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Westinghouse Astronuclear Laboratory

DEVELOPMENT TEST PROGRAM INTERIM PROGRESS REPORT
FOR MARCH, 1967
(Title Unclassified)

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Classification cancelled for change to
by authority of D.O.C.
by P.F.C. TIC, date SEP 10 1973

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TABLE I
THERMO-FLOW LABORATORY TEST SCHEDULE

PERFORMED THIS PERIOD (March)

PLANNED NEXT PERIOD (April)

Tests for NRX-A6

TFL-1. a Cluster Tests

- 1. a. 0008a, b Exit gas thermocouple assembly
2 Cycles - 16.5'; 0'
- 1. a. 0009a Exit gas thermocouple assembly
1 Cycle - 7.0'
- 1. a. 0010a Exit gas thermocouple assembly
1 Cycle - 20.7'
- 1. a. 0007 Developmental tungsten cup.
- 1. a. 0006 Developmental composite cup.

Complete exit gas thermocouple.

Vapor deposited tungsten cup.
Start composite cup and modified A-6 block -
(Proof).

TFL-2. a A-6 peripheral design effort.

Continuation of concept.

TFL-2. c Plunger pin capsule seal tests - Completed test series.

No activity.

TFL-6. b Filler strip plugs - completed test series.

No activity.

Tests for XE-2

TFL-3. e Nozzle interface seal tests - completed testing.

No activity.

General Development

TFL-1. a Cluster Tests - Analysis of cold end electrode warping problem.

Procure and test modified cold end chucks.

TFL-1. b Single Element Tests -
Eight tests at high power levels for furnace engineering evaluation using high void elements.
Two tests as part of Phase II-1B overcoated elements.

Initial testing of the water injection system.
Additional tests to establish the capability of the corrosion furnace system to operate at high power and flow levels.

Two tests for electrical and pneumatic system checkout.

Initial evaluation of the long hot end chuck.
Initial testing of the methane injection system.

TFL-5. b Interstitial Corrosion - pyrofoil test.

Continue testing.

TFL-5. c Permeability - assembled 18" furnace.

Initiate testing.

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TABLE II
ENGINEERING MECHANICS TESTING

PERFORMED THIS PERIOD (March-April)

PLANNED NEXT PERIOD (April-May)

Tests for NRX-A6

EML-C.1 Carbide Composition Cup Development Tests
Tungsten Cup Development Tests
EML-D.5 Lateral Support System Static Tests
EML-E.2 Friction Tests of Reactor Components
EML-F.4 Shield Flow Screen Burst Tests

EML-C.1 Carbide Composition Cup Proof Tests
Tungsten Cup Proof Tests
EML-D.5 Lateral Support System Static and Dynamic Tests
EML-E.2 Continue Friction Tests
EML-E.4 Filler Strip Keyway and Tile Groove Tests

Tests for NR-1

EML-A.4 Ganged Drum Decoupler Fixture Design
EML-G.1 Planning NR-1 Vibration Program

EML-A.4 Ganged Drum Drive Band Tensile Tests

General Development

EML-E.1 Core Periphery Pyrofoil Wrapper Evaluation Tests
EML-E.3 Pyrofoil Compaction Tests
Aft End Flow Impedance Tests with Pyrofoil Sleeves
Pyrofoil/Carbonized Metal Sealant Aft End Impedance Development Test

EML-C.1 Composite Material Creep Tests
EML-E.1 Core Periphery Pyrofoil Wrapper High Temperature Strain Proof Tests
EML-E.3 Aft End Flow Impedance Tests without Pyrofoil Sleeves
Continue Testing

Facilities

Equipment for Ganged Drum Band Fatigue Test Delivered

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TESTS FOR NRX-A6

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TFL-1.a Single Cluster Development Tests

The developmental tungsten and composite cups from tests TFL-1.a.0006 and TFL-1.a.0007 were sectioned and examined by microscope. Both cups had been tested for a nominal 60 minute duration at 4300°R. The tungsten cup essentially was intact; there were no cracks, pits, or voids as a result of the test. Carbiding of the surface took place on the inside of both tungsten cups, where contact with graphite components (insulating cup, insulating sleeve, and support washer) provided a high carbonaceous environment. The large and small cups were welded together at their interface and the support washer was welded to the small cup and support block.

