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RESEARCH DEPARTMENT

HIGHLIGHTS REPORT

JULY 1982

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FIREARMS

Model 7400/7600 Rifles

Model 7400's, in 25-06 and 7mm-08 calibers, are complete. The 22-250 caliber requested by Marketing is being designed along with the required new magazine box.

Bolt Action Rifle Development

Three different prototype rifles are being fabricated to illustrate design options. A rotary box magazine is being detailed for fabrication.

New Shotgun Concepts

A new 3-shot M/1100 is being developed with a shortened magazine tube and fore-end. Six models with variations of cosmetic design changes are being fabricated. Included are plain receiver designs, new checkering patterns, shorter barrel (23"), and an English-type stock. Models should be complete by September 1.

HIPEX (High Power Electric Ignition Long Range Experimental) Shotgun

A program has been initiated to develop a new generation shotgun. This will be a joint venture between Ammunition and Firearms Research in order to capitalize on our synergistic strength.

Parker Shotgun

Detailed drawing work will begin as soon as model guns are now scheduled for completion in November, 1982.

Model 700 ADL Restyle

Prototype long action stamped no-bind followers passed Production gallery tests, but did not do as well in Research field testing. Feeding malfunctions occurred when some magazine springs shifted forward during recoil. A more positive method of spring retention is in test.

Model Seven Lightweight

Testing of 308, 243, 6mm, and 222 calibers has been completed with prototype stocks having a higher barrel pad. Accuracy was within specifications in all calibers.

Prototype 7mm-08 caliber actions were tested for accuracy in production stocks the week of July 19. Results were satisfactory

Model 1100 Ducks Unlimited - 1983

A prototype Special Dinner model has been delivered to Marketing.

Model 1100/870 20 Ga. 3" Mag. 28" Mod. Choke Barrels

Prototype guns have been tested for point of impact and pattern. Point of impact was satisfactory. Pattern density is still being analyzed.

Injection Molded Metal and Ceramic Components

A Remington mix Fe-2% Ni alloy has been processed to a density of 95%. The binder system contained 6% paraffin and 2% polyethylene.

Five runs have now been completed through the small process reactor and one through the large reactor. Fe-2% Ni and Fe-50% Ni parts have been successfully sintered, but satisfactory stainless steel parts have not yet been produced. Additional stainless runs will be made: (1) holding a low dew point for increased time; (2) increasing the sintering time; and (3) increasing the sintering temperature.

Cut Checkering Machine Development

The pilot run of the CO.RE.MA. stock machine has been completed. Diamond quality over 90% of the checkered area was satisfactory, but all stocks would require manual touchup.

Additional samples were run at Bostomatic on their Model 312 CNC machine. Purchase price, cycle time, and pattern flexibility are all within program goals. Checkering quality appeared satisfactory, and will be reviewed against competitive rifles and shotguns.

FIREARMS MODERNIZATION

Universal Receiver Manufacturing System

Remington, EDL, and Design Division personnel met in July to present the scope of work for the P & E to Remington Management. The development schedules for the critical technology items were also reviewed and discussed. The P & E and an additional EDL work request has been authorized.

EDL computer software personnel visited Ilion to begin discussing proposed system requirements with MRP and Quality Control personnel. Representatives of each plant department have been selected to act as a liaison between the plant and the FM group. This interface will insure that the most efficient, cost effective manufacturing systems are developed for the plant. The first meeting of this liaison group is scheduled for August 20 to discuss the details of the Rectangular Receiver Project.

GFM Automation

EDL has completed the construction estimate for the first machine. This will be combined with Remington's installation cost and forwarded to I.E. for economic evaluation. New project economics are expected in August.

Presently, the GFM mandrels are lubricated with a hot forging agent to reduce the friction caused by the blank as it is forged. For an automated process it will be much easier to lubricate the interior of the blanks rather than the exterior of the mandrel. A successful test of approximately 400 barrels was run with the interior of the blanks lubricated.

Long Stock Machining - Secondary Machining Cuts

A purchase order has been issued for a Heian NR12G dual turret CNC router. Delivery of the machine is expected in December 1982.

Plans are now underway to obtain a post processor, procure tooling and prepare N.C. tapes for M/700, M/788, M/7LW and M/500 series long stocks.

Production start up is scheduled for February 1983.

Wood Machining

A $7M purchase requisition was placed with Ekstrom, Carlson and Company to demonstrate twenty-two (22) long stock machining operations, i.e., top and bottom inletting and most secondary machining. Ekstrom is to provide a tool package and the minimum cycle time for the required operations. Fifty (50) carved but uninletted stocks have been shipped to Ekstrom for testing.

Automatic Sanding

Preliminary tests by Gebruder-Hau indicate the required stock surface finish can be achieved with their sanding system, but that separate machines would be required for long stock and short stock applications.

Three M/700 stocks were sent to ABTEX Corporation for a sanding evaluation using their nylon bristle BRADEX® abrasive. The BRADEX® gouged the soft parts of the grain resulting in a smooth but wavy surface.

City Machine Tool & Die Company tried several unsuccessful autosand techniques on M/700 stocks. In all cases, high spots were not taken down and soft wood areas tended to gouge.

Wood Finishing Automation

The Electrostatic Renovation-Rotary Bell Atomizers Project has been approved. The current electrostatic spray line will be shutdown for approximately five days in December for the bell system installation.

