

Three Mile Island Reactor Building Airborne Contamination Event Lessons Learned

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November 2010
2010 ISOE International Symposium

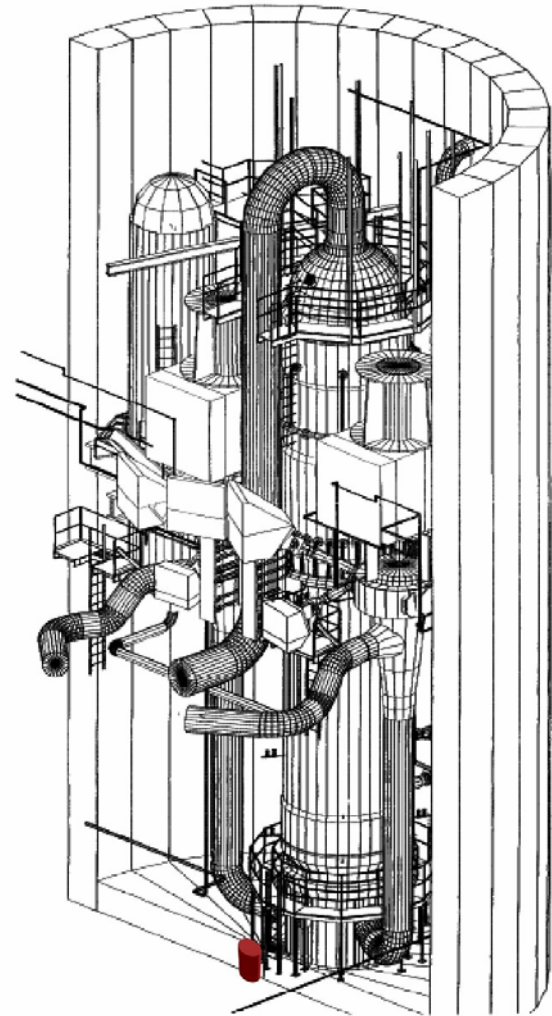
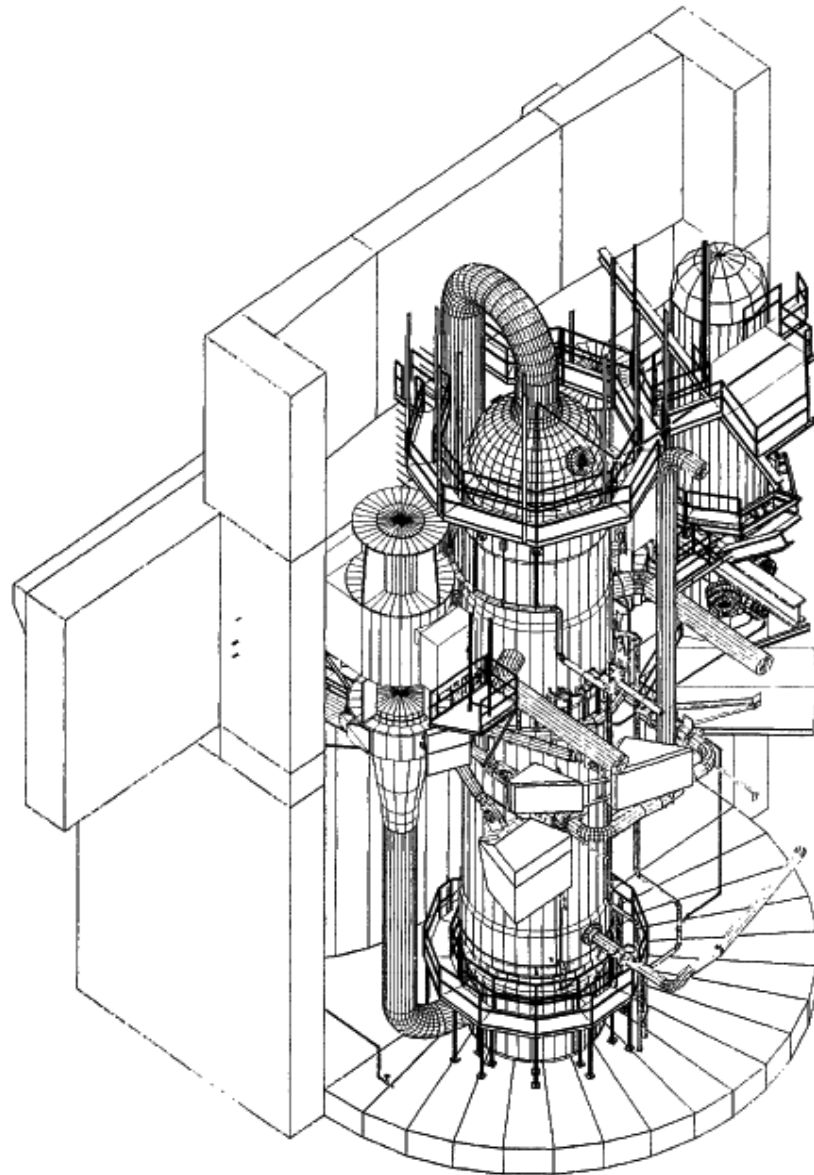
- ✓ **Initial Plant Conditions**
- ✓ **Description of the Event**
- ✓ **Cause of the Event**
- ✓ **Immediate Actions Taken**
- ✓ **Impact on Workers**
- ✓ **Lessons Learned**