The composite cup had some corrosion of the carbon matrix on the trailing edges of the cup where cracks in the coating had exposed the substrate. In addition, the cup was cracked in two areas. One crack began on the outer surface and proceeded radially inward at an axial location near the "flange" that carries the load from the tie rod. A second crack was observed on the "flange" itself which began on the downstream side of the flange and proceeded upward toward the support washer. In spite of these cracks, the cup performed adequately and maintained its structural integrity. As in the case of the tungsten cup, the block, support washer, and composite cup were welded together.

The exit gas thermocouple assembly for NRX-A6 was evaluated in tests TFL-1.a.0008a, 8b, 9a, and 10a. Problems with the model and the cluster furnace compromised some of these tests. These included warping of the electrode on the cold end of the furnace, arcing in the cluster assembly, and breakage of elements near the cold end. The cause of these apparently inter-related problems is being investigated.

Test TFL-1.a.0008a was successfully conducted on March 9, 1967. The thermocouple operated adequately for 16.5 minutes at a steady-state temperature of 4230°R and a hydrogen flow rate of 0.15 lb/sec. Test TFL-1.a.0008b was

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aborted on the initial power ramp when arcing took place between the center element and the cluster plate assembly on the model. There was no damage to any of the aft end components including the thermocouple assembly, and the thermocouple operated throughout the test. However, the tie rod was slightly overheated because of the arcing. The assembly was, therefore, put aside for further testing at a later date if required.

A second assembly was built and tested for 7.0 minutes at 4270°R in TFL-1.a.0009a. The test was terminated when warpage in the cold end electrode caused several elements to break. A restart of this assembly was not made because of damage to the thermocouple sheath during the re-assembly of the model.

A third thermocouple assembly was tested for 20.7 minutes at about 4300°R in TFL-1.a.0010a. This thermocouple indicated an open lead on the initial power ramp at an indicated temperature of 3900°R. Post test examination revealed that arcing inside the cluster from the fuel elements to the center element had caused the failure of the thermocouple.

Testing of the exit gas thermocouple configuration will continue next month along with the proof testing of the irregular tungsten protection cups.

TFL-2. a Filler Strip Corrosion Tests

Efforts have been directed towards (1) redesigning a multiple layer wrapper test model which is representative of the NRX-A6 peripheral design concept, and (2) procuring the required test hardware.

The present design incorporates an eight-layer wrapper sandwiched between the coated hot buffer type filler strips and the hot buffer tile. Each layer of the wrapper contains two circumferential split liners with each layer stacked in such a manner as to eliminate radial alignment between the gaps formed by any two circumferential liners.

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A one dimensional thermal and hydraulic design analysis of the model has been completed by Thermo-Flow Laboratory based on the preliminary reactor and mechanical design information supplied. Changes in operating levels since the initial completion of the analysis requires further analytical effort.

Design of the model is 75% complete and the procurement of hardware from the outside supplier is 90% complete. Procurement of hardware from the Machine Shop and WNCO has been slow and is presently 40% complete. Effort has been initiated to expedite earlier delivery dates for these items.

