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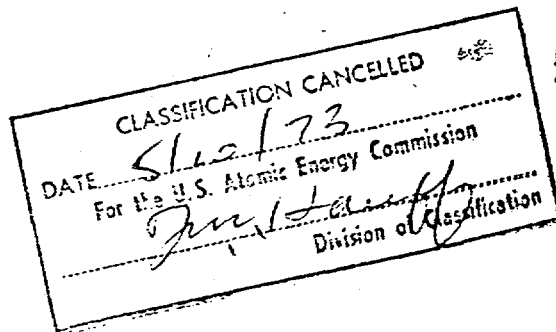
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REVIEW OF PROPOSALS ON THE FABRICATION OF ZIRCONIUM PROCESS TUBES

On June 10, 1953, a meeting was held in Pittsburgh, Pennsylvania with Mr. H. T. Sharpe, Atomic Energy Commission, Pittsburgh Area, and Dr. C. E. Lacy, Knolls Atomic Power Laboratory, to review proposals on fabrication of zirconium process tubes. In addition to the foregoing, the problem of end-capping zirconium jacketed slugs was discussed with Dr. C. E. Lacy.

Zirconium Tube Fabrication

In order to provide Hanford Atomic Products Operation with approximately thirty zirconium process tubes for in-pile evaluation, the Pittsburgh Area, AEC office has extended invitations to bid on a modified cost-plus fixed fee basis to nine possible tube fabricators.

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Of the companies contacted, only the Superior Tube Company submitted a complete proposal. Using the techniques developed by KAPL, the Superior Tube Company would sub-contract the extrusion of starting pieces and finish by tube reducing methods at the Superior Tube Company plant. In order to get a 42 foot three-inch tube, Superior Tube Company feels that their tube reducing machines would need to be modified so as to accomodate a sufficiently large starting piece. Superior Tube Company estimates that 8 to 10 weeks would be required to extrude the starting pieces, 4 to 5 months for procurement and installation of tube reducing machine modifications, and 8 to 10 weeks for the finishing operation. The zirconium metal requirements were estimated at 35 billets weighing about 75 pounds each for a total of approximately 2650 pounds.

The Tube Reducing Corporation expressed interest in doing only the tube reducing and finishing phase of fabrication. They would ask the AEC to provide the extruded starting pieces. Present capacity of their machines limit the finished length to 28 feet but they would consider tube reducing machine modifications. They also suggested using the tube reducing machine mandrel which was designed and fabricated by MIT. No time, material or cost estimates were given.

The Wolverine Tube Company expressed an interest in attempting to fabricate the tube by extrusion followed by drawing techniques. Again, no time, material or cost estimates were given.

Allegheny Ludlum Company proposed to fabricate the tubes by roll forming and seam welding.

In summary, of the nine companies contacted, only one company submitted a firm and complete proposal and three others expressed an interest in doing some or all phases of the fabrication on a development basis. Because of the interest shown, Mr. Sharpe plans to further explore the possibilities of Wolverine Tube Company, Tube Reducing Corporation and Babcock and Wilcox Company, (the latter has had some experience in fabricating zirconium for WAPD and is equipped with tube reducing machines).

The AEC has allocated approximately 3500 pounds of double arc melted USBM zirconium which will be available on about July 15, 1953. The material is in the form of ten inch diameter billets.

End Capping of Zirconium Jacketed Slugs

Two possible end cap designs were suggested to Dr. C. E. Lacy. These designs were conceived with the view of incorporating ceramic insulators as well as being amenable to mechanized welding methods. Dr. Lacy stated that the mechanized (principally resistance type) welding equipment at KAPL was limited but that KAPL would look into the feasibility of the

proposed methods. On the basis of their experience and excellent success with hand-welding, the first attempts would be done by hand-welding.

Forging and Extrusion

A brief discussion of forging and extrusion of zirconium was held with W. J. Hurford of Westinghouse Atomic Power Division. WAPD has attempted forging and bare extrusions from a BaCl_2 heating bath. Forging at approximately 1000°C is done rather easily and metal loss from oxidation is not considered excessive. Success with bare extrusion at 1000°C from the BaCl_2 bath, without and with glass (Ugine-Sejournet Process) as a lubricant, has been somewhat limited. WAPD reports that they have noted little or no advantage in using glass as a lubricant when bare extruding from a BaCl_2 bath.

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