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Metallurgical Laboratory

July 28, 1943

DCV #55161

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For your information, I am summarizing our experience in the use of centerless grinding equipment on uranium. I also recommend the purchase of a Cincinnati centerless grinder for the Site B shop.

Our first experience with centerless grinding was obtained at the Summerill Tubing Company on January 4, 1943 when an extruded tube 2½ feet long and 1 5/16" in diameter was ground with an accuracy of about .0005" over the entire surface. Although I did not see this actual operation, I understand that great pains were taken. I do not know how long the grinding took.

On January 28, two tubes and one rod, each about 4 feet long, were taken to the Wycoff Drawn Steel Company where they were surfaced with an accuracy of about .001". About an hour was required to adjust the machine properly so that it would handle this material, and about an hour to clean up the surfaces. The wheel used was somewhat too soft and had to be dressed frequently. Our impression after this test was that this method was a satisfactory one for obtaining good accuracy on uranium but was rather slow and would be expensive because of wheel wear. Harder wheels tended to fill and for this reason did not seem to offer much advantage. It was realized that it would be very desirable to make tests with a number of different types of wheels to try to determine the most satisfactory. On February 26, a visit was made to the Zephyr Laundry Machine Company which had recently started manufacturing centerless grinders. The manager offered us the opportunity to make tests with different types of wheels at some time in the future.

On February 29, some 1" diameter pieces 6" long were ground at the International Register Company again with an accuracy of about .001". The same impression was gained here that time spent on determining the most suitable type of wheel would be well worthwhile. The machine design people suggested cylindrical grinding of these short pieces as a more practical method if they were out of round although a roughing cut in a turret lathe and finishing in a centerless grinder also seemed practical.

On March 3, a 6 foot rod was straightened on an Abramson straightener and ground over its entire length with an accuracy of about .002" at Globe Steel Tubes. The wheel used here did not require

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TO: NOT CLASSIFIED
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frequent dressing nor did it fill up. Although it was somewhat coarse, it seemed to give the best results of any we had tried. It was a carborundum wheel number 36ME. On May 18, some short pieces of rod 2 cm in diameter were ground at Globe preliminary to cladding with steel. On May 25, some 3 foot tubes were accurately ground at Globe to be clad with aluminum. For successful cladding, experience has shown that the tube should not taper or be out of round more than about .002".

On June 22, a 6 foot tube was ground and this longer length, requiring great care in handling, was successfully clad with aluminum.

In general, we have learned that centerless grinding can be very effective in producing high accuracy on short or long pieces of uranium providing the stock is not too far out of round, does not have excessive taper from end to end, and a wheel of the right composition is used. Also some time must be taken to set the machine properly. In cases where bad results have been obtained, one of these factors has apparently been at fault.

When a large number of accurate pieces of the same size are required, a good method seems to be to take a rough cut, for instance, on a turret lathe, and then finish on a centerless grinder. For short experimental rods and tubes of the sort finished recently for Abbott's experiments, the centerless grinder has been very useful. For accurate production of tubes or rods of lengths longer than a few feet, such as will probably be used in P-9 exponential and later piles, there seems to be no other available method than centerless grinding since a cylindrical grinder is not well suited for such work on pieces longer than about 3 feet. Therefore, to make use of the equipment for regular experimental parts, as well as to investigate thoroughly its applicability to long pieces and to special items such as thin walled tubing, I believe we should purchase a grinder that could be installed in the Site B shop.

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