- ✓ Outage commenced on October 26, 2009
- ✓ Planned for 66 days
- ✓ Outage goal was 194 person-rem on an estimate of 211 person-rem
- ✓ Significant work included:
 - Replacement of Once Through Steam Generators
 - Alloy 600 Weld Mitigation
 - PZR Nozzles
 - Core Flood Nozzles
 - Refuel Floor Activities
- ✓ Forced Oxidation began on October 30, 2009

- ✓ Reactor was defueled, Reactor Coolant System drained
- ✓ Four craft workers from the Steam Generator Replacement Team were vacuuming in the “A” steam generator cold leg pipe cleaning prior to machining with support from project radiation protection staff
- ✓ Containment Construction Opening (26’ x 23’) and Equipment Hatch were open to support steam generator movement
- ✓ The “A” steam generator had been severed from reactor coolant system and was in process of being transported out of containment
- ✓ Ventilation line-up change in progress

OTSG and “D” Rings

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- ✓ At approximately 1550 on Saturday 11/21/09, a Local Air Monitoring System Alarms (AMS – 4)
 - First Alarm in area of “B” OTSG Cold leg Breach
 - Shortly thereafter, alarm received at construction opening
- ✓ 175 workers were in the Reactor Building at the time
 - All confirmed evacuated from the area by 1630
- ✓ Ventilation line-up assisted in distribution of fine particles inside the reactor building

Reactor Building Construction Opening

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✓ The Root Cause of the event:

- Misapplication of a non filtered vacuum in an application that should have required one
- Site specific procedure which allowed use of a non filtered vacuum in certain applications

The Contributing Causes to the event:

