#8

MEMO: 1-18-82

FROM: CE. RITCHIE

TO: CB WORKMAN

RE: EVALUATION OF LUBRICANTS ON FIREARMS

OBJECTIVE: TO SEE ABOUT DEVELOPMENT (BY REMINGTON) OF LUBRICANT FOR RIFLES.

See marked pages

Read in entirety

Jan 1982 Remington is looking for a lubricant that won't "gum up" the Fire control. They intend to describe the cleaning and lubing procedure in the owners manual

REMINGTON ARMS COMPANY, INC.
Firearms Research Division

January 18, 1982

TO: C. B. WORKMAN

FROM: C. E. RITCEIE

EVALUATION OF LUBRICANTS ON FIREARMS

ABSTRACT

Remington Arms Company is interested in developing a cleaning and lubrication procedure for the Model 700 Fire Control that can be included in the rifles instruction manual. It is intended the cleaning and lubrication procedure be done without disassembly from the receiver and the products used should not gum up the close tolerances of the mechanism. The products selected should also be readily available on a nationwide basis, be non-flammable and non-toxic, as well as operate from -20°F to 120°F.

Preliminary evaluations were conducted by A.B. Hughes, Senior Consultant, ESD Maintenance Engineering Group, with conclusions reported on August 24, 1981 in document entitled "Maintenance Engineering - Lubrication of Rifles". Twenty-five (25) products were finally screened for rust removal, rust prevention, grease displacement, water displacement, cleaning capability, and appearance on metal and wood firearms parts. From this evaluation five candidates have been recommended for further testing:

1. Du Pont - Synthetic Diesther
2. Krylon Ten-4
3. Sprayon 711
4. CRC 3-36
5. Houghton HLP

These five lubricants (along with 2 lubricants presently being used in Firearms Research Test Lab - WD-40 and Molycote GN-paste) will now be subjected to a more extensive test which best duplicates conditions the rifle will experience in the field and storage between hunting seasons.

SCOPE OF NEW TESTS

List of lubricants to be tested:

- Dry Condition (No lubricant)
- Du Pont Synthetic Diesther
- Krylon Ten-4
- Sprayon 711
- CRC 3-36
- Houghton HLP
- WD-40
- Molycote GN-paste } R&D Ilion results only

Tests to be conducted will include:

- Cock & Fire Dry cycle tests
- Environmental/Cold Tests
- Cleaning Capability, Rust Removal & Prevention Analysis

Sample size:

- 1 - M/700 Rifle, 5 bolts, 5 fire controls per lubricant and controls.

Environmental/Cold Tests

Firearms: M/700 and M/1100

1. Photos of surfaces where lubricant applied.
2. Determine application (same as dry cycle tests)
3. Live round jack shooting in following sequence:
   - o Take bolt and closing velocities, fire 100 rounds,
   - o Place firearm on roof of building for 4 hours
   - o Place firearm in freezer for remainder of shift (specify time on log) at -20°F.
   - o Place rifle in stress coat oven overnight at +120°F.

   } All to take place in one day
4. Continue with Step 3 for one week or until failure of firearm to function properly occurs.

"Failure to Function Properly"

- o The firearm does not perform as designed.
- o Evaluate rust development if any.
- o Record the function of the M/1100 via bolt velocities and/or closing velocities during test every 100 rounds.
- o Observe safety operation on both firearms during test.

Cock & Fire Dry Cycle Test Procedure

1. Photos at start of test
   a. Cocking cam surface on bolt body
   b. Firing pin striker
2. Apply lube: Determine amount of spray (1 sec./2 sec., distance from surface, etc.)
   a. Bolt assembly
   b. Fire control assembly
3. Take the following measurements:
   a. Trigger pull (3)
   b. Safe on/off forces (3)
   c. Bolt lift — cocked & fired ~~Bolt lift~~ sear lift / sear engagement
4. Start Dry Cycle

   Inspection cycles: 0, every 100 cycles on 1st sample of each lube to determine inspection cycle for remaining four samples.

   Monitor cycles: Auto counter and human inspection.
5. Cycle Limit: 25,000 cycles all samples - or failure. Re-evaluate at 25,000 cycles if failure does not occur.
6. Measurements: (#3) will be taken on samples #2 thru #5 at levels determined by sample #1.
7. Photos at completion of test - or failure
   a. Cam track area on bolt
   b. Firing pin striker area
   c. Sear and connector surfaces of fire control

8. Measurements (#3) taken at completion of test.

Note: Two dry cycle machines available.
Cycle rate: 1 every 3 seconds per machine.

Cleaning Capability, Rust Removal & Prevention Analysis

Firearms: Consignment guns at Ilion Fish & Game Club (Winter Skeet/Trap Shooting)

(All firearms tested will be M/1100 - 12 & 20 Ga.)

1. Review firearms and select for excessive crud/dirty condition and rust evident on surfaces of receiver and barrel.
2. Assign a lubricant to a firearm.
3. Record via photos; crud and rust.
4. Attempt to clean firearm using assigned lubricant and document results.
5. Thoroughly clean firearm by other means if assigned lubricant fails to do so.
6. Lubricate firearm with assigned lubricant.
7. Maintain accurate log on each firearm in test for one month's usage at the Gun Club, or longer depending on results.
   - o Date - rounds fired
   - o Load used
   - o Shooters comments on function
   - o Weather
   - o Storage location and temperature variance.
8. Review condition of firearms and record results of crud and rust via photos.

Note: Bolt velocities at start and finish?

CER:T
Test.,Meas.& Mech.Analysis Lab