

An Experimental Study on the Vibrations and Grid-to-Rod Fretting Wear in PWR Fuel

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Abstract

An experimental study on the vibrations and grid-to-rod fretting wear is performed based on extensive fretting wear tests of the PWR fuel. The fretting wear between grid and fuel rod is initiated at a certain critical gap correlated with a critical work rate. A critical gap between grid and rod is formed due to in-reactor performance of fuel, thermal relaxation of grid spring and irradiation growth of grid strap, etc. A critical work rate is generated with the combination of high frequency vibration of grid strap, fuel rod vibration and fuel assembly vibration. Fuel assembly fretting wear has been evaluated using the grid-to-rod fretting wear rates as a function of initial gap size under a certain work rate determined by the fuel assembly design and a test flow rate considered. Based on the fretting wear tests, a methodology is proposed for predicting fretting wear rate as a function of grid-to-rod gap size that is strongly dependent on the fuel assembly design as well as the grid-to-rod contact geometry.