- Oversight
- RP Tech Procedure Use/Adherence
- ALARA Pre-job Brief

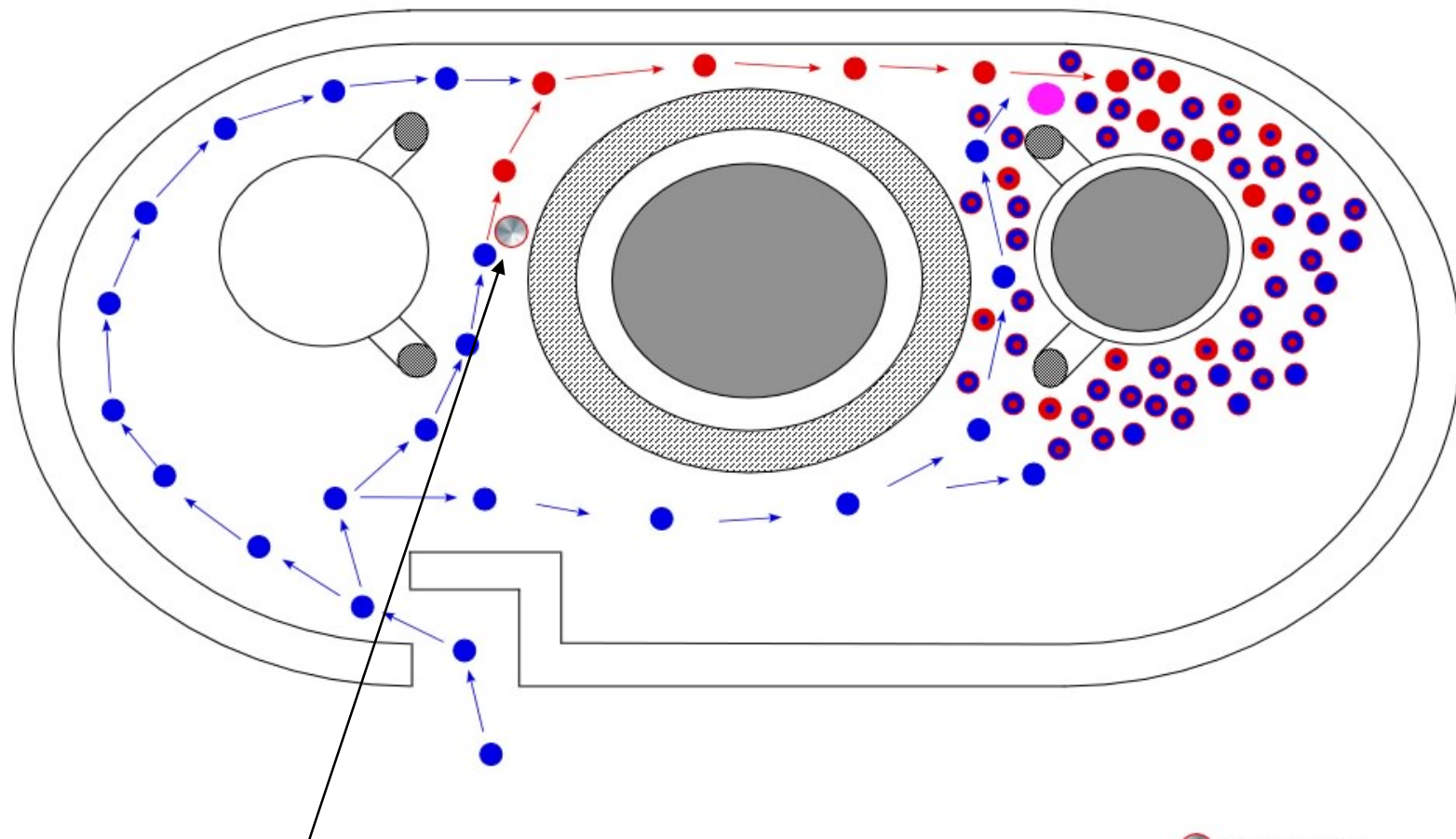
A “D”-Ring - Vacuum in Background

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Vacuum
SGR#1

“A” Cold
Leg



Vacuum SGR#1

-  SGR-1 Wet Only
-  Blue Contains No Contaminates
-  Red Contains Contaminates
-  Multi Color = Air in Vertical Movement
-  Solid Color = Air in Horizontal Movement
-  AMS-4

- ✓ Stopped all work activities in the Reactor Building
 - All non-filtered wet vacuums were removed and disabled
 - All radiation work permits were reviewed to ensure that the proper radiological controls were included
 - Verified radiation protection controls to prevent spread of airborne contamination were being used as specified
- ✓ The RP Technician covering work was disqualified
- ✓ Augmented project staff with fleet resources to provide additional oversight of radiological significant work
- ✓ Controls were implemented on the purge supply and exhaust fans
- ✓ Developed and Implemented Fleet Procedure for Control of vacuums used in RCAs

✓ Impact to workers

- 17 Personnel had External contamination
 - All contaminations were at Lowest Risk Level by industry standards
 - All workers immediately decontaminated
 - No external skin dose assigned due to event
- 145 potential Internal Contaminations
 - Personnel involved received additional monitoring for internal contamination with onsite whole body contamination monitors
 - One worker received measureable internal dose (10.6 mrem)
 - All other workers were below dose reporting criteria

✓ Calculated Dose at Site Boundary: 0.06 mRem; 0.4% of annual limit

✓ Independent experts validated our findings for internal dose and offsite dose calculations

✓ Communication Actions

- Plant Manager and Senior Management communications to workers at group meetings
- Personal letters to all 145 workers
- Multiple site-wide communications (news flash, SVP letter, TMI newsletter)

✓ Additional Actions

- Follow-up Whole Body Counts for all workers
- One-on-one interviews with workers
- Multiple independent technical reviews of personnel exposure data and basis for assigned dose

- ✓ Ensure that the site RP Manager reviews ALL internal and external communications involving radiological events
- ✓ Evaluate addition of talking points (Q&A) to the Personnel Contamination Event procedure
- ✓ Evaluate addition of procedure guidance to the Bioassay Procedure for release of WBC printout sheets to workers
- ✓ Evaluate timing of communications with INPO and NEI

- ✓ Develop a corporate RP triage procedure to supports actions to take when dealing with a large number of personnel contamination events
 - Address creature comforts
 - screening methods
 - Corporate and site notifications
 - Rapid callout of additional support
 - Tracking of workers
- ✓ Develop a backup method to quickly ascertain if workers are externally contaminated or have internal contamination.

- ✓ Validate assumptions used in engineering control procedures
- ✓ Develop criteria in the Personnel Contamination Event procedure to allow workers to be released from the RCA without passing a PCM or PM-7 in order to use the restroom.
- ✓ Evaluate replacement of NaI whole body counters.
- ✓ Validate that WBC libraries are appropriately established based on both on-line and shutdown.

- ✓ Evaluate outage staffing model for key projects
- ✓ Validate that RP technicians get appropriate ALARA briefings and review and understand procedures
- ✓ Review current risk evaluation procedures to ensure that appropriate tasks are identified and oversight is specified

Questions?