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FFTF UTILIZATION FOR IRRADIATION TESTING

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ABSTRACT

FFTF utilization for irradiation testing is beginning. Two Fuels Open Test Assemblies and one Vibration Open Test Assembly, both containing in-core "contact" instrumentation, are installed in the reactor. These assemblies will be used to confirm plant design performance predictions. Some 100 additional experiments are currently planned to follow these three. This will result in an average core loading of about 50 test assemblies throughout the early FFTF operating cycles. The experiments include several others of particular significance to conferees. Acoustic monitors, complementary to the Vibration Open Test Assembly, will be used to sense any in-reactor noises. Radionuclide Trap Tests, a special series of two different types of assemblies, are planned. These tests are designed to remove radioactive corrosion products from the primary sodium coolant, diminishing undesirable depositions at other heat transport system sites.

TEST PROGRAM OVERVIEW

Loading of the first core at FFTF has been completed; the plant is now in a period of final preparation for the initial ascent to power later this year. The initial irradiation program is based heavily on confirmation of plant design performance predictions and involves specially selected standard core components plus three contact-instrumented test articles. The latter assemblies, now installed in the reactor, take advantage of the unique FFTF design which includes eight specific core locations wherein in-core instrumentation can be used to monitor test article performance during operation.

Two of these three contact-instrumented tests are Fuels Open Test Assemblies or FOTAs, Figure 1. An assembly consists of an in-core section surmounted by a stalk. The stalk is an assembly of hardware which serves to provide in-core assembly holddown in each of the eight special OTA positions and it is also used to provide the exit path for contact-instrumented leads from the monitored location in the experiment. In the case of the FOTAs, each of the assemblies is equipped with thermocouples positioned to monitor local sodium coolant temperatures in flow channels between pins at different elevations in the assembly. Each test is also instrumented to monitor coolant exit conditions. Early data will be used to monitor the initial ascent to power and FFTF primary system natural circulation testing. Subsequently, the

tests will be used to confirm driver operating temperature and coolant flow model predictions during normal operation throughout the test lifetime.

The third contact-instrumented test is called the Vibration Open Test Assembly or VOTA, Figure 2. The assembly has been specially designed to accomplish a number of objectives, including monitoring of assembly flow-induced vibration, coolant flow measurements, monitoring of core restraint loads, neutron flux measurements, gamma flux measurements and gamma heating rate measurements.

The projected lifetime for these Open Test Assemblies is three or more reactor cycles or a minimum of 300 Full Power Days (FPD) and we are expecting them to provide confirmatory data of the FFTF design. A number of the sensing devices to be used are developmental in nature and, thus, the reliability of these devices will also be determined.

Within the total FFTF irradiations program are some 100 plus experimental assemblies which will be installed in the reactor through the first five operating cycles. Since the 100 assemblies have varying reactor residence times, as determined by individual test objectives, the average reactor loading will be at or near 50 tests each early FFTF operating cycle. The 100 experiments are primarily tests of fuel materials and support methods, control materials and construction materials plus an extensive characterization program of standard FFTF assemblies. Of the 100 experiments, several others may be of particular interest to this audience. As an adjunct to the VOTA, additional monitoring devices are being installed in stalks, for insertion in one or more of the eight FFTF OTA positions, to complement the vibration monitoring of the VOTA.

The first of a second grouping of tests, designed to remove radioactive corrosion products from the primary sodium coolant, has been assembled and certified. This assembly, identified as the Radionuclide Trap Test, Figure 3, will be inserted in the reactor prior to FFTF Cycle 1. In-core removal of radioactive corrosion products diminishes undesirable deposition of this material at other heat transport system sites which, in turn, results in lower radiation exposures to maintenance and operating personnel.

The assembly is basically an FFTF standard driver which has been modified at the sodium outlet (top) end to accept a housing containing cylindrical segments of rolled foil. Adjacent roll surfaces are spaced apart by dimples impressed in the foil. The foil acts as a "getter" for corrosion products generated from the fuel pin cladding and the assembly. This type of trap has operated successfully in two EBR-II tests using the reduced size compatible with EBR-II fuel assemblies.