TFL-2. c Plunger Pin Capsule Seal Tests

Twelve sets of plunger pin capsule seals were thermal cycled from ambient to liquid nitrogen temperatures. While stabilized at the temperature extremes, the seal assembly was pressurized with hydrogen gas at 600 psig upstream and differential pressures, in turn, of 15, 100, and 200 psid. The leak rates through each set (pair) of seals was measured at each set of test conditions. Six sets of the seals were the NRX-A6 double diamond design modified by removal of the outer flange and the other six sets were the "L" shaped NRX-A7 proposed design. Each seal had been tested previously and had been reassembled in the fixture again for these tests. The results were that the leak rate was either very small or negligible at ambient temperature and not over 0.50 scc/sec (not shown on curve), in the worst case at 200 psid and cryogenic temperature. The two seals performed remarkably alike. Figures 1 and 2 present actual cryogenic temperature leak rate values.

TFL-6. b Filler Strip Plug Tests

Filler strip plug tests were conducted on specimens which consisted of two inch long coated filler strip samples containing a coolant passage. The coolant passage was plugged by means of a plug, the axis of which was at right angles to that of the coolant passage. The back of the plug and the side of the plug

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exposed on the aft end of the coolant passage were sealed with zirconium foil which had melted and carbided to produce the seals. The specimens were placed in the fixture and the forward end of the fixture was pressurized with helium gas at ambient temperature and 10 psig. The aft end of the strip was sealed with a flat gasket while the area around a jet orifice supplying the helium was sealed with an "O" ring.

Five filler strip segments were proof tested in the following sequence:

1. Leak Rate Measurement conducted by Thermo-Flow Laboratory.
2. Pressure Test conducted by Materials Laboratory.
3. Thermal Cycle conducted by Materials Laboratory.
4. Leak Rate Measurement conducted by Thermo-Flow Laboratory.
5. Hot Hydrogen Exposure conducted by Thermo-Flow Laboratory.
6. Leak Rate Measurement conducted by Thermo-Flow Laboratory.

The overall leak rate measurement for the test specimen included the permeability of the specimen and the plug leakage. By sealing over the plug a measurement of specimen, permeability was obtained. By subtracting the specimen permeability less plug leakage from overall leakage, the plug leakage was determined. The leakage rate measurement before and after the pressure and thermal cycle events was 12 to 15 cc/min of helium through the specimen with an average of 1 cc/min through the plug. The hot hydrogen exposure was for 30 minutes in the hot end plenum of the WANHES single element furnace. A void about 1/8 inch diameter by about 3/8 inch diameter was created around the plug in the filler strip segments, Figure 3. The overall leak rate measurement did not change appreciably and the leak rate at the plug was not detectable, that is, it was less than 0.05 cc/min.

Additional hot hydrogen exposure would probably have freed the plug from its socket.

A second pressure and thermal cycle may be followed by an additional leak rate measurement.

FIGURE 3
2-INCH FILLER STRIP SEGMENT CORROSION

EML-C.1

Carbide Composition Cups

A coated cup of Carborundum Co. material was intentionally cracked in the Engineering Mechanics Laboratory and then run for one hour in the Single Element Test Rig of the Thermo-Flow Laboratory. It was then returned to the Engineering Mechanics Laboratory and loaded to failure at 4300°R. This occurred at 3800 lb. Examination of the shattered pieces showed about three to four mils depth of corroded material where the original crack was made. It could not be determined whether the original crack had penetrated below the coating into the carbide.

A coated Carborundum Co. material cup was tested three times with a support washer whose contacting surface was honed flat and coated with graphite lubricant. Test loadings of 700, 900 and 1100 lb were obtained by gradually increasing the load according to temperature along a pre-set program. A crack developed at the 900 lb loading but did not change much at the 1100 lb loading. Metallographic examination revealed many surface cracks in the coating but none penetrating into the carbide material. Previously, this particular cup had been tested five times with the load applied after reaching temperature.

Prior tests have shown that the deflection of the inner bore area of the ledge on the carbide composition cup (H cross section) results in a crack. To combat this deflection a series of tests is being run to evaluate a two mil tapered surface support washer with the higher surface in the central area of the washer. The tests have been run on uncoated cups made from LASL materials. Constant loading tests at 1100 lb with varying temperature to 4300°R with a ten minute hold have produced no cracks in the ledge surface. To date, five tests have been conducted with the tapered washers and these tests indicate that this configuration will result in higher crack initiation loads than obtained with standard flat washers.

