CALSPAN--6782-M-6

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ARVIN/CALSPAN

MITIGATION OF BIOFOULING USING COATINGS - YEAR 2

QUARTERLY PROGRESS REPORT #2

March 15, 1982

Contract Number DE-AC02-80ER10766
Calspan Report Number 6782-M-6

Prepared for: Department of Energy
Office of Basic Energy Sciences
Mail Station J-309
Washington, D.C. 20545

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DISCLAIMER

Objectives

Objectives of this project are to evaluate benefits associated with control of the surface energetic properties of materials used in heat exchangers; and to identify preferred ranges of these surface conditions that minimize deposits of biological fouling known to deteriorate heat exchange efficiencies in cooling water systems. The technical approach employed uses special diagnostic plates in novel flow cells where fluid flow conditions can be well-controlled, modifying the surface chemistry and surface energy of the plates with very thin coatings and examining the earliest events of biofouling caused by macromolecules and microbial organisms. For the present phase of the project (Year 2), attention is focussed on biofouling in a freshwater/brackish water system.

Progress - January 18 to March 12, 1982

New Heater Block

The new heater blocks that were described in Progress Report #1 (DOE Report No. DOE/ER/10766-5) were fabricated and outfitted with thermocouples. Two sets of copper blocks and one set of Monel blocks were made. The new systems will be tested in laboratory tank experiments being initiated at this time.

Field Tests

In our report dated January 15, 1982, we anticipated that the field tests would begin by mid-February. The experiments did not begin as scheduled due to an unforeseen shut-down of PASNY's Indian Point #3 nuclear power station. Because of the shut-down, the nuclear fuel that was to have been used by that time was not completely consumed. The reactor is currently back in operation and is running on the remaining fuel. As soon as that fuel is spent, and the reactor is shut down for normal refueling operations, our apparatus will be installed and tests will proceed as planned. PASNY officials have informed us that we can be on-site in late April or early May 1982. In the meantime, we have continued to prepare for the field tests by characterizing the pre-exposure germanium plates. The plates will be coated with durable thin films

and then recharacterized in the coming weeks.

Planned Activity - March 15 to June 15, 1982

- Finish laboratory tank experiments to test the sensitivity and durability of the new heater blocks.

- Prepare germanium plates for freshwater field tests. Coat one set with dimethyldichlorosilane; another set with 3-(heptafluoroisopropoxy)-propyltrichlorosilane;* a third set will be detergent washed and left uncoated for the tests; and a fourth set will be radio-frequency glow-discharge-treated and stored in boiled distilled water until they are assembled into flow cells on-site.

*NOTE: This fluoroinated compound is different than the one used in Year 1 of this project. We have found that the new compound leaves a more durable and lower energy film that the substance used last year.

- Begin freshwater field tests at Indian Point #3 nuclear power station.

NOTE: Simultaneous with the field tests supported by the Department of Energy, Calspan will be exposing flow cells containing stainless steel (AL6X) to the same cooling water. The stainless steel testing will be supported by monies from the Power Authority of the State of New York (Contract Number NYO-82-10, dated March 3, 1982). There will be some economy in travel expenditures to both the DOE and PASNY; each project will be charged for only half of the travel for the field trip. The dollars saved on travel will be re-channeled into technical effort.

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