THE EFFECT OF DISSOLVED OXYGEN IN LITHIATED COOLANT

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Objectives: The aim of this study was to determine the effect of slightly oxidizing conditions on cobalt-60 activity buildup on 403 stainless steel, carbon steel, and iron oxide pellets. It has been hypothesized that oxidizing conditions lead to a higher rate of field growth.

Comments: Experiments were performed in a high-temperature experimental loop constructed of 304 stainless steel. The measurements and examinations done included:

- average Co-60 activity in the water
- Co-60 pickup by oxide pellets and steel surfaces
- scanning electron microscopy (SEM)
- conversion electron Mössbauer microscopy
- transmission electron microscopy (TEM)
- energy dispersive X-ray (EDX)
- scanning auger microprobe (SAM)

Remarks/Potential for dose limitation: The conclusions of the study were as follows:

- Oxide films formed on steel materials in deoxygenated and slightly oxygenated water were seen to have different structures and different affinities for Co-60.
- Oxide films formed under oxidizing conditions were thinner, but had higher Co-60 activities per unit volume of oxide.

Because of these two properties working against each other, the net result was similar Co-60 activity per unit area of base metal under reducing and oxidizing conditions.

References: Allsop, H.A., Sawicki, J.A., Lister, D.H., and Godin, M.S.L., "The Effect Of Dissolved Oxygen in Lithiated Coolant," *Water Chemistry of Nuclear Reactor Systems 6*, Vol. 1, pp. 25-32, British Nuclear Energy Society, London, 1992.

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