

## Development of Suspendable Servo Manipulator for Activity Reduction in Vitrification Cell - WIP, Trombay

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Induction heated metallic melter has been deployed at Waste Immobilisation Plant (WIP), Trombay, for vitrification of high level radioactive waste. Vitrified product from melter is poured into stainless steel canisters for interim storage and its subsequent disposal in geological disposal facilities. During the completion of pouring of molten vitreous mass, a few glass-threads get formed at the bottom part of process pot due to physic-chemical properties of glass. These threads invariably get collected in the canister itself but on a few occasions, it falls on the turn table during handling of canisters. These threads are generally very small in sizes with an average diameter of 4 mm and length of 50 mm. Existing remote handling tools are used for lifting these glass threads. However, a few glass threads remain inaccessible, because of limited reach of the remote handling gadgets. Suspendable

Servo Manipulator (SSM) developed by Division of Remote Handling and Robotics (DRHR), BARC was deployed after extensive mock trials to lift remaining glass threads fallen at inaccessible areas during recently completed vitrification campaign. With the joint effort of Waste Management Division (WMD, NRG) and DRHR, campaign of picking up of about 30 number of glass threads of smaller sizes were successfully completed resulting in a substantial dose reduction within the hot-cell.

The suspendable Servo Manipulator [Fig.1] is a novel design consisting of a slave and a master arm, connected to a controller through electric cables. The slave arm is suspended onto the crane hook and taken to the site remotely. It has five degrees of freedom and gripper, all controlled by electric motors. The major joints of the slave arm are mechanically

balanced to reduce the swing of the arm, during motion. The master arm is small and kinematically similar to that of the slave arm. Remote operations are viewed through in-cell cameras and additional cameras mounted on the slave arm [Fig. 2 & 3].



Fig.1: Suspendable Servo Manipulator (SSM)



Fig.2: Master Arm of SSM in the Control Room



Fig.3: Active Glass Thread Picked-Up by SSM