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Processes and Practices Related to Occupational Dose

ID: 45

REMOTE TOOLING; ROBOTICS; AND REMOTE SURVEILLANCE

Keywords: ROBOTICS; REMOTE TOOLS; REMOTE SURVEILLANCE; SURVEILLANCE; ROBOTS; MAINTENANCE; AUTOMATED MAINTENANCE; AUTOMATION; REMOTE SYSTEMS

Description:

Over last 35 years robotics technology was used in the nuclear industry primarily in spent fuel processing, post-irradiation analysis, waste management and R&D. Industry is now finding many other uses of the technology, e.g. for primary containment inspection, reactor maintenance, routine health physics, facility decontamination and decommissioning and post accident recovery. Programmed robotic devices are also available for use in nuclear plants. There are devices for ultrasonic scanning, pipe cutting or welding, remote manipulation, pipe crawling, underwater surveillance, and steam generator tube inspection and repair.

Mobile robotic devices can provide a high degree of flexibility to accomplish a wide variety of tasks. They may be a way of meeting tightening ALARA requirements. Robots may also provide significant cost saving (from \$100K to \$1.5M in net present value according to one estimate), but cost can be high (say \$200K per robot). In Japan they are also proving cost effective as replacements for skilled labour in a tight labor market.

Commercially available robot technology must be modified for utilization in the nuclear plant environment and modification of plant equipment and procedures may also be required to integrate robotic devices into the plant. At present, robots can save exposure and do such tasks as:

- * Plant inspection, surveillance, sampling
- * Plant maintenance
- * Improvement in preventive maintenance
- * Capability to deal with radioactive leaks or spills
- * Assist in radwaste handling, reduce waste materials
- * Provide on-line maintenance, inspection, surveillance and reduce plant down time and save replacement power.

In future, robotics will be integrated directly in new plant designs and routinely be used in plant decommissioning. Typical robotic applications may be: smear tests; radioactive sampling; small spill clean-up; filter changing; steam generator repair; radiation monitoring; steam, gas, fluid leak detection; security/intruder alerts; valve/instrumentation, equipment status verification; condenser tube sheet inspection and repair; firefighting; post accident monitoring, clean-up, repair; hazardous environment maintenance; pipe inspection and repair; equipment and tool transport; snubber inspection; cavity cleaning; core reloading; flange unbolting/rebolting; pipe welding; pool cleaning, etc.

Factors to consider in cost-benefit evaluation of robotics:

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- + Reduction in exposure (both from radiation and other hazards)
- + Reduction in man-hours
- + Reduction in crew size
- + Improved worker safety
- + Repeatability of job
- Reduction of inspections
- + Savings in Health Physics procedures
- + Reduction in safety equipment
- + Reduction in radwaste
- + Reduction in worker injury and illness costs
- + Clean-up of spills/leaks
- + Reduction in plant downtime

- Purchase cost of robots
- Site specific installation cost
- Robot Operation & Maintenance
- Robot utilization (single/ multiple use)
- Operator/technician training
- Decontamination cost to move robot around plant
- Establishment of robot support staff

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