COMPUTER-CONTROLLED WALL SERVICING ROBOT

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After four years of cooperative research, Pentek has unveiled a new robot with the capability to automatically deliver a variety of cleaning, painting, inspection, and surveillance devices to large vertical surfaces.

The completely computer-controlled robot can position a working tool on a 50-foot tall by 50-foot wide vertical surface with a repeatability of 1/16 inch. The working end can literally "fly" across the face of a wall at speed of 60 feet per minute, and can handle working loads of 350 pounds.

The robot was originally developed to decontaminate the walls of reactor fueling cavities at commercial nuclear power plants during fuel outages. If these cavities are left to dry after reactor refueling, contamination present in the residue could later become airborne and move throughout the containment building. Decontaminating the cavity during the refueling outage reduces the need for restrictive personal protective equipment during plant operations to limit the dose rates.

The initial design considerations for the new cavity decontamination robot include:

1. Application to all reactor cavities of differing configurations at both BWRs and PWRs.
2. Time reduction in reactor cavity in decontamination in an effort to reduce outage time.
3. Eliminate use of the reactor building crane.
4. Reduce occupational risks associated with reactor cavity decontamination.

Cavity decontamination is typically completed just after the reactor has been refueling and the reactor cavity water is simultaneously being drained. Access to these 25' to 40' high walls is typically limited to the top of the cavity. This restricted access makes manual decontamination a time-consuming and risky exercise. By employing a vehicle that only operates on the wall surface, the unnecessary time and risk can be virtually eliminated.

The WALLWALKER can be mounted with scrubbers, high-pressure water jetting, CO2 blast, or even scabbling techniques with vacuum attachments for concrete surface decontamination. Complete system operation is implemented by an off-board computer with sensory input and control output provided via tether.

This presentation, complemented by a video demonstration, will discuss the design criteria of the WALLWALKER, its demonstration successes, and the various potential applications of this new robot.

Speaker Biography

Sheldon Lefkowitz is President of Pentek, Inc., located in Corapolis, Pennsylvania. Originally from Queens, New York, Mr. Lefkowitz earned a Bachelor's Degree in Mechanical Engineering from the Cooper Union in 1973, and a Master's Degree in Mechanical Engineering from M.I.T. in 1974. He has worked as a heat transfer design engineer with General Electric, a nuclear systems safety analyst for the California Energy Commission, and a consulting engineer engaged in nuclear power plant safety and licensing projects. Mr.

Lefkowitz started Pentek in 1981, shortly after the accident at Three Mile Island, and has been engaged in the decontamination and handling of hazardous materials for the past 13 years. Pentek is engaged in the manufacture of lead paint abatement systems, and performs hazardous material abatement services in all regions of the country and around the world.

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DISCUSSION

Mei: The picture that you showed us is more like a very flat wall. Can the robot also handle curved wall surfaces or if the wall is in and out?

Lefkowitz: Yes. A curved wall is treated as a series of arc segments. The work point is moved across the face of the wall along the plane of the chord or tangent line. Within limits, the work point is held at a small but varying distance from the surface. If the surface of the wall is in and out (i.e., the wall is not flat), then the load path is established at a maximum distance from the wall, but sufficient to travel over the closest obstruction.

Mei: Can you keep a constant distance from the wall?

Lefkowitz: Absolutely. If greater control of standoff distance is required, the control of a third dimension (into and away from the wall) can be accommodated by a local positioning mechanism attached directly to the work point.