Defueling TMI-2

Russ Green
TMI-2 Accident

- PORV leaking by with only indication in alarm
- Loss of Feedwater
- Rx tripped on High Pressure
  - Heat Production / Heat Removal Imbalance
- PORV Opens and does not close
- LOCA at the top of the Pressurizer w/ ES actuation
- PORV/HPI Cooling is defeated over concerns of excess inventory
- EFW not available due to Switching and Tagging mishap
- No heat removal capability results in core damage
Core Damage
Work Platform

Internals Indexing Fixture
Rotating Work Platform
Rotating Service Platform
Rotating Shielded Work Platform
Service Platform
Canister Carousel

[Diagram showing the structure of a canister carousel with labels for Drive Assembly, Intermediate Spindle, Main Structure, Shielded Work Platform, Canister Support Sleeve, Sleeve Locking Device, and Sleeve Support.]
Work Platform

- Canister transfer device
- Rotating shielded work platform
- Tool rack
- Support structure with integral off-gas and water processing
- Upper plenum assembly
- Dam
- Transfer canal
- IIF
- Shielding
Defueling

Key:
A: Camera Operator
B: Tool Operator
C: Crane Operator
D: Probably the Camera Controller acting as an assistant to the Tool Operator
E: Radiation Control Technician
F: Step Stool for disconnecting tools from the jib crane when tied off in the slot
G: Hydraulic control skid used to power long handled tools.
H: Long Handled tool tied off in the slot
I: Step off pad to the Defueling Water Cleanup equipment.
J: Small Long Handled tools tied off in the slot
K: Long Handled tools tied off along the fuel canal wall
L: Monitor console
M: Rack containing disposable booties and gloves
N: Unknown but may to be a container of discarded booties and gloves awaiting transfer
O: Camera control console and radio repeater equipment
Defueling
Work Platform
Tools

Rod Cutter
Design & Fabrication crew on site for Fast Turnaround. Many Tools: Lariat tool, Fuel Assembly Lifting tool, Hydraulic Fuel Assembly Clamps, Peters tool, Jet Pump Vacuum Cleaners, Frew Screw, Socket Wrench, All Bolts were Standardized w/ threaded receivers (no nuts), Rinse System, more
Core Bore
Data for Accident Analysis
Monolith Break up

Tungsten Carbide Teeth with Synthetic Diamond
Core Bore

- Adapted from commercial mining drilling equipment
- One of the most important machines for the project
- First use with hollow core bits: 10 samples 1.8 m long x 6.4 cm diameter (figure below)
- Second use with solid face bits to chew through the hard once-molten mass in the core region
- Third use was assisting lower grid and instrument tubes by grinding metal (next viewgraph)
Internals Cut Out
Underwater Plasma Arc Cutter
Water Clarity

• DWCS (Defueling Water Cleanup system)
  – Stopped Work
  – Design and Testing Under High Stress
  – Solution: Diatomaceous Earth Filter on a larger scale
  – Very Effective
  – Suggestion: Minimize Hoses

• Bacteria (Hydraulic Oil Leakage as Carbon Source)
  – Stopped Work
  – Testing Performed Under Stress
  – Solution: Addition of Oxidizing Biocide (H₂O₂)
  – Heavy Decontamination Required
  – Very Effective
  – Suggestion: Use UV light if possible
Man Power

• Manpower Will be Critical
  – Apply Skilled and Unskilled labor effectively
  – Don’t Overwork the Teams
    • Unsustainable in the long run

• Allow the crews learned experiences to benefit future work (defuel in series)
  – Defuel the least damaged unit first
  – Defuel the remaining two in parallel if desired

• Robots are useful but always require more work than human labor alone
  – Personnel Safety / Dose
Questions?

Now or Future

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