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PROPOSAL FOR A PRODUCTION TEST TO EVALUATE
ULTRASONIC WEIDED SELF-SUPPORTED FUEL ELEMENTS

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Fuels Fabrication Development

REACTOR AND FUELS RESEARCH
AND DEVELOPMENT OPERATION

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MASTER

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PROPOSAL FOR A PRODUCTION TEST TO EVALUATE ULTRASONIC WELDED SELF-SUPPORTED FUEL ELEMENTS

INTRODUCTION

Projections attached to standard "F" canned fuel elements are designed to support the fuel elements accurately in a smooth bore process tube. Three supports 0.080 inch high are attached near each end of the fuel element by ultrasonic welding at each end of the supports. These supports function through 360 degrees when the element is in the process tube. The self-supported fuel element concept has been tested under reactor operating conditions "IP84-A" and the support system functions satisfactorily. The change in the method of attaching the supports from resistance spot welding to ultrasonic welding with a slight modification of the tab shape in the weld area is the only modification over the self-supported fuel elements irradiated in the past under Production Test IP-84-A.⁽¹⁾

OBJECTIVE

The objective of this test is to evaluate the ultrasonic welding method of attaching supports to standard "F" canned fuel elements.

JUSTIFICATION

In development of the self-supported fuel element concept all work was based on resistance spot welding of the supports to the jacket of the fuel elements. Certain fabrication and support design factors may be improved by changing the process from resistance welding to ultrasonic welding. In fabrication one factor, automation of the attachment operation, may be simpler and result in higher yield with ultrasonic welding than obtainable with resistance welding. Secondly, the problem of electrode cleaning encountered in resistance welding is eliminated.

A change is possible in the tab design of the fuel element supports for ultrasonic welding. The wide tab used for resistance welding is not necessary and a straight 3/16 inch wide support can be used. This results in less fuel element surface covered by the tab and also the coolant flow should be somewhat greater with a reduced tab width, and resultant flow resistance decrease.

The advantages of the self-supported fuel element will be maintained⁽²⁾ with the added advantage of better support design and an improved fabrication process.

PRE-IRRADIATION TESTS

The only factor changed from the self-supported fuel elements charged in the past is the method of attachment. Therefore, the factors evaluated in pre-irradiation tests of ultrasonic welded supports include attachment strength, autoclave behavior and determination of the effects of this welding process on the uranium-aluminum bond in the attachment region. All other properties remain the same as determined for self-supported fuel elements.⁽³⁾

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The strength of each attachment is in excess of 140 pounds shear load which has been established as a standard for self-supported fuel elements irradiated under IP-84-A.

Autoclave testing and inspection indicate no adverse effect on the cladding as a result of using the ultrasonic welding process to attach supports.

A series of micro sections indicate that the cladding, Al-Si layer and the compound layer are not damaged as a result of this attachment procedure.

No potential hazards to in-reactor testing were observed. Results of out-of-reactor tests indicate that an irradiation test is the next step in the development of the system.

FUEL ELEMENTS

Standard "O" size I & E elements will be used. The elements will be taken from 313 Building canning line after completion of all steps except autoclave testing and final inspection. Fuels Fabrication Development will attach supports to the elements by ultrasonic welding. Following welding the elements will be sized for a 1.600 inch diameter support circle and autoclave testing, final inspection and pre-irradiation measurements will be made.

IRRADIATION

Charges:

Two tubes to 400 MWD/T.
Five tubes to 800 MWD/T.
Two tubes to 1200 MWD/T.

FACTORS TO BE DETERMINED

1. Effects of irradiation on:
 - a. Dimensional stability.
 - b. Corrosion (to be determined by visual inspection).
 - c. Coolant flow variation during test.
 - d. Pressure drop variation during test.
 - e. Effects of irradiation on the support attachment region. Micro-inspection of weld region.

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REFERENCES

- (1) Hall, R. E., "Production Test IP-84-A. Evaluation of Slugs Having Projections for Use in Ribless Process Tubes," HW-50991 A, March 12, 1958, HW-50991 B Supplement.
- (2) Wyman, W. L., "Proposal for a Production Test to Evaluate Self-Supported Fuel Elements," HW-50317, May 15, 1957.
- (3) Dodds, F. W., "Evaluation of Slugs Having Projections for Use in Ribless Process Tubes. Final Report," HW-48489.

Waters, E. D., and Toyoda, K. G., "Pressure Flow Characteristics for Self-Supporting Slugs in Ribless Tubes," Undocumented, April 16, 1957.

Wyman, W. L., "Projection Fuel Element Autoclave Rupture Test," HW-49857, April 27, 1957.

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