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Size Reduction and Dismantling of Radioactively Contaminated Equipment by Tele-Operated Robotics

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Key Words: robotics, disposal, plutonium

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Abstract

Handling contaminated components, ALARA and personnel exposure control, size reduction and packaging, and efficient operations are all major concerns when dismantling and decommissioning nuclear weapons production facilities. Oceaneering's Remote Operations Size Reduction System (ROSRS) was designed specifically to address these needs. The ROSRS is a Tele-Operated Robotic processing cell, that will be used for size reduction and dismantling of radioactively contaminated (plutonium) equipment.

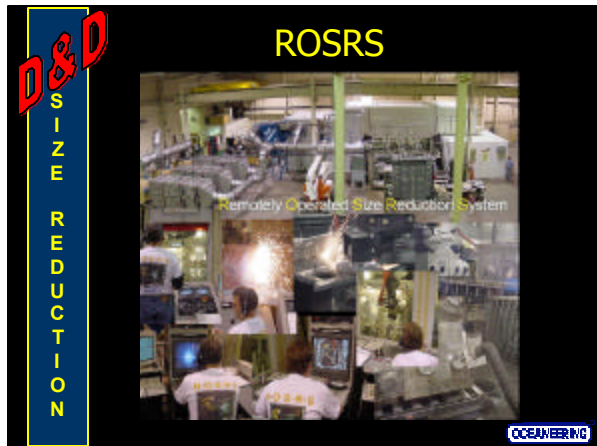
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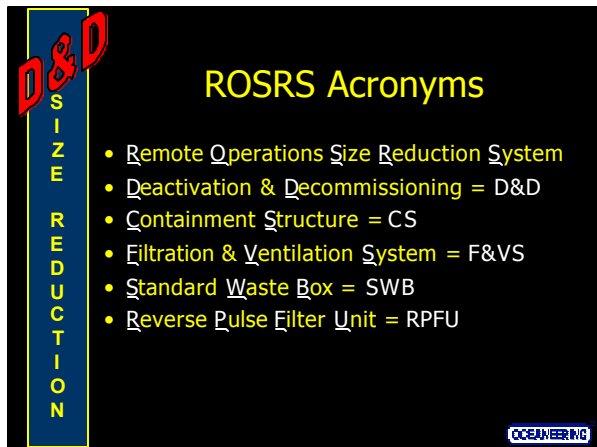
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Of Radioactive Contaminated Equipment Using Tele-Operated Robotics

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Gloveboxes

- Sealed Enclosures
- VW Bug to Semi's
- Machining
- Product Assembly
- Pyrochemistry
- Remnants of Pu & other Nuclear Materials




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ROSRS Gloveboxes

- Max Size:
6' H x 6' W x 12' L
10,000 LBS.
- Feed Preparation:
Remove Lead
lining, Glass, Gloves
& Liquids
- Pu Residue Less
than 320 grams



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ROSRS Objectives


- Increase Worker Safety
- Minimize Exposure to Radioactive Materials & Contamination
- Improve Productivity
- Accelerate Cleanup at DOE Sites
- Reduce Cost of Environmental Management Activities

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ROSRs Major Systems

- Robotics System
- Conveying
- Containment Structure
- Filtration & Ventilation (HVAC)
- Radiological Monitoring
- Controls & Power
- Remote Viewing




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ROSRs Robotics Systems

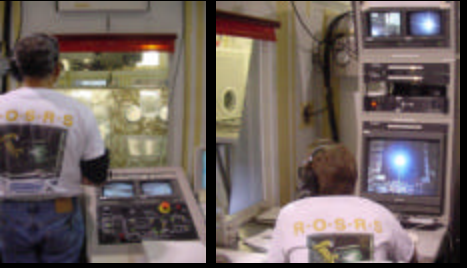
- XR-100 3 axis - Cut
- TR-6350 6 axis -Lift
- Chain Hoist
- Gantry Crane
- Instrumentation & Controls
- Tool Racks
- End Effectors



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Tele-Operated Robotics




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ROSRS Containment Structure



- Preparation Chamber
- Personnel Entry Chamber
- Cutting Chamber
- North Waste/Bag Out Chamber
- South Waste/Bag Out Chamber
- Sorting Table & Racks



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ROSRS Conveyor Systems

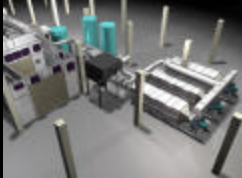

- Pallets
- Prep Powered
- Cut Powered
- Cut Gravity
- Slag Trays
- Bumpers
- PAC Ground Connectors

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ROSRS F & V Systems


- Inlet Filter & Damper Units
- Exhaust Ducting
- Motorized/Manual Outlet Dampers
- Source Capture
- Reverse Pulse Filter Unit
- Filtration Units (3)

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ROSRS Controls & Power

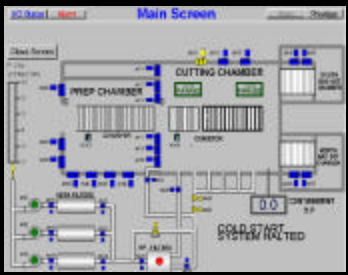
- Programmable Logic Controller PLC
- Input/Output (IO) Interfaces
- Graphic User Interface (GUI)
- Industrial Computer
- Power Distribution Unit
- Motor Control Center



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GUI Main Screen




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ROSRS Remote Viewing

- 10 Pan, Tilt & Zoom Cameras
- Monitors & Controls @ Control Station
- Rack Mounted Support Equipment
- Interconnect Cabling




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ROSR Operations Process

- Item Receiving
- Size Reduction
- Sorting/Queuing
- Standard Waste Box (SWB) Loading
- SWB Closure & Exchange




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ROSR Fire Suppression

- CO2 - Cutting Chamber, F&VS, RPFU, Distribution, Storage & Spot Suppression on XR-100 Arm
- Two (2) CS Dumps
- 85 Spot Shots




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ROSR Filtration Unit Fire Suppression

- Water Deluge Sub-System
- Fire Detection Sub-System
- Control & Supervision Sub-System



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Throughput Per GB


- Normal - Manned:
 - 10 to 18 Hours
 - Personnel = 10
 - Workers Inside CS
 - PPE Required = A
- ROSRS:
 - 12 to 20 Hours
 - Personnel = 3
 - Workers Outside CS
 - PPE Required = D

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ROSRS & the Future

Robotics & Remote Operations will play an increasing important role in cleanup activities & mixed waste management in the coming years



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