Tungsten Cups

Two sets of tungsten cups of the back-to-back design were tested. One of G.E. extruded material and one of vapor deposited rhenium-coated material. The extruded set of cups was tested for ten minutes at 4300°R in an argon atmosphere with the load held at 800 lb from start to finish of the cycle. While the surface ended up somewhat discolored, there was absolutely no carbiding of the tungsten surfaces or deformation under loading.

The rhenium-coated cup was tested for one hour at 1100 lb and 4300°R with the load held steady through the rising and falling temperature periods. Sectioning revealed a substantial amount of large grain growth, a small amount of carbiding, no cracks, small deformation, and a very good surface finish. Although neither of these specific material variations is presently intended for reactor usage, these tests provide a good estimate of the potential of the vapor-deposited cups.

EML-D.5

Lateral Support System Static Test

Another static test was performed on the simulated NRX-A6 lateral support system with the test arrangement as shown in Figure 4. With the aluminum reflector rigidly attached to the floor, lateral loads were applied to the solid graphite disc which represented a 9 inch length of the core. The disc was restrained to pivot about a position 52 inches forward of the nozzle end of the core which based on previous stress analysis simulates the point of rotation for the bottom plane of the core at the moment of breakaway. Four NRX-A6 displacement transducers were mounted to the nozzle end of the reflector. Outputs from these transducers located in line and at 90° from the loading path were monitored on the digital printer. The displacement transducer at 180° was also attached to the X-Y plotter. The resulting force-deflection curve is shown in Figure 5. It should be noted when reviewing this curve, that the behavior of the core is accurately described only in the region approximately 30 mils in the line of motion either side of the geometric center of the reflector. As seen in the

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FIGURE 4
ARRANGEMENT FOR STATIC TEST OF LATERAL SUPPORT SYSTEM
EML-D.5

FIGURE 5
TYPICAL LOAD-DEFLECTION CURVE FOR STATIC TEST OF LATERAL SUPPORT SYSTEM
EML-D.5

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Figure, the loading started at A and gradually increased to Point B. In order to evaluate the initial movement, the displacement scale was increased to give better resolution and the enlarged portion of the curve from A to B is shown in Figure 6. The load was then increased to Position C just short of impact and then gradually reduced to 0 lb at D. The loading system was disassembled and then reassembled to pull in the opposite direction. During the time of change-over, a slight shift in displacement is noted by the motion from D to E. This offset was probably due to a redistribution of forces in the opposite direction. The mechanical aspects of this zero force region and their implications for the dynamic tests will be reviewed. The load was then increased from E to F, reduced to 0 lb at G and the mechanism disassembled and reassembled for loading from H to I, thereby closing the loop. The slope of the plot shows an apparent spring rate of 6086 lb/in. over the flat portion of the curve. The reduced apparent spring rate compared to the previously reported static test values of 7100 lb/in. unrestrained and 7400 lb/in. restrained is due to a variation in the friction force on the lateral support system. A mathematical model of the system is being studied for the actual reactor system and for the partial length core tests to determine the magnitude of friction and the true spring rate.

Additional tests were performed to investigate the load-displacement curve that characterizes the reversal of loading over a displacement of $\pm .125$ inches. In each case, the curve was similar to the portion of the curve from A to B, C to D, and E to G in Figure 5.

As soon as the test assembly has been disassembled, inspected and re-assembled, the dynamic tests will begin.

EML-E.2

Friction Tests of Reactor Components

Tests of rhenium-coated graphite on NbC-coated unfueled partial element specimens were performed to determine the friction and wear that would occur during simulated reactor test operation of ten minute duration. The tests were performed in air at 530°R and in hydrogen at 4400°R with a contact pressure of approximately 35 psi.

