PESSIMAL HEIGHT OF RELEASE AND THE RADIATION DOSES FROM A RADIOACTIVE CLOUD AND FROM DEPOSITION OF FISSION PRODUCTS

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Abstract—In the evaluation of the hazards to the environment resulting from a release of radioactive materials from a nuclear reactor, it is generally considered that an increase in the height of release would be advantageous in minimizing the concentrations in the environment and that inversion atmospheric conditions and deposition of the radioactive material by rain represent the most hazardous atmospheric condition.

In the present study it is shown that when the depletion of the cloud by deposition during its travel from the release point to the distance of interest is taken into account, a different picture is obtained: (1) an increase in the height of release, within certain limits, may cause an increase in the ground concentration at a given distance from the source, and (2) for certain distances from the release point, at which highly populated centres may exist, consideration of the hazards during inversion and rainout conditions only may result in an underestimation of the environmental hazards.

The computation of the integrated radiation doses from the fission products released from a ground source following a reactor accident and deposited during dry or rainout conditions shows that at relatively short distances from the source the doses are greater if deposition occurs during dry conditions; at greater distances the doses are greater if deposition occurs during rain conditions. The distance from the release point to the point of intersection between the radiation doses from dry and rainout depositions decreases with time since deposition, the time factor reflecting the more rapid decay of the iodines.

The Total Integrated Cloud Concentration (TIC) of the iodines computed for lapse and inversion atmospheric conditions, considering the depletion of the cloud by deposition, reveals the following: due to the relatively high deposition of the iodines and to the greater deposition during inversion conditions, the TIC during lapse conditions will be greater, from a certain distance on, than during inversion conditions. Higher wind velocities during inversion conditions and lower wind velocities during lapse conditions cause the approach to the point of release of the intersection point between the TIC for inversion and for lapse conditions.