TRIP REPORT

ASTRONUCLEAR LABORATORY

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Author: L. A. Salvador

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MASTER

PURPOSE OF TRIP:

To review composite fuel element corrosion testing conducted at LASL and at WANHES with emphasis on recent test developments.

PERSONS PRESENT:

D. Newby and L. A. Salvador - WANL

D. MacMillan, H. Filip, R. Leep, and I.D. Leffler - LASL

L. A. Salvador
Site Manager, WANHES

LAS:l

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LASL TRIP REPORT

November 4, 1970

LASL CHUCK DEVELOPMENT

Recently, LASL has been using the No. 5 vertical furnace for chuck development studies. Tests with the pneumatic control loaded cold end chuck have been successful. The results indicate that several advantages can be achieved with this type of chuck:

1. Contact pressure can be continuously controlled by the pneumatic loading on the chuck grips.
2. The spherical surfaced grips provide a ball joint contact which tends to reduce stresses in the cold end chuck region caused by the cantilever effect.
3. Contact of the grips and the element between portions of the chuck are assured even when movement of the element occurs because of the pneumatic loading.
4. Resistance measurements in the chuck indicate that contact impedance for this design is approximately $1/3$ the value for the three-fingered grip design.

LASL has also developed a "cantilever" chuck that can be utilized in the cold or hot end areas. The design is shown schematically in Figure 1 attached.

Recently, work in the No. 5 furnace has centered around the development of a LASL version of the six-fingered chuck used at WANHES. The LASL version involves a larger diameter snout, larger contact pins and smaller springs. A composite "stop" with a 19-hole configuration is used to backup the fuel element. Results have been very favorable in their tests.

The hot end chuck fitup tool designed at WANHES was discussed with LASL, and drawings were given to R. Leep for possible future use by LASL.

COMPOSITE TESTING

The results of recent composite tests conducted at LASL were reviewed with H. Filip; in particular, testing of WNCO elements in the LASL horizontal furnace was discussed.

LASL has eliminated the bowing problem by using graphite supports along the length of the composite elements in the furnace. One or two supports are now felt to be adequate.

The power supply at LASL is capable of providing smooth power ramps as opposed to the step change power ramps used at WANHES. LASL still feels that, intuitively, one can expect the smooth ramp to be less damaging to the element than a step change ramp. Their power supply is controlled manually on the first ramp which uses a soak period at 400KW. It is put on automatic control for the remaining ten-minute cycles.

LASL is presently testing elements at approximately 4200°R drilled hole temperature at Station 45 with a helium pressure of about 600 psi and a hydrogen exit pressure of about 435 psi. Typical values of the electrical parameters are approximately 800KW at 140 volts.

Flow control in the No. 3 furnace is now being achieved with sonic nozzles. LASL feels that control is simpler, more consistent and less dependent on downstream effects.

A brief discussion of the occurrence of surface impurities, such as zirconium oxide, on corrosion tested elements was held with the test people. The consensus is that the impurities are introduced in the manufacturing process and not in the hydrogen or helium gas supplies used for the tests.

SNPO QUESTIONS

During the visit, N. Thielke, SNPO-C, telephoned to request that answers be provided for a list of questions he had concerning the results of composite fuel element testing. These questions were discussed with LASL personnel, and a summary is being prepared for presentation at the next fuel meeting on November 12th.

FIGURE 1 - CANTILEVER CHUCK