FIGURE 6
EML-D.5
EXPANDED DISPLACEMENT SCALES FOR INITIAL BREAKAWAY
AS SHOWN IN FIGURE 5

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The rhenium-coated specimen was held in contact with, and moved relative to the NbC-coated specimen.

One test cycle at each temperature was performed. At 530°R the static coefficient of friction was 0.21, and at 4400°R the breakaway load ratio (ratio of load to slide the specimens to the load that holds the specimen in contact) was 1.5. Post-test inspection of the specimens revealed that material transfer had occurred as an outline of the rhenium specimen was visible on the NbC-coated surface.

EML-F.4

NRX-A6 Shield Flow Screen Burst Tests

Burst tests of NRX-A6 flow screen (Part Nos. 947C256 GO1 and GO2) were conducted to provide Advanced Reactor Design with a means of evaluating screen performance. The screens tested had been tentatively rejected by Quality Control. A brief description of each screen is included in Table III.

The screens were tested in a simulated shield and screen retainer. A rubber membrane was laid across the screen to simulate a blocked screen condition while helium gas pressures of 1, 5, 10 and 20 psid were imposed on the screens. The pressure was then increased until the screen failed. Detailed test information is shown on Table III. Oval screen No. 20 was instrumented with strain gauges and is shown in Figure 7. The gauges were positioned longitudinally on the screen hoop. Figures 8 and 9 show the screens after testing. All screens withstood low pressure testing without any visible damage other than slight screen deflection. All screens seem adequate for use in the NRX-A6 shield configuration. Figure 10 illustrates the pressure vs strain plot from screen No. 20.

TABLE III
EML-F.4

TEST CONDITIONS

Screen No. and Initial Condition	1 psid	5 psid	10 psid	20 psid	Final Test Pressure psid	Comments *
No. 11 (circular) Screen brazed on wrong side	No damage	No damage	No damage	No damage	430	Screen burst at 430 psid
No. 31 (circular) Weld exceeds 0.005 in. max.	No damage	No damage	No damage	Slight deflection	525	Screen wires began to break at 300 psig and deflection of 0.255 inches. Screen split at 525 and a deflection of 0.439 inches.
No. 122 (circular) Foreign material blocking screen .750 long x .125 wide	No damage	No damage	No damage	No damage	550	Membrane burst at final pressure. Screen deflected to 0.282 inches.
No. 22 (oval) Oversize 1.260 Braze width 0.030 in. Screen broken near 0.530 R.	No damage	No damage	No damage	Slight deflection	450	Hoop deformed (Figure 6) Minimum external width = 1.012 in. Maximum external length = 2.525 Deflection = 0.350 Slight twisting at failure
No. 20 (instrumented and oval) Oversize 1.265 Braze width 0.035 in.	No damage	No damage	No damage	Slight deflection	150	Hoop deformed and screen burst at final pressure. Minimum external width = 1.204 Maximum external length = 2.495

* deflections = maximum dimension of screen in a direction normal to the plane of the hoop

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FIGURE 7 INSTRUMENTED OVAL SCREEN NO. 20
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FIGURE 8 CIRCULAR SCREENS AFTER FAILURE
EML-F.4

FIGURE 9 OVAL SCREENS AFTER FAILURE
EML-F.4

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FIGURE 10
EML-F.4

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[REDACTED]

TESTS FOR XE-2

[REDACTED]

TFL-3. e Nozzle Interface Seal Performance Tests

The nozzle interface seal designated for the XE-2 reactor has been tested in accordance with PS WANL 294560, Revision No. 1, Amendment No. 1, Paragraph 4. 4, dated September 22, 1964.

The seal received two cycles of the specified pressure differential range in order to determine its hysteresis characteristics. Slight displacement of the up ramp and down ramp curves was noticed on each case and from one test to the next. The small magnitude of this displacement did not appear to effect the overall performance of the seal.

