

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

May 10, 2024

TO: Timothy J. Dwyer, Technical Director
FROM: Frank Harshman and Clinton Jones, Resident Inspectors
SUBJECT: Oak Ridge Activity Report for Week Ending May 10, 2024

Building 9212: CNS declared a potential inadequacy of the safety analysis (PISA) after discovering heavy organics in the bottom of the wiped film evaporator (WFE) phase separator and WFE (see 05/03/2024 report). CNS analyzed a sample of the material from the phase separator and confirmed that it was a heavy organic material primarily composed of tri-*n*-butyl phosphate (TBP). The phase separator is not designed to limit a heavy phase from passing through the system and as a result, heavy phase organics were observed in the WFE. CNS continues to investigate how the heavy phase organics got to the phase separator and WFE. The sampling results from the WFE are still pending. CNS declared a PISA after determining that there is a potential for a new failure or an unanalyzed event. The resident inspector (RI) discussed the situation with the Building 9212 assistant operations manager to ensure that CNS had reviewed other credited safety features, such as the WFE vents, for proper function. The RI also provided a copy of *DNFSB Technical Report 33: Control of Red Oil Explosions in Defense Nuclear Facilities 2003* to aid in the investigation of the phenomenon. The DNFSB report defines red oil as a substance of varying composition formed when an organic solution, typically TBP and its diluent, comes in contact with concentrated nitric acid at a temperature above 120°C. These conditions are possible in the WFE however the system is operated below the nitric acid concentration and temperature thresholds. The DNFSB technical report identified temperature, pressure, mass, and concentration controls to prevent or mitigate a red oil event. CNS established three operational restrictions to ensure safety of the WFE system. CNS placed the following operations on hold: WFE heating operations to prevent heat addition into the system, and processing of solution in secondary extraction to prevent additional mass into the system. Additionally, CNS implemented a requirement to maintain WFE in warm standby mode to prevent any operation of the system. These restrictions keep the secondary extraction and WFE systems in a safe and bounded condition. The RI reviewed the current set of operational restrictions against the controls identified in the DNFSB technical report and found the restrictions in line with the report recommendations.

Resident Inspector Field Activity: The RI conducted a walkdown of Building 9204-2E to observe routine floor activities and gauge overall combustible loading in the facility. The RIs have observed issues with combustible loading compliance in past walkdowns (see 12/15/2023 and 01/05/2024 reports). CNS has reduced combustible loadings in some areas that were identified in the previous walkdowns. The RI identified one combustible loading notice sign that was damaged and unreadable. The RI reported this issue to the shift manager for resolution.

Oak Ridge: At Y-12, severe weather on Wednesday resulted in a power outage that impacted portions of the site. The loss of power to the Highly Enriched Uranium Materials Facility resulted in the two emergency generators starting and activation of the secondary containment system. These systems activated as expected. Building power was restored in an hour. No significant safety impacts were reported from Y-12 nuclear facilities. At ORNL, no adverse impacts from the weather were reported for the Transuranic Waste Processing Center, Building 2026, and Building 3019.