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STATEMENT OF PROBLEM

OMRI Driver Fuel Element #236 was inserted in the reactor for an accumulative reactor exposure of 209.0 Mwd. The element was disassembled and examined at the CDHC facility to provide information for performance analysis.

ABSTRACT:

Due to high recorded surface temperature during reactor operations, OMRI Driver Element 7-4 was disassembled and a limited examination was performed in the CDHC facility. Included in the examination were:

1. Visual and photographic inspection of all components such as the fuel element box section and the fuel plates. All the fuel plates appeared in good general condition and were free from damage. All surfaces of the fuel plates were coated with a light black film or had light crusty deposits. No gross deposits or foreign materials were found anywhere on the element. No distortion or peculiarities were noted. Fuel plate photographs and closeup photographs of T/C junctions are shown in Figures 1 and 2.

2. Fuel box dimension were recorded and indicated no significant changes (Table I).
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I. INTRODUCTION
The thermocoupled cermet driver fuel element #236 received a partial examination in the CDHC facility following irradiation at the OHRE. This report contains the observations.

II. ELEMENT DESCRIPTION
A. Component Description
Fuel Element #236 contained sixteen stainless steel clad fully enriched UO₂ stainless steel cermet fuel plates. The containment box and end hardware were fabricated of type 304 stainless steel. Five thermocouples were provided to measure element temperatures. No other instrumentation or special apparatus was provided on this element.

B. Exposure History
Cermet Driver Element #236 was inserted in core location #12 of Core III-C. Core III-C layout is shown in Figure 3. Element #236 had an accumulative reactor exposure of 209.0 Mwd. During irradiation T/C #332 showed a continued temperature increase in the midplane of the element which indicated a possible blocked flow channel (see Figure 4). Due to the unusual temperature recordings, a hot cell examination was performed.

III. HOT CELL EXAMINATION (CDHC)
A. Receipt in CDHC and Final Washing
The element was received at CDHC in August of 1963 and removed from the shipping cask and unloaded by standard techniques into Cell #3. The element was placed into a can containing tetrahydrofuran. After a two-hour soak, the element was raised into the air and suspended for photography (See Figure 5).

B. In-Cell Examination
1. Preliminary Box Inspection
Before any work was initiated, reference identification of the element sides was made as shown in the plan sketch below:
The appearance of the outer surface of the fuel element was quite similar to other stainless cermet and experimental elements. Generally, blackened with a thin brittle film (Reference 1).

2. Measurements of the Box Section

Measurements of the box section were obtained using calipers. Inconsistency in the measurements were due to the variables in the weld seam running the length of the box section. These measurements were in agreement with measurements obtained on other OMRE fuel element examinations. These measurements showed no bulging or distortion with values ranging from 2.804 to 2.825 inches. The measurements are presented in Table I of this report.

3. End Hardware and Box Removal

The upper and lower hardware was removed using an electric hacksaw. After removal, a visual inspection through the flow channels showed no obstructions and appeared to be quite clean. This view through the flow channel is shown in Figure 2.

4. Removal of the fuel plates from the Box Section

The fuel plate tabs and spacer bar were cut by a milling machine operation. The stainless steel fuel box was then split by milling the corners between sides #2 and #3 and between sides #1 and #4. The fuel plates were readily removed from the box section.
5. Photographs of the Fuel Plates and Inside of Fuel Box

The fuel plates were placed on a plywood rack and photographed on both sides. Photographs of the fuel plates and the inside of the fuel box section are presented in Figure 1. Figure 2 is an illustrated figure showing the deposits around the thermocouple junctions.

IV. CONCLUSIONS

Thermocouple #332 (Figure 4) showed an abnormal temperature increase throughout the period of irradiation, indicating a possible restriction in the midplane of the fuel element. The flow channels appeared to be quite clean for this type of element (see Figure 2). The small amount of deposits found in the examination were on fuel plate #1 in the general area of T/C #332 and #333 (see Figure #2). However, the deposits that were noted around the T/C junction were quite brittle and loose. Therefore, it seems reasonable to assume that during disassembly some of the deposits were shaken loose from the thermocoupled fuel plate. Also, it is quite possible that there could have been more deposits surrounding T/C #332 than are shown in Figure #2. If this were indeed a fact, then it is conceivable to believe that a deposit around T/C #332 prevented the organic coolant from reaching the thermocouple junction which would indicate a high temperature increase at the midplane of the fuel element when, in fact, the high temperature was only in the immediate area of the thermocouple junction.
FUEL BOX DIMENSIONS OMRE 7-4

ALL MEASUREMENTS FROM OUTLET END

<table>
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<th>SIDE # 1 and 3</th>
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<td>2.814</td>
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TABLE I
FIG. 2

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