Approval has been received to develop a radionuclide trap test wherein the exterior pin cladding surface is treated to act as the "getter". This provides a significantly larger active surface which is expected to produce superior results.

Subsequent planned efforts in the area of radioactive contaminant control also

includes the possibility of placing corrosion product "getters" in the FFTF Closed Loop Systems where test environments can be controlled separately from that of the FFTF primary system and where special fuel tests will be conducted.

This provides a brief summary of the current approved Reference FFTF Irradiation Test Program. Details of test article design and testing results will, of course, be made available to program participants under the appropriate agreements now in force. The program undergoes periodic updates to incorporate either new information or tests to meet newly determined needs of program participants. However, the current plan is built on a broad base involving many types of tests and the next several years promise to be interesting ones.

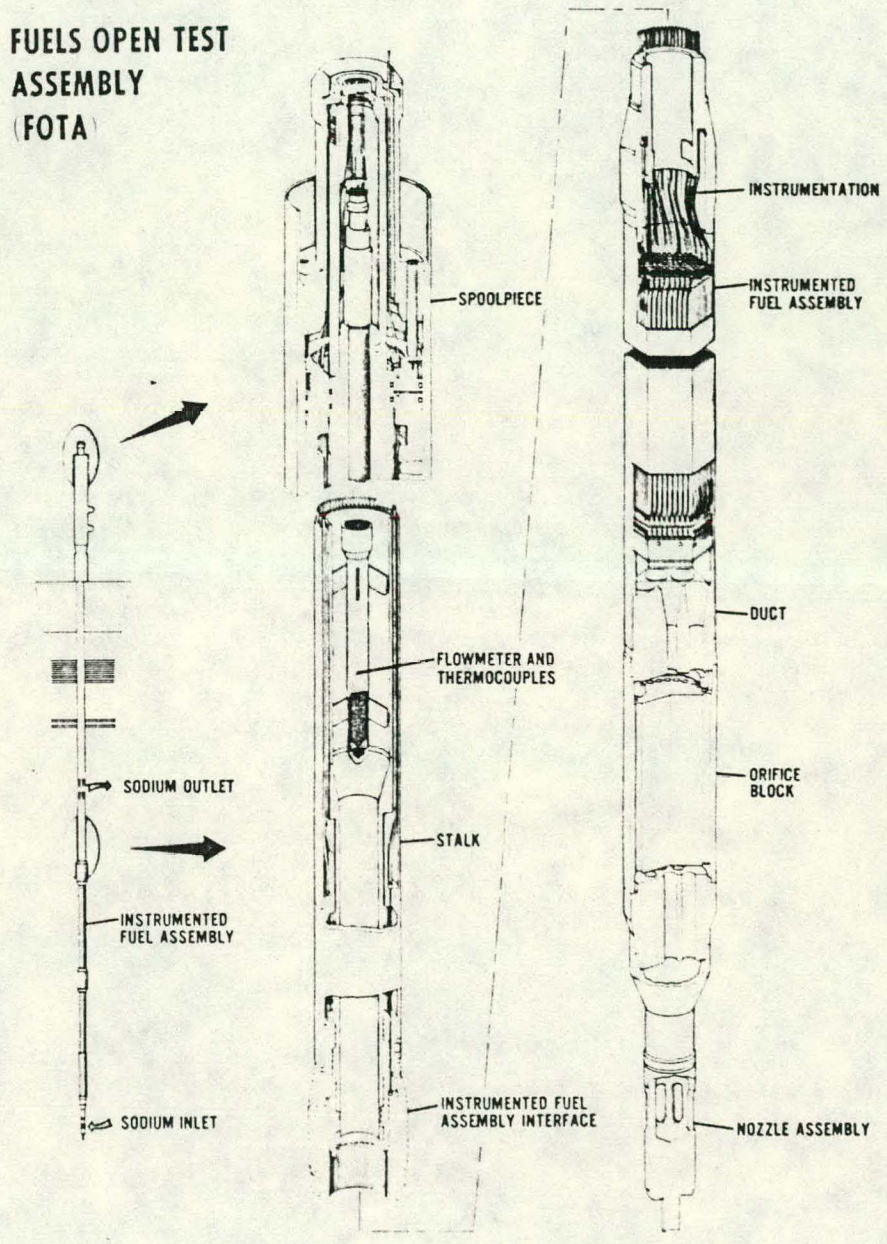
FUELS OPEN TEST ASSEMBLY (FOTA)
SODIUM OUTLET
INSTRUMENTED FUEL ASSEMBLY
SODIUM INLET
SPOOLPIECE
FLOWMETER AND THERMOCOUPLES
STALK
INSTRUMENTED FUEL ASSEMBLY INTERFACE
INSTRUMENTATION
INSTRUMENTED FUEL ASSEMBLY
DUCT
ORIFICE BLOCK
NOZZLE ASSEMBLY

