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Explosives Department
Atomic Energy Division
Wilmington, Delaware

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MEMORANDUM TO FILE

FROM: ANDREW POCALYKO

A. Pocalyko

TRIP REPORT
METALS AND CONTROLS CORPORATION
Attleboro, Mass. - Sept. 3, 1953

On September 3, 1953, the writer visited Metals and Controls Corporation to discuss the progress on bonding and cladding of extended surface fuel elements. Present at the discussion were:

R. G. Delagi, NYOO
George Durst, M&C
T. McGinn, M&C
A. Pocalyko du Pont

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SUMMARY

1. Satisfactory bonding with no significant deformation of 0.035" thick uranium cores plated with Ni • Cu was achieved by roll cladding with 13% total pack reduction at a temperature of [REDACTED]
2. Plans have been formulated to scale up picture frame size to full-scale element width and thickness dimensions.
3. Roll cladding of simulated sheathed assemblies, i.e., aluminum sheet wrapped around nickel-plated uranium strip, will be conducted if MTR sheaths are not available.
4. Ribs of dimensions considered to be optimum for the M&C solid phase bonding technique will be affixed to a prototype fuel element. Evaluation of the sample will disclose the applicability of the rib bonding technique to flat fuel element fabrication.

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DISCUSSION

Metals and Controls Corporation initiated work on roll cladding as a means of fabricating extended surface fuel elements. In preparation for scale-up of sample size, preliminary roll cladding runs were made on 0.035" thick uranium strip electroplated with 0.0002" nickel + 0.0002" copper. Only the sides, not the edges, of the strip were clad with 0.015" thick aluminum sheet. The initial results obtained in this study agree essentially with the data presented by the Battelle Memorial Institute. Satisfactory bonding with no deformation of the core was achieved by M&C with 13% pack reduction at a temperature of [REDACTED]. These conditions, however, are not necessarily the minimum conditions for satisfactory bonding. Further work is under way to determine these conditions and the complete bonding characteristics of the nickel + copper barrier layer system.

Plans have been formulated for scale-up of roll cladding sample size to full-scale fuel element width and thickness dimensions. Initial tests will be made with 3-piece picture frames containing 3.1" x 0.180" x 6" uranium cores. The cores will probably be plated with nickel + copper since the preliminary bonding study was conducted with this barrier layer. However, nickel plate only will be employed in future tests as it is our current barrier layer preference.

Because MTR sheaths will probably not be available for their studies until sometime in October, 1953 M&C plan to roll clad simulated sheathed assemblies. A 2S aluminum sheet will be wrapped tightly about a nickel-plated core and then welded to form a complete sheath. Roll cladding the simulated assembly will, it is hoped, provide information for use when MTR sheaths become available.

Rib channels fabricated by the M&C solid-phase bonding technique indicate that this method of joining ribs to sheet has good possibilities. Our present rib design, according to M&C, has an unfavorable height-to-width ratio, 2:1, for satisfactory solid-phase bonding. They fabricate ribs commercially with a 1:2 height-to-width ratio and believe they can easily provide us with a rib of 1:1 ratio. They doubt that they can produce a rib 0.100" high and 0.050" wide. Because it would be premature to consider redesign of the rib before it has been definitely established that their technique is satisfactory for fuel element fabrication, M&C was requested to develop a rib which they consider to be optimum for their technique. They will then affix this rib to a prototype fuel element, uranium strip plated with nickel and clad by hot pressing, which will be provided by AED for this purpose. The effect of affixing the rib on the nickel barrier and uranium core will be determined subsequently. Should evaluation of the sample show that the rib technique has definite merit, modification of our present rib design to suit M&C fabrication requirements could then be considered.

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