Figure 11 is a plot of seal leakage expressed as a function of the product of seal inlet density and pressure differential.

Examination of the curves shows a tendency for the leakage flow to decrease as the pressure differential increases. This trend is characteristic of a seal of this type which is actuated by pressure difference.

LEAKAGE FLOW, LB/SEC HYDROGEN
 FIGURE 11

NOZZLE SEAL LEAKAGE EXPRESSED AS A FUNCTION OF THE
 PRODUCT OF SEAL INLET DENSITY AND PRESSURE DIFFERENTIAL

[REDACTED]

TESTS FOR NR-1

[REDACTED]

EML-A.4 Ganged Drum Decoupler Fixture Design

Layout design of the ganged drum decoupler fixture was completed.
Detailing of the individual components is 90 percent finished.

Test plans for the individual components and assemblies of the ganged drum drive system are being formulated and coordinated with Reactor Design.

EML-G.1 Planning NR-1 Vibration Program

Planning for NR-1 vibration testing has been initiated. A review is being made of testing requirements and possible scheduling problems. The possible sources of fuel elements for future testing needs are also being investigated.

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GENERAL DEVELOPMENT

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TFL-1. b Single Element Process Development and Evaluation Tests

There were twelve single element tests conducted at WANL during this period. Eight tests were furnace engineering tests to evaluate the corrosion furnace system at high power and flow levels using high void elements. Elements were tested over a range of power levels from 900 to 1275 KW with hydrogen flow rates from 592 to 810 scfm. Three of the tests were conducted at power levels of 1275 KW with hydrogen flow rates of 810 scfm without excessive exit gas temperatures or apparent damage to the furnace or gas cooling equipment. The use of the tapered molybdenum stainless steel inserts in the short heat exchanger designed to increase the heat transfer rates in the cooler section of the heat exchanger function very well, and their use has permitted operation at the 1275 KW power level.

Two equipment engineering tests were conducted to checkout a new 5000 amp electrical switch and water cooled power cables and the pneumatic control system. Two additional tests were completed as part of Phase II-1B, Part 2, Power and Flow, with overcoated elements to complete the data required for the statistical analysis.

The installation of the water injection system to permit higher test temperatures is 50% complete.

Design of equipment required for corrosion test methane inhibition studies was completed and the fabrication of an orifice calibration rig was started.

A system for sampling the helium atmosphere during single element tests to obtain the data required for the helium reclamation system was designed and installation was started.

TFL-5. b Interstitial Corrosion Tests

One test, TFL-5. b. 037, studying the effects of corrosion on 10 mil thick core non-thermalized pyrofoil wrapper components was conducted during this

report period. This test was conducted at the following conditions with the following results.

Test Number	TFL-5. b. 037
Specimen Serial Number	76
Run Time (min)	30
Inlet Pressure (psig)	350
Inlet Gas Temperature ($^{\circ}\text{R}$)	520
Outlet Gas Temperature ($^{\circ}\text{R}$)	2136
Average Material Temperature ($^{\circ}\text{R}$)	3697
Flow Rate (lb/sec- H_2)	4.28×10^{-5}
Specimen Weight Loss (gms)	0.132
Pyrofoil Weight Loss (gms)	0.117
Pyrofoil Weight Loss (%)	37.8

The average material temperature attained during this test was 200 degrees hotter than the normal 3500°R maintained in previous tests. Upon disassembly the damage and weight loss of the pyrofoil specimen was significantly greater than that previously observed at the 3500°R temperature condition, other parameters being equal. Calculations comparing the average of three weight losses at the 3500°R temperature to the 3700°R level weight loss show an increase of 62.5%.

The specimen had been corroded through for approximately 1/2 of its original length opposite the simulated coated filler strip gap, also corrosion on its exposed edges had progressed to a greater extent than previously observed. Figure 12 shows the pyrofoil specimen before and after testing.

