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DECOMMISSIONING STRATEGY FOR CERAMIC MELTER IN NUCLEAR WASTE VITRIFICATION OF HIGH LEVEL WASTE IN INDIA.

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Abstract : Vitrification of high level liquid waste (HLW) by single step Joule heated ceramic melter (JHCM) based technology was developed in India in mid nineties to meet the growing demand of HLW management in near future.With the enhancement of Indian atomic energy programme substantial increase in HLW generation is expected in integrated reprocessing and vitrification plant under construction at Tarapur.Joule Heated Ceramic Melter (JHCM) technology has been adopted for industrial scale vitrification of high level liquid waste at Tarapur and Kalpakkam and also the reference melter technology planned to be adopted in the upcoming integrated reprocessing and vitrification plant at Tarapur.
As a technology demonstrator a radioactive demonstration plant viz. Advanced Vitrification System (AVS) was designed, installed, commissioned and under operation in process cells of the Solid Storage Surveillance Facility (SSSF), Tarapur for treatment of HLW presently stored at Tarapur site. The AVS plant was successfully hot commissioned and around 175 Cu.M of high level waste was successfully vitrified and stored in interim storage facility of SSSF,Tarapur in the first phase of operation which lasted around three years, in the first vitrification cell (AVS-1) of SSSF.While the second cell was being equipped with a new melter (AVS-2), the melter operation in the first cell was discontinued and efforts were initiated to remotely remove the melter by cutting/grabbing/shearing the metal/refractory pieces.

As the melter was placed in a retrofitted cell available in SSSF facility, it was felt that a mock-up facility must be created to test different tools and gadgets to test their life, endurance and efficacy in real situation while actual cutting and removal operation will be initiated later on.

Key Steps of dismantling the AVS-1 melter were identified as follows:

a) Removing removable top accessories such as thermocouples, thermocouple guide pipes, plenum heaters, and feed (frit & HLW) lines and off gas jumper.
b) Cutting & removal of Melter top nozzles & inserts of thermowells, density probe, and level probe.
c) Cutting & removal of Melter top plate.
d) Cutting of inconel side electrodes.
e) Breaking/Removal/ sizing of fiber wool, fiber board, bubble alumina, top refractory, side refractory, backup insulation, glass, inside pieces of side electrodes, bottom refractory, insulation block and inside piece of freeze valve electrodes.
f) Removal of melter casing.
g) Sizing & Categorization
h) Packaging inside drums, canisters/over packs depends upon activity level.
i) De-dusting and de-contamination of cell

Considerable efforts were made to create and operate a mock-up facility where different cutting tools and gadgets for remotely cutting and removal of stainless steel plates, structural materials, ceramic parts and components of the melter, inconel plates and pipe were tried and the life cycle of each tools were tested and evaluated.
The actual operation of decommissioning of AVS-1 melter was initiated and considerable progress was made in the first few months in removing almost 70 % of the components.
The lesson learnt during the process was absorbed and the experience was taken into account while designing the ceramic melter for subsequent upcoming projects. It was also felt that for faster and easy decommissioning, the design of the glass contact refractory ceramic blocks plays a crucial role. The refractory block design was modified to take care of this aspect in future design.
This paper describes the decommissioning experience of the first ceramic melter of Advanced Vitrification System (AVS) ,Tarapur ,difficulties , lessons learnt and modifications incorporated in the design of future plants.

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Country or International Organization

India

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Primary author: Mr BANERJEE, Kalyan (Bhabha Atomic Research Centre,Department of Atomic Energy,Government of India)

Co-author: Mr BADGUJAR, K.T (Bhabha Atomic Research Centre)

Presenter: Mr BANERJEE, Kalyan (Bhabha Atomic Research Centre,Department of Atomic Energy,Government of India)

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