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Paper Summary

AMERICAN NUCLEAR SOCIETY INTERNATIONAL TOPICAL MEETING ON LWR FUEL PERFORMANCE

Session: Fuel Performance in Storage Conditions

Title: Fuel Performance of DOE Fuels in Water Storage

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Westinghouse Idaho Nuclear Company operates the Idaho Chemical Processing Plant (ICPP) at the Idaho National Engineering Laboratory. In April of 1992, the Department of Energy decided to end the fuel reprocessing mission at ICPP. Fuel performance in storage received increased emphasis as the fuel now needs to be stored until final dispositioning is defined and implemented. Fuels are stored in four main areas, an original underwater storage facility, a modern underwater storage facility, and two dry fuel storage facilities.

As a result of the reactor research mission of the Department of Energy, and predecessor agencies, Energy Research and Development Administration and the Atomic Energy Commission, many types of nuclear fuel have been developed, used and assigned to storage at the Idaho Chemical Processing Plant. Fuel clad with stainless steel, zirconium, aluminum, and graphite are represented. Fuel matrices include uranium oxide, hydride, carbide, metal, and alloy fuels resulting in 55 different fuel types in storage. Also included in the fuel storage inventory is canned scrap material.

DISCLAIMER

Algae growth in the original fuel storage basin in the late 1960's prompted increased use of calcium hypochlorite to control the algae. The high basin water chloride levels accelerated corrosion of some of the fuel types and fuel storage components. Basin water chloride levels reached 400-750 parts per million (ppm) for a period of 7 years and were later reduced to a current level of 52 ppm (see Figure 1). Failure of a carbon steel fuel storage fixture at the original ICPP fuel storage facility in 1992 resulted in a detailed underwater remote examination of the fuels and fuel storage components to determine their condition and actions required to ensure continued safe storage.

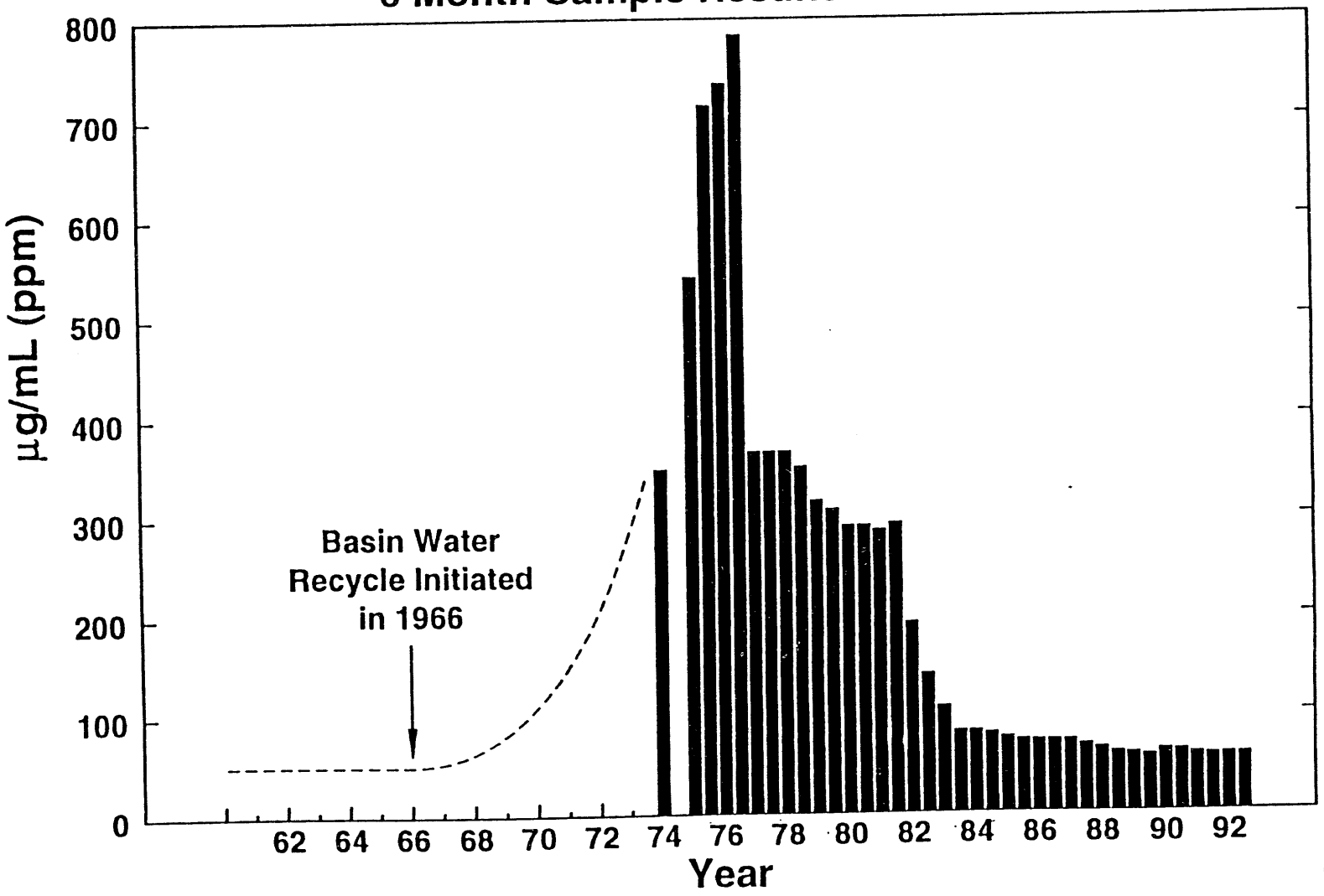
This remote examination of the fuels in storage documents various degrees of resistance to the corrosive effects of water storage. In general, aluminum clad fuels that have been stored for up to 34 years have displayed poor performance in storage. Stainless steel and zirconium clad fuels have exhibited good performance in storage. Carbon steel, used only in storage equipment, has also shown poor performance.

Fuel storage in the newer storage basin utilizes a stainless steel basin liner and extensive water quality control. Aluminum dummy fuel cans simulating the performance of fuel cans in storage have shown indications of corrosion. The cause is currently under investigation. Recent examinations in this basin have also revealed microbiological growth on the fuel storage equipment. Studies to evaluate possible microbiological corrosion and to control growth are underway and will be discussed.

Metal coupons in the basin water simulate performance of the materials of construction for fuels and fuel storage components. Laboratory corrosion tests with bi-metallic coupons have been used to evaluate the various galvanic corrosion effects of storing dissimilar fuels in storage containers constructed of carbon steel, aluminum and stainless steel. Recent efforts to resolve the corrosion induced storage issues in the underwater fuel storage facilities will be discussed.

CPP-603 Basin Water Chloride Levels

6 Month Sample Results Since 1960



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