Figure 1

VIBRATION OPEN TEST ASSEMBLY (VOTA)

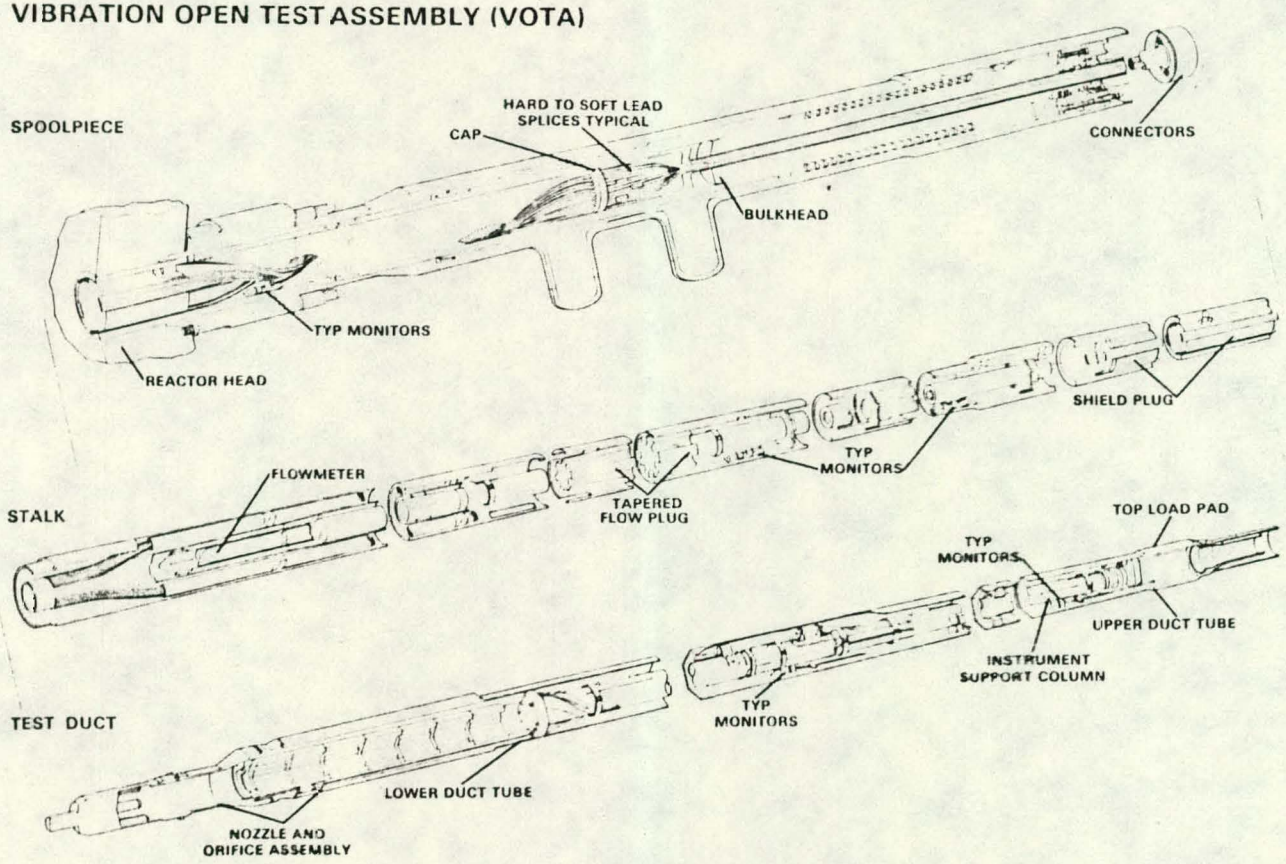

