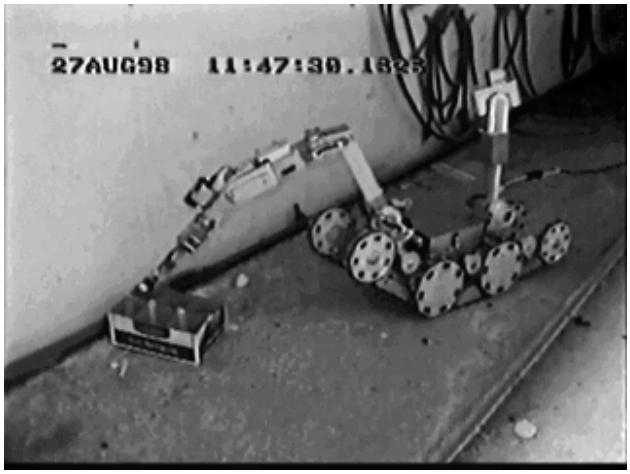
Technology Deployment Fact Sheet

Andros Robot for Canyon Disposition Initiative Remote Characterization



SUMMARY

The Andros Robot is a robotic characterization platform designed for use in the chemical processing facilities at Hanford, Idaho, and Savannah River sites (or other facility areas that are not accessible by humans). It is designed for fully remote collection of characterization data such as gross gamma readings, video, and smear samples. The initial mission for the Canyon Disposition Initiative (CDI) was to survey the railroad tunnel at the Hanford 221-U Facility. The railroad tunnel deployment was completed with the following:

- A Remotec Andros Mark VI robot configured with two camera and lighting systems (one color and one black and white).
- A real-time gross gamma detector
- Smear sample pads
- A lifting fixture (with camera and lights) for the robot, cable, and cable playout system, and
- An operator control station with video recording equipment.

The objective of the railroad tunnel deployment was to complete an initial characterization of the tunnel in support of the CDI Record of Decision process for determining the final disposition of the facility. No human access has been allowed in this tunnel for more than 20 years.

The Andros robot was deployed into the 221-U Facility railroad tunnel in August 1998. The robot traversed to the outer rollup door (approximately 190 feet) collecting gross radiation data and video taping the condition of the tunnel. Nine smear samples were taken.

The deployment of the Andros system in the railroad tunnel was a complete success and all objectives were met or exceeded. Because of this, this system may be used in other portions of the 221-U Facility, such as the ventilation tunnel or the canyon deck.

INNOVATIVE TECHNOLOGY DESCRIPTION

This remote characterization system was developed by the Department of Energy Robotics Technology Development Program (RTDP) primarily at PNNL with support from the Idaho National Engineering and Environmental Laboratory and the Oak Ridge National Laboratory.

The system is designed for deployment in areas where personnel are prohibited access, such as high radiation areas. The Andros robot is capable of operating off of 110 VAC, RF, or battery power, and can drive on and off of the custom-designed, crane-deployable lifting fixture. Communication is via umbilical or fiber optics. The lifting fixture has a motorized cable playout and retrieve system as well as a color camera and lighting system.

BASELINE DESCRIPTION

Prior to this deployment, the radiation levels in the railroad tunnel were unknown, and as such, personnel access was prohibited. This remote characterization system was considered an enabling technology.

DEPLOYMENT DESCRIPTION

The Andros robot completed an initial characterization deployment in the 221-U Facility railroad tunnel in August 1998. The Andros robot was operationally tested on the canyon deck of U-Plant, then lifted, via the overhead crane, into the railroad tunnel. The robot traversed the entire length of the tunnel and back. The tunnel **is about 16 feet wide, 30 feet high, and 220 feet** long. Gross radiation data and video footage were taken to document the condition of the tunnel.

The tunnel was predominately empty, however there were many objects along the walls and in the corners. Some of these items included boxes, a barrel containing objects in a plastic bag, gloves, a shoe cover, brooms, a fire extinguisher, a telephone, ladders, step-off pads, electrical panels, and plastic-wrapped equipment. Dispersed throughout the tunnel were numerous tumbleweeds and deceased animals (birds and rodents). The floor of the tunnel was heavily laden with dust and dirt. The radiation levels in the tunnel were very low. The highest level recorded was 5 mR/hr.

Nine smear samples were taken throughout the length of the tunnel. One sample was taken of the barrel, one on the floor near the rollup door, and one on the floor about mid tunnel. Five samples were taken of visibly-stained floor areas, and one sample was taken from the bottom of an open trough in the floor.

Approximately four hours of video coverage was taken from the two video links in the tunnel. In addition, professional video coverage was taken of the equipment set up process, diagnostic testing of the robot, the lift into the tunnel, and coverage of the robot until it moved out of site.

DETAILS OF BENEFITS

This system allows the safe collection of critical characterization data, from hazardous facility areas, that are necessary for the Record of Decision process. Remote operations allow minimization of exposure and health risks for laborers during characterization activities in high radiation areas or areas unsuitable for manned entry.

SUCCESS CRITERIA

Six criteria were developed to determine the success of this technology deployment:

- Robot would traverse the entire length of the tunnel
- Video footage would be collected that documented the physical condition of the entire tunnel
- Gross gamma data would be collected throughout the tunnel
- One smear sample would be collected
- The Andros system would be safely retrieved at mission completion
- No injuries to personnel or damage to equipment

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