ROCK ISLAND ARSENAL LABORATORY REPORT

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OF

DATE 14 April 1944

LAB NO 44-1824

SPEC NO

M NO

EX O

DRG NO

Re-Processing of
Caliber .50 Machine Gun Receivers

AD625893

INTRODUCTION

1. Considerable difficulty has been experienced in successfully reprocessing Caliber .50 machine guns due to rusting after the guns have been phosphated.

2. The rusting was almost entirely localized on the receivers of the guns. These are particularly difficult to reprocess because of the many overlapping joints which imprison rust preventive materials, cleaning solutions, and acidic residues from processing liquids. The imprisoned materials later bleed out and cause rusting at various stages before and after parkerizing.

3. When a serious situation developed due to numerous rejections of reprocessed guns because of this rusting, a good deal of time and effort was spent in analyzing the procedures causing difficulty so as to correct them and produce satisfactory reprocessed coatings on the guns.

4. It is gratifying to report that this objective has been attained. The Laboratory has received complete cooperation from manufacturing and inspection personnel in working on the problem, and appreciation for this cooperation is hereby expressed.

5. Since the establishment of a satisfactory processing procedure, guns have been reprocessed for approximately a month at a normal rate. The appearance of the finished guns is excellent. The improvement is particularly apparent on the receivers near jointed plates and on the interior surfaces where a good deal of rusting occurred formerly near the top plate bracket, etc.

6. Some of the finished receivers processed in this manner have been held in the humidity cabinet for a week without rusting. After two weeks in the humidity cabinet, some of the surfaces bore a slight yellow stain, but there was no sign of staining or rust at the critical points bounding the large number of overlapping and butt joints of the receivers.

7. In twenty-four hour salt spray tests of the receivers, no rust or stain was noted at any of the critical points. The foregoing tests indicate that no difficulty will be experienced with loci of corrosion at these joints due to bleeding of corrosive residues from between plates.

8. The method of investigation and the processing procedure developed, with some attendant details, are summarized in the following:

PROCEDURE

1. A memorandum detailing suggestions for tightening up and improving general processing procedure in Department

DA 100 was sent to C. J. Dall by Major Paul C. Cunnick on 15 February 1944.

2. The processing procedure employed on the guns was followed through every detail of procedure from first degreasing to final assembly in Department DA 710.

3. A first group of 24 receivers was followed through in this manner, experimentally varying details of procedure and noting results. The appearance of some of the work was encouraging and processing of 200 more receivers in groups of fifty was supervised by the Laboratory to fix the final procedure. At this stage, it became obvious that the procedure evolved would produce a satisfactory coating and further work was limited to inspection of the finished guns and checking rinse solutions, etc., daily for a month.

4. The final procedure established together with some pertinent details, is outlined below:

A. Degreasing of incoming guns:

(1) A thorough degreasing procedure has been established and described in a memorandum of 3 February 1944, to E. Osborne. It involves a double spraying of the guns in the degreaser with cool solvent, paying particular attention to the joints in the receiver. The mechanical removal of greasy materials by the spray and the three successive condensations of vapor that result, clean the guns quite thoroughly. This is evidenced by slight or no bleeding of

oil or rust preventive from between the joints of the receivers after the guns are removed from the degreaser and cooled. Formerly, there was considerable bleeding of oily materials at these points.

B. Baking of receivers before processing:

(1) After the guns are disassembled, the receivers are baked at 500-525° F. for one-half hour to carbonize any remaining oily residues.

(2) Temperatures of 600° F. may reduce the hardness of the extractor cam, which is the most heat sensitive part, by 4-8 Rockwell D units. At 550° F., the hardness reduction was 0-3 Rockwell D units after baking.

C. Sand blasting:

(1) The receivers are sand blasted to produce a meticulously clean surface, and processed as soon thereafter as possible.

(2) An alkaline wash prior to the sand blasting operation was discontinued. This obviated difficulties caused by wash water residues seeping out of the jointed sections after the receivers were sand blasted and permitted to stand, sometimes overnight or longer. It was noted that such receivers were frequently rusty at areas adjacent to the jointed portions before they were processed. Others, which had been inadequately degreased, showed seepage stains of oil from the joints on

standing. Naturally, rusting subsequently occurred at these points.

(3) If the parts are processed soon after sand blasting, any oily residues which may have escaped the degreasing and baking operations and which may be trapped between the plates, have insufficient time to bleed out by capillarity. Thus, phosphating is accomplished before these residues can exert their harmful effect.

D. Phosphating:

(1) A number of changes were introduced here:

(a) The operations were put into line so that parts are phosphated, rinsed, and oiled in quick succession.

(b) Sprays were installed so that the parkerized receivers are kept wet between the phosphating bath and clear water rinse.

(c) The method of suspending work was changed to that the belt holding pawl spring holes which are blind, face up. Thus, the air could be displaced and rusting due to air pocketing was eliminated.

(d) Rinsing in clear water and in the chromic acid solution rinse is conducted 30-60 seconds with some agitation of the racks. Immersion for more than 60 seconds should be avoided.

(e) The rinse waters were checked regularly for a month. With the installation of a large

clear water rinse tank with a weir overflow, the condition of the rinse waters was consistently excellent. An occasional check will be made to see that minimum contamination is maintained.

(f) It was found that the time element was of prime importance. It is impossible to rinse out completely all of the acidic phosphating residues from between all the faying surfaces in every receiver processed. There is bound to be some retention between the plates, although probably the residues are considerably diluted by the rinse waters. If the receivers are transferred between rinsing baths in quick succession, dried off quickly with the air blast, and immediately dipped in the rust preventive containing water displacing agents (Rust Ban 392, Cosmoline 805, etc.), while still hot, the oil can penetrate between the faying surfaces, sponge up the acidic moisture and render it inactive. If, on the other hand, the receivers are permitted to stand for as little as five minutes after air drying and before dipping, rusting at the critical points will begin and cannot then be forestalled.

(g) Consequently, the processing schedule was rearranged so that each rack of guns was oiled immediately after rinsing and drying, with no intervening delay. This time factor cannot be overemphasized, for even though all other details are satisfactory, rusting will occur

in an appreciable number of cases if there is any delay between the rinsing and drying operations and oiling.

5. Inspection of the various details of processing will be made from time to time to see that the quality of the work is maintained.

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