

EFFECT OF NON-FULLY DEVELOPED FLOW AND THE SURFACE ROUGHNESS IN AN ELBOW PIPE UNDER THE INDIAN NPP FLOW CONDITIONS

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ABSTRACT

The objective of this paper is to examine the last step of the mechanistic model of wall thinning degradation mechanism i.e., convective mass transfer in feeder pipes under different environments of piping of nuclear power plants (NPP). In the present study, the flow and mass transfer of demineralized water in carbon steel double elbow simulated under Indian NPP feeder water system conditions. The analysis carried out in this study based on the position of the first elbow i.e., the first elbow positioned at the non-fully developed flow in the upstream region of first elbow as the piping system in NPP contains such type of construction of piping. For this analysis, the upstream horizontal limb of the double elbow considered to be of different lengths 0.09 m, 0.11 m, 0.13 m and 0.15 m. In addition, the surface roughness of the primary side of the pipe plays major role in detecting the prone areas. Analysis will be done for the various range of surface roughness. MTC is the most important parameter to predict the highly susceptible FAC locations. For the MTC analysis, the Chilton-Colburn analogy in terms of wall shear stress used. The reported results are useful for developing the targeted inspection plans in predicting the vulnerable FAC locations.

Keywords: Mass Transfer, Surface Roughness, non-fully developed flow, Flow accelerated corrosion