

The current challenges and good practices of utilities

“Measures for containing an increase in pipes' dose-equivalent rate in the hydrogen-injected environment at the Shimane Nuclear Power Station Unit 1”

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At Shimane unit 1, hydrogen injection is started in 1998, and hydrogen injection continues at the rate of 0.5ppm since then. At the 21st outage after the first cycle beginning hydrogen injection, the dose rate at PLR outlet vertical pipe had been increased. The reasons why the increases in dose rate happen under the circumstance of hydrogen injection are as follows. Chromium became insoluble Cr_2O_3 under HWC circumstance and attached to the surface of pipes and machineries; however, when it was switched to be under NWC circumstance, it became Cr_2O_3 and solute quickly. Accumulated and attached chromium crud by HWC operation for consecutive 300days is drastically dissolved by switching to NWC operation so that it created unevenness on the surface of pipes, and radioactive cruds were gathered in dents that caused increase in dose rate.

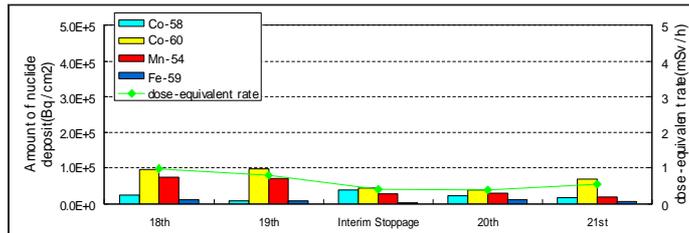
To prevent increase of dose rate under the circumstance of hydrogen injection;

- a. Phased hydrogen injection, and
- b. Chromium discharge operation

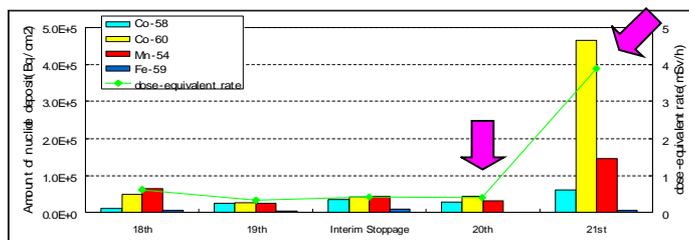
were implemented. a. Phased hydrogen injection was to ease the rapid change of Water Chemistry circumstance at the shift between HWC and NWC, and it dropped from 0.45ppm to 0.2ppm when the injection was stopped, and it finally dropped to 0ppm after 24 hours. When the hydrogen injection was resumed, it rose to 0.2ppm and finally rose up to 0.45ppm after 24 hours. b. Chromium discharge operation is to discharge chromium by stopping the hydrogen injection for three days in every three months. By implementing measures above, the increase of dose rate in piping was almost resolved.

Transition of PLR piping dose-equivalent rate (Pump B (21th outage))

PLR(B) inlet vertical piping



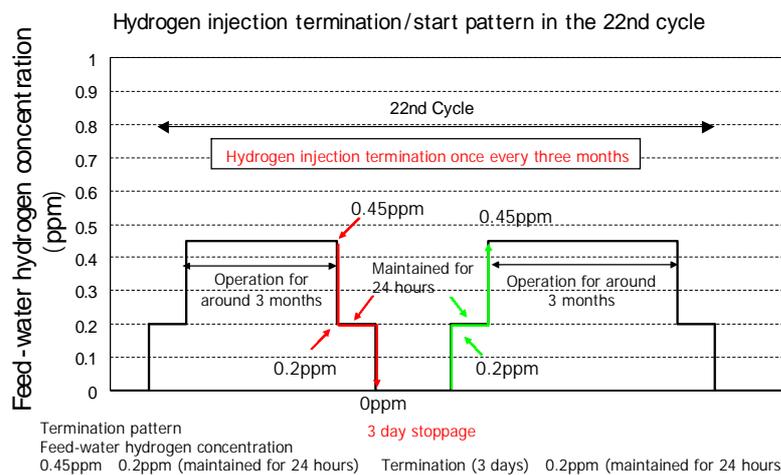
PLR(B) outlet vertical piping



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Management of gradual hydrogen injection termination (reflection to the 22nd cycle)

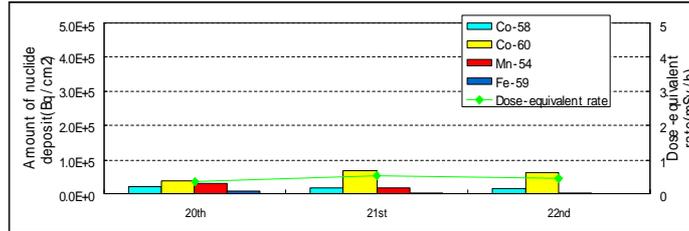
Pattern of hydrogen injection termination / start



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Transition of PLR piping dose-equivalent rate (Pump B (22nd outage))

PLR(B) inlet vertical piping



PLR(B) outlet vertical piping

