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TO: D. S. Toomb

FROM: R. L. Moore

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INTRODUCTION

The following is a status report, on HRT pressurizer and dump tank displacement level instrument development, covering work performed during the last quarter.

I. Magnetically Damped Pressurizer Level Instrument

The prototype model, Ref. Dwg. TD-E-2942, was placed on the mock-up for test and has operated for approximately 1190 hours. The instrument exhibited very high zero shift during the first few hours of operation and has exhibited a zero drift with temperature during subsequent operation. The reason for the high initial zero shift is not known but was possibly due to stress relieving of the iso-elastic springs (which through oversight were not stress relieved prior to installation) or to baking out of moisture in the coil. There does not appear to be a long term zero shift, although the iso-elastic springs are not plated. This indicates a low rate of spring corrosion. The temperature effect on zero appears to be consistent and amounts to a 35% zero shift downscale as the pressurizer temperature raises from 25 to 325°C. This shift appears to be a shift in the modulus of elasticity of the springs as the instrument remains in phase electronically and differential expansions would produce a shift in the opposite direction. Further investigation is planned to determine the cause of this shift.

The coil temperature during operation at 2000 psi (325°C) does not exceed 150°C at the hottest point. This temperature is measured on the stem, below the coil. The actual temperature of the coil is probably lower. No coil failures on this instrument have been experienced to date.

Magnetic damping appears to be satisfactory.

Except for difficulty experienced with the pneumatic controller section and for a tube failure in the dynalog transducer, control has been satisfactory. The addition of a capacity pot in the pneumatic line between the transducer and the controller appears to improve control. This capacity pot acts as a filter to absorb fast transients from vibration of the float element. As the reactor will be a heavier and more stable support, there will probably be less vibration and this pot may not be needed for the HRT installation.

II. Hydraulically Damped Pressurizer Level Instrument, ORNL Photograph 25284

This instrument has controlled satisfactorily since installation on the mock-up except for one shut-down which was caused by a short in the coil. The short was a high temperature, intermittent short which disappeared at low temperature. The coil in use at the time was wound with "Ceroc 200" wire and was silicone varnish impregnated. Operating temperature of the coil is in the neighborhood of 250°C when the system is at 2000 psig. This coil was replaced with one wound with wire having a single glass insulation. Recent behavior of the instrument indicates that this coil may be failing. Operation time to date is 1936 hours.

III. Pressurizer Level Instrument Springs

A. Elgiloy

Corrosion tests of the material show evidence of stress corrosion cracking. As the history of the sample is unknown a decision as to the worth of this material is being withheld until the Elgiloy on order is received.

B. Gold-Plated Iso-Elastic

Two springs plated by R. J. Fox in the ORNL Research shops are being tested by J. L. English for corrosion resistance. The springs are being tested in a .04 molar UO_2SO_4 boiling solution with .02 molar excess H_2SO_4 and .005 molar CuSO_4 at 100°C . At present the springs have been in solution for 100 hours and show no evidence of corrosion or blistering. Further testing at 300°C is in progress.

IV. Pressurizer Level Instrument Coils

Investigation is continuing on the coil insulation problem. In addition to the "Ceroc 200" and "Ceroc T" wires (produced by Sprague Electric Company) a single glass insulated wire and a single glass with "Dacron" filler (produced by Phelps-Dodge Copper products) are being investigated. The "Ceroc T" appears to be the best wire but its use in the reactor may not be desirable due to radiation damage to the teflon and the resultant release of fluorine gas.

The Crescent Engineering Company claims to make a high temperature coil. Correspondence with this company has not yielded much additional information other than that given in their technical bulletin. It is planned to order one of their standard coils for test and evaluation.

R. L. Moore