Estimate of Moderator C-14 Concentration from Demestic Pressurized Heavy Water (PHWR) Reactor

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Carbon-14 is one of the principal nuclei in radioactive gaseous emissions from PHWR. The gaseous emissions of C-14 occur mostly by purging and venting of the moderator cover gas, whose the C-14 content depends on the C-14 concentration in the moderator ($m_{C-14\ in\ MOD}$). Therefore, $m_{C-14\ in\ MOD}$ plays a central role in the C-14 stack emission. In this study, the values of $m_{C-14\ in\ MOD}$, especially during extended operation of ion exchange resins, are estimated via theoretical calculation and actual measurements. The estimate shows that the values of both calculation and actual measurement are in agreement within an order of magnitude. It also reveals that when high C-14 stack emission occur, the values of the measurements are bigger than the value of the calculation. Accordingly, it is suggested that the value of the calculation gives an effectual estimate for the moderator C-14 concentration and that it can be used as a criterion to determine whether or not high C-14 stack emissions occur.