Remington
Remington Arms Company, Inc.

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Research & Development Technical Center
Elizabethtown, Kentucky

TLW2507
TEST REPORT

MODEL 770 SEAR SAFETY CAM NON-CONFORMANCE EVALUATION

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INTRODUCTION

The Mayfield, KY manufacturing plant received a suspect lot of M770 sear safety cams on or about April 2, 2008. The suspect lot contained a total of approximately 3,000 pieces. After the parts were distributed into the general build population, it was determined that some parts in this lot did not meet the hardness specifications on the print. The parts are manufactured by Remington Powder Metal Products Division (PMPD) locating in Ilion, NY. The print specifications state HR15n 88-92 or HRc 50 Min. The hardness of the parts as measured at the Mayfield manufacturing facility range between HR15n 70-85.

Discussions with the Ilion facility indicate that the parts are normally inspected using a specification of HRc 50 Min. If the parts do not meet this specification, they are checked using the HR15n scale and a value of 85.5 Min. is used. While this is not specified on the print, it is the practice that has been adopted for many years.

Upon checking previous lot samples at Mayfield, it was discovered that a second suspect lot of safety sear cams was delivered to the facility and built into product which was located at the OHL warehouse in Memphis, TN, waiting for shipment to customers. At the time of the discovery, all product at OHL was put on hold until an evaluation could be completed. This information was relayed to the Elizabethtown R&D center on Friday, April 4, 2008.

An evaluation of the suspect parts was initiated to evaluate the parts for confirmation of the hardness level and their subsequent fitness for use. At the request of R&D, a sample of 30 safety sear cams from the Mayfield facility were measured for hardness using the HR15n scale and the softest 5 samples were built into completed insert assemblies. These samples were dry-cycle tested at the R&D Center along with 2 control samples that met the drawing specifications. All 7 of the test samples were cycled to 2,000 cycles, being evaluated for trigger pull force curves and visually for excessive wear. The 2 softest non-conforming samples and one of the control samples were cycled to a total of 5,000 cycles and evaluated for the same criteria. The remaining test samples were evaluated for hardness, micro-hardness, density, and porosity.

RESULTS SUMMARY

The results of the testing showed no indications of the suspect parts not performing acceptably in actual use. However, the suspect parts did not meet the minimum macro and superficial hardness requirements as stated on the component drawings.

Several of the examined sear safety cams from the suspect lot failed to meet the HRc hardness inspection criteria and all of the examined sear safety cams from the suspect lot failed to meet the HR15n hardness inspection criteria. Microhardness analysis revealed extensive interconnected porosity in the parts, as would be expected

with a P/M component, that results in through carburizing of the components rather than case hardening. The micro-hardness levels indicated that the steel had been hardened to at least the HRc 50 equivalent level.

Density determination by submersion indicated that 10 randomly selected safety sear cams from the suspect lot were on the low edge, with some samples slightly below, the minimum density requirement of 7.4g/cc stated on the print. This was confirmed with porosity measurements of 5 additional samples through the cross section that exhibited optical porosity levels around 5% and higher, which is the upper porosity level for this material.

Dry cycle testing of the 5 softest safety sear cams and 2 control safety sear cams that met the print specifications showed no significant differences in trigger pull forces or engagement surface wear over 5,000 cycles.

The fact that the density of the components is at the low end of the specification likely resulted in the parts not meeting the minimum macro and superficial hardness specifications. This is due to the porous nature of the finished component. The material present is of the proper chemistry and hardness to perform and function as intended and confirmed by testing.

CONCLUSIONS & RECOMMENDATIONS

Recommendations were communicated by telephone conference on Monday, April 7, 2008 between the following site locations: Mayfield, Elizabethtown R&D, Ilion PMPD.

The recommendations were that the existing M700 product at OHL or packed and ready to ship at Mayfield be released for shipment. All existing insert assemblies at Mayfield containing the suspect sear safety cam components will have the sear safety cams replaced with new parts that meet the communicated specifications from PMPD. All of the remaining sear safety cams from the suspect lot will be scrapped. Ilion PMPD is tasked with determining a location at which to measure the hardness in the future and update the prints to reflect this information.

RESULTS

The results of the testing completed at the R&D Technical Center have been tabulated in a master excel data file named "***TLW2507 770 Sear Safety Cam Evaluation.xls***". The data sheets contained within the spreadsheet file includes the test matrix of the tests completed, the superficial, macro, and micro hardness data, the porosity measurements, the density measurements, and all of the trigger pull load-displacement curves. The trigger pull data is presented in normalized units with the summary tab actually converted to lbs-force. This complete data file has been archived on the R&D Technical Center's TLW system and is available on request from the R&D Technical Center.