment Plant (ETP) is mandated with the task for management of Radioactive Low Level Liquid waste (LLW) generated by various plants and radiochemical facilities in Trombay. The Plant was commissioned on 26/07/1966 and since then engaged in receipt/collection, treatment and conditioning of LLW generated by Research Reactors, Plutonium Plant, Waste Immobilization Plant, Radiological Laboratories, etc. Chemical Treatment Flow sheet is employed at ETP for treatment of LLW. Cementation process is used for solidification of concentrated chemical sludge resulting from chemical treatment and centrifugation operations. Spent TBP from Plutonium Plant is also managed at ETP. Alkaline hydrolysis

system used to partition the radioactivity into aqueous stream leaving behind a relatively low active Dodecane. The aqueous stream is cementised and Dodecane stream is incinerated.

In order to follow ALARA principle and in accordance with “near-zero-discharge” philosophy, a hybrid process comprising of membrane processes and ion exchange process is being evaluated to further reduce the discharges and to recycle the decontaminated effluent.

ETP is thus fulfilling its mandate, within regulatory limits, for more than 50 years and will continue to support BARC activities in the coming years.

		
<p align="center">Ultra-Filtration module</p>	<p align="center">Reverse Osmosis unit</p>	<p align="center">Pilot scale ion exchange system</p>
		
<p align="center">Clariflocculator</p>		<p align="center">Alkaline Hydrolysis Process</p>

3. Decontamination Centre (DC):

Decontamination Centre was established with a mandate to decontaminate the protective wears (active as well as inactive) and metallic components generated by various divisions of BARC. The facility was established in 1965. Different types of protective wears from various plants / facilities in BARC are collected, subjected to adequate decontamination process using industrial scale Washer-Extractors and Dryers, monitored and delivered back to respective users. Dhruva cut-end are also decontaminated in a multi-step ultrasonic-assisted chemical decontamination process.

DC is continuing to fulfill the mandate of decontamination of all types of protective wears and other heavy equipments thereby contributing towards significant minimization of waste and realizing the philosophy of **“Recover-Recycle-Reuse”**.



Protective Wear Decontamination



Heavy Equipment Decontamination



Ultrasonic DC Tank



Decontaminated SS plugs

4. Radioactive Solid Waste Management Site (RSMS):

Radioactive Solid Waste Management Site (RSMS) is mandated with safe management of Radioactive Solid Waste generated from various nuclear fuel cycle facilities and radiological laboratories of BARC Trombay. RSMS caters to safe collection of radioactive solid waste (Category-I, II & III), processing (Category-I) for amenable volume reduction, conditioning based on need and disposal in engineered disposal modules of Near Surface Disposal Facility.

The facility comprises of two NSDF sites, namely RSMS and IRE at Trombay. Disposal operation at IRE site is completed and site is presently under surveillance. At RSMS, various processing system and disposal modules are under operations for safe and effective management of radioactive solid waste. RSMS houses various processing systems such as Compaction system for compressible waste; Conventional diesel fired Incinerator for Cellulosic Waste; Plasma based incineration for mixed combustible wastes including rubber and plastics; Disused Source collection, storage and disposal system; High active Spent Resin Fixation system in cement matrix etc.

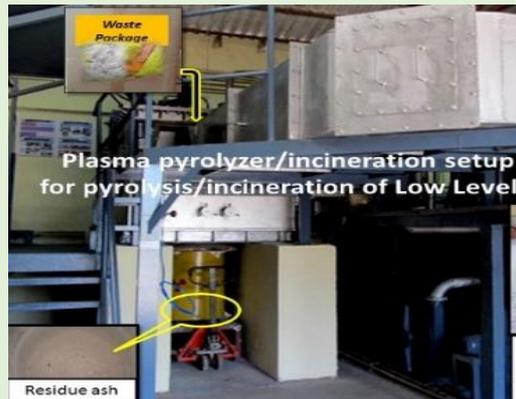
The facility also has various engineered modules, such as Stone Lined Trenches (SLT), Reinforced Concrete Trenches (RCT), Multi-tier Reinforced Disposal Module (MRDM), Tile Holes (TH) etc., for disposal of solid radioactive waste after imparting suitable treatment. Facility is also equipped with interim storage of Category-IV waste before its eventual treatment and/or disposal.



COMPACTION SYSTEM
Volume Reduction Factor: 3 - 5



INCINERATION SYSTEM
Volume Reduction Factor: > 30



PLASMA PYROLYSIS/INCINERATION
Volume Reduction Factor: > 30



Reinforced Concrete Trenches (RCT)



Multi-tier Reinforced Disposal Module (MRDM)