

Effect of Secondary-Side Deposit Inventory on Hydrazine Concentration in Recirculating Steam Generators in Korean Nuclear power Plants

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1. Introduction

In the secondary system of pressurized water reactors(PWRs), hydrazine is injected as a oxygen control agent due to remove the dissolved oxygen in secondary water. The injected hydrazine is naturally consumed through reaction with dissolved oxygen, reduction of oxides, and thermal decomposition during the process of circulating through the secondary system. Schwarz et al. reported that the thermal decomposition reaction is further promoted with an increased inventory of iron corrosion products(i.e. deposit inventory) on the secondary-side of the steam generator as shown in Fig. 1[1]. In this paper, the correlation between the change in deposit inventory of Korean PWR steam generators and the hydrazine concentration ratio between the secondary-side water of a SG and feedwater(FW) were analyzed.

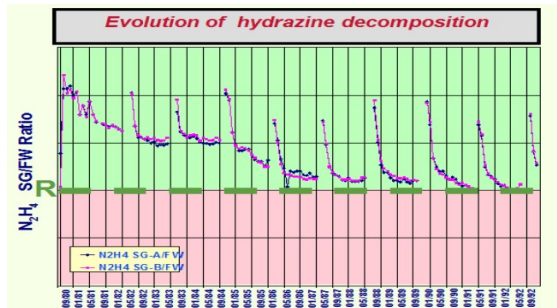


Fig. 1. Typical evolution of hydrazine concentration ratio SG/FW in a PWR[1].

2. Methods and Results

Fig. 2 shows the SG/FW hydrazine ratio of SGs that has experienced a reduction in deposit inventory. As the number of SG operating time increases, the deposit inventory naturally increases, and accordingly, the SG/FW hydrazine ratio tends to decrease. However, the SG/FW hydrazine concentration ratio increases when the secondary-side deposit inventory of the SG decreases, such as during chemical cleaning. Then, it shows a tendency to decrease again as the deposit inventory increases. Fig. 3 shows the SG/FW hydrazine ratio of SGs that has not experienced a reduction in deposit inventory. Since there was no experience of reducing the amount of deposit inventory inside the SG,

SG/FW hydrazine ratio is continuously decreasing as the number of operating days increases.

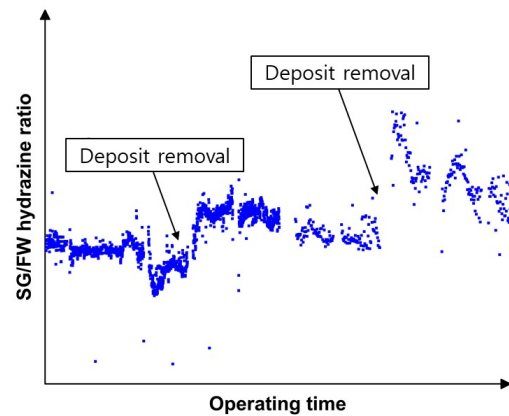


Fig. 2. SG/FW hydrazine ratio with deposit removal.

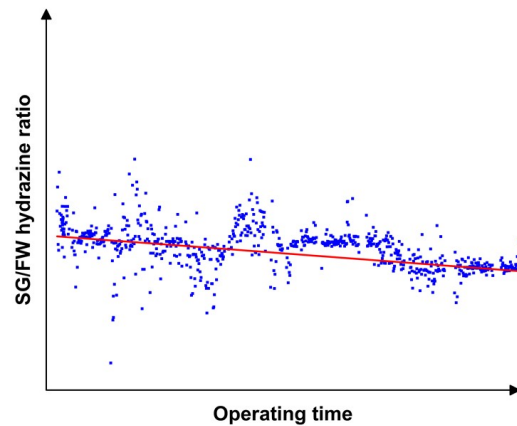


Fig. 3. SG/FW hydrazine ratio without deposit removal.

3. Conclusions

As the increasing of steam generator operating time, the SG/FW hydrazine ratio naturally decreases. The only way to restore this ratio is to remove the deposits inside the SG. Therefore, the SG/FW hydrazine ratio can be used as an indicator to indirectly confirm the amount of deposit increase inside the SG.

REFERENCES

- [1] T. Schwarz, R. Bouecke, S. Odar, Cleanliness Criteria to Improve Steam Generator Performance, International Conference Nuclear Energy for New Europe 2025.
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