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 January 21, 1947

INTERIM REPORT NO. 6
 PRODUCTION TEST NO. 105-62-P

GRAFITTE EXPANSION - GUN BARREL CLEARANCE

Previous Reports -

Interim Report No. 1 dated 3/29/46 - Doc. No. 7-5835
 Interim Report No. 2 dated 8/5/46 - Doc. No. 7-4628
 Interim Report No. 3 dated 8/20/46 - Doc. No. 7-4669
 Interim Report No. 4 dated 8/14/46 - Doc. No. 7-4636
 Interim Report No. 5 dated 11/12/46 - Doc. No. 7-5353

Prepared by: W. R. Lewis
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GRAPHITE EXPANSION - GUN BARREL CLEARANCE

Introduction

The face to face expansion of the graphite packing of the pile reduces the gun barrel sum-clearance and if continued will strain the aluminum tubes with ultimate rupture of the Van Stone joints. The graphite expansion may be determined while an aluminum process tube is out of the unit. The distance from the graphite at the inner end of one gun barrel to the corresponding point at the opposite face is measured and compared to a similar measurement that was made during construction of the pile. The replacement of the two scored aluminum tubes at F Pile provided an opportunity to make these measurements.

Summary

A comparison of the present face to face graphite length with corresponding measurements made during construction indicates an expansion of 28/32" at Tube 2174-F and 23/32" at 2284-F on November 5, 1946, after a total pile exposure of 132,896 MWD.

Measurements of gun barrel sum-clearance and aluminum tube length before replacement indicated a graphite expansion of 25/32" at Tube 2174-F and 24/32" at 2284-F, which is in reasonable agreement with the above graphite measurements.

Experimental Details

Push-pull tests were made on Tubes 2174-F and 2284-F with the 1500 lb. pneumatic jack on 11/4/46, with the tubes discharged and the pigtails on. There was no evidence of binding while the tubes were moved in and out. After these tests the pigtails and nipples were removed and the overall length of the tubes was measured. On 11/5/46 the tubes were pushed out of the unit from the front face and cut up into two-foot sections by a flame cutter mounted on the rear face. A probe, which consists of an eight-foot length of 1/2" pipe with a 1/8" thick hook on the end, was used to measure the length of each gun barrel and the distance from the outer end of the gun barrels to their contracting washer in the graphite. The length between outer ends of the gun barrels was then measured with a calibrated tape. These data are given in Table I and Table II.

Discussion

The two aluminum tubes, Nos. 2174-F and 2284-F, were 15/32 inch and 17/32 inch longer than nominal after a correction for expansion of the tubes from 12.8° C. to 20° C. It is possible that they were stretched during discharge of the stuck slugs which damaged the tubes and necessitated their replacement.

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Graphite expansion rates of 28/32 inch and 23/32 inch per 132,896 MWD indicate that zero gun-clearance would be reached at 160,000 to 198,000 MWD if the rate is linear with exposure and if there is no creep of the aluminum tube. This estimate represents a reduction of clearance from an original 34/32 inch at 5° C. to zero at 5° C.

Measurements of gun barrel gun-clearance which are in progress at D and B Files will give additional information concerning face to face expansion.

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100 Technical

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TABLE I

	Tube 2174F	Tube 2284F
Outer end of front gun barrel to washer in graphite	7' 4 1/32"	7' 3 15/32"
Outer end of rear gun barrel to washer in graphite	7' 6 18/32"	7' 6 22/32"
Length between outer ends of gun barrels	41' 7 24/32"	41' 7 4/32"
Length-washer to washer (nominal 26' 8 8/32")	26' 9 5/32"	26' 8 31/32"
Deviation from nominal as measured during construction	+ 1/32"	0
Graphite expansion	28/32"	25/32"

TABLE II

	Tube 2174F	Tube 2284F
(1) Gun barrel sum-clearance at 12.8° C.	24/32"	30/32"
(2) Deviation of tube length from 41' 7 22/32" at 12.8° C.	10/32"	14/32"
(3) Deviation from nominal graphite length as measured by construction.	1/32"	0
Graphite expansion = 40/32" - (1) + (2) - (3)	25/32"	24/32"

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