Figure 2

FTR RADIONUCLIDE TRAP

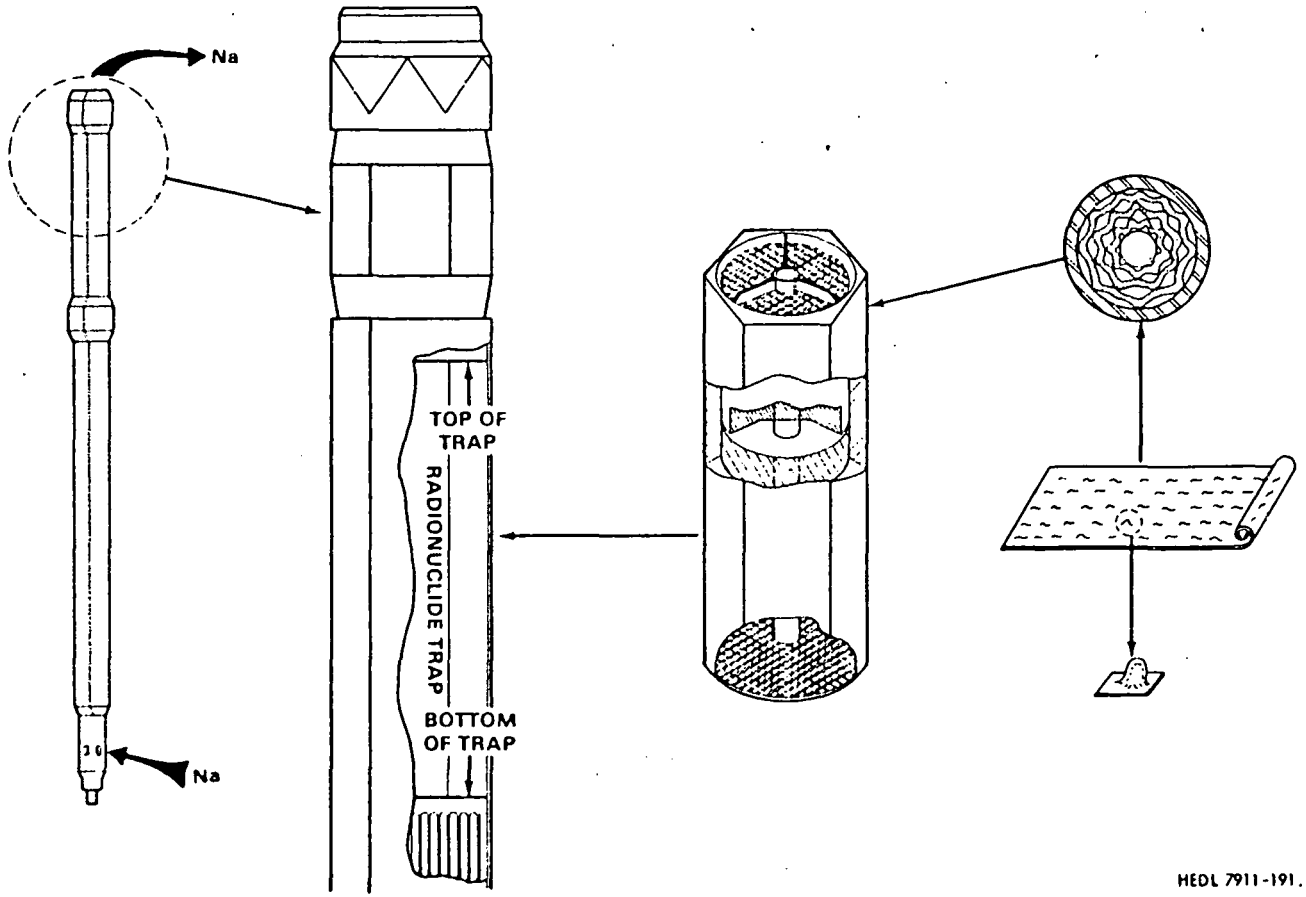

Figure 3