TFL-5. c Reactor Graphite Component Permeability Tests (18 Inch Furnace)

The test cell flow loop and control console are operative. The furnace was assembled and installed in the test system. The test hardware consists of a reactor grade graphite tube with a 0.725 inch outer diameter and a 0.099 inch inner diameter.

The purpose of the tests will be to acquire basic corrosion data on permeability, bore flow, and coating effects.

FIGURE 12

.010 INCH THICK PYROFOIL SPECIMEN IN FIXTURE BEFORE AND AFTER TEST

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A preliminary test is planned for the week of April 24, 1967. The test will be conducted using helium in order to determine the overall system performance. Some individual aspects of the test will be the test specimen's seal performance, the axial temperature profile along the heater and test specimen (Figure 13) at various flow conditions and power settings, furnace efficiency, flow loop control and response characteristics, and obtaining the necessary experience for the ensuing hot hydrogen runs.

FIGURE 13
HEATER - TEST SPECIMEN ASSEMBLY

EML-E.1 Pyrofoil Wrapper Tests

Evaluation tests were run on several candidates for a temporary adhesive to be used during assembly of the core wrapper strips. Screening tests were conducted in conjunction with the high temperature strain limit tests. In these tests the decomposition of the adhesive and the reaction with the pyrofoil when exposed to reactor temperatures in helium atmosphere were studied for Nitro Cellulose (DUCO), Dow Silicone Vacuum Grease, Vaseline, and Rubber Cement. In collaboration with Assembly and Materials Engineering the Dow Silicone Vacuum Grease was selected as the most promising candidate. A final proof test was made in which a vacuum grease joint between two pyrofoil discs was exposed to a hydrogen atmosphere at 4500°R for thirty minutes. No adverse reactions were evident and the discs could be cleanly separated. Figure 14 shows the interfaces after test and the location of five holes through which the hydrogen gas flowed at the average rate of three SCFM.

High temperature strain proof testing of reactor grade pyrofoil is scheduled for the first week in May.

EML-E.3 Aft End Impedance Tests (NT-1)

Pyrofoil compaction tests were completed on three, ten layer stacks of six mil pyrofoil sheets (2" x 4"). Typical hysteresis on successively increasing load cycles are depicted on attached X-Y plots of Stack No. 2. (Figures 15-16).

Flow data from the standard tolerance core with six mil pyrofoil sleeves has not been completely analyzed but the effectiveness of the sleeve as a flow impedance device is indicated in attached flow reduction curves. (Figure 16).

A third model core is being assembled for comparative flow measurements. This core will be built up with close tolerance elements without impedance sleeves. Information obtained from this test will provide a direct

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FIGURE 14
EVALUATION OF TEMPORARY PYROFOIL ADHESIVE
EML-E.3

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FIGURE 15a
EML-E.3

FIGURE 15b
EML-E.3

FIGURE 16
FLOW REDUCTION IN PYROFOIL SLEEVED CORE ($1 - \frac{Q_s}{Q_c}$) PERCENT
EML-E.3

comparison with a standard tolerance core with and without impedance sleeves.

Development tests have been initiated to evaluate a combination pyrofoil/metal carbide sealant aft end impedance concept. Screening tests will be conducted to establish the most suitable carbiding metal from four candidate materials: 1) Zirconium, 2) Niobium, 3) Vanadium, and 4) Titanium. Screening runs will be performed in the diffusion test stand at WANHES. Two sub-assemblies containing Nb and Zi wire wraps at both ends of pyrofoil sleeves were prepared for the WANHES diffuser test. Due to pressure buildup in the diffusers some difficulties were experienced during an early run. Modifications to holder and diffuser are now being made to alleviate the pressure buildup.

Engineering Mechanics Laboratory Facilities

Ganged Drum Band Fatigue Test Fixture

The test fixture was received and is currently being installed.