Scotchbrite® wheels have been obtained to conduct experimental scuff sanding tests. Tests will be run by manually presenting the part to the wheel. If successful, the feasibility of automating this operation with a Harper buff machine will be explored.

High solids urethane finish samples are being obtained to experiment with spray on filler applications. The proposed concept involves replacing manual fill and scuff sand operations with an automated spray operation and a level sand operation.

Shotgun Barrel Automation - Turn, Chamber and Polish

The Fuji Electric proposals for automating these operations were evaluated and indicate less than 1% NROI for all cases. As a result, we are pursuing a modified concept using the most efficient elements from the Fuji proposal and retrofitting several of our existing manufacturing machines.

We have initiated a comprehensive turning study, with outside vendors, to determine optimum parameters for turning shotgun barrels on new C.N.C. lathes. The feasibility of automatically loading the existing New Britain chuckers for performing chambering cuts is being evaluated and reconstruction requirements on the machine have been outlined.

Shotgun Barrel Automation - Defect Inspection

Magnetic Analysis inspected the barrels sent to them and returned two for re-inspection on our magnaflux machine. The eddy-current method approved two barrels that had been rejected by the magnaflux technique and this discrepancy is being investigated.

The major difficulty in implementing automatic inspection for this operation in the past has been because the minimum acceptable defect is not defined, and is left up to the operator's discretion. In order to circumvent this problem, Quality Control is assisting in establishing a minimum acceptable defect.

Shotgun Barrel Automation - Bore Polish

Abrasive impregnated rubber and plastic samples from three companies have been received. These samples, along with a special designed tool using abrasive rubber inserts, are being prepared for testing.

Brush Research Manufacturing (BRM) returned two sample barrels that had been polished using a two-stage polishing process. The results were favorable, and look roughly equivalent to our present bore polish. However, an objective method of evaluating an acceptable bore finish does not exist on-plant. Therefore, six (6) acceptable barrels after bore polish were sent to BRM for electronic analysis. The results will help determine if an acceptable barrel can be determined automatically.

Automatic Breech Bolt Assembly

All proposals for automatic breech bolt assembly equipment have been reviewed. The most promising quotation is from RWC Incorporated. Their equipment is fixtured to handle all shotgun 12 gauge and 20 gauge, right hand breech bolt assemblies. The machine has automatic feeds of all components and will operate on a 5 second cycle. At current production levels, the machine indicates a 10% ROI and, at projected 1986 volumes, the ROI increased to 19.5%. RWC will be visited in July to discuss their proposal in greater detail and to view assembly machines now under construction at their facility.

This proposal will be compared against EDL's robotics approach to the same assembly. A summary report of EDL's progress to date is expected in the week of 8/2.

Automatic Fire Control Assembly

Machine proposals have been received to automatically perform the safety subassembly on the common fire control. Industrial Engineering is now doing a high spot estimate of return on investment. The major technical problem is in setting the trigger play. It is planned that development funds will be used to build a prototype station to verify the trigger adjustment task. Vendors will provide an estimate of the prototype station costs.

AMMUNITION

New Unibody Shotshell Process

20 gauge bodies from the Production machine are ready to assemble, head and prime for product confirmation. 8 gauge should be ready for production immediately following plant shut-down. Nearly 20,000 rounds of 16 gauge bodies were successfully produced on the semi-works unit before a power transmission assembly failure forced this experimental run to be temporarily halted.

Polymer Support Program

Improved extrusion productivity is resulting on one Bridgeport extruder as the result of a joint program involving Research, Corporate Engineering, Production, ESD and ETL. Experience with the cascaded ultrasonics wall thickness-die pressure extruder control system continues to prove successful. To date, two slug sizes and three feed blends have been run in production with excellent results. Twenty gauge RXP® and 12 gauge Rotary Cam slugs have been produced with no changes to the control system. The system also performed flawlessly when 100% regrind and 100% repelletized regrind were extruded. Average production rates on the one extruder have increased by 40% with significantly increased yields. Plans are being made for other extruders at Bridgeport and Lonoke.

"Premier" Shotshell

Data is being analyzed on the results of a series of extensive designed tests to determine the effect of shot hardness, plating and buffer on patterns. Preliminary results show that each of these alone improved patterns, but in combination any one tends to mask the other depending on shot size. In load development, a powder blend has been identified which, with a heavier pellet primer, gives acceptable ballistics for the 3" 1-7/8 oz. heavy magnum at all test temperatures.

"Premier" Center Fire

The bullet feed and groove machine has been changed over to the 22 caliber 55 gr. Sierra bullet. The machine runs the smaller bullet well.

The bullet balance detector has been reassembled and is functional. Some 30 caliber bullets have been rotated up to 100,000 rpm on the device.

"Premier" Center Fire - Cont'd

A meeting with the Hercules powder representatives was held at Lonoke on July 13. They were told we had a usable match with the two following cartridges:

30-06 Spfd. 165 gr. PSPBT - HRP-85
223 Rem 55 gr. PSPBT - HRP-38

The six remaining cartridges need work. Hercules expressed an eagerness to support this project.

12 Ga. 1 oz. Target Load

Tests of handloaded 1 oz. Target Loads continue to show acceptable load fit, ballistics, patterns and gun function using the RTL wad/PTL shell combination. It is recommended that Union Carbide 7342 LLDPE be used in the RTL wad. The lower cost standard resin was evaluated but the resulting wad breakup caused "off sounds" and gun malfunction at 0°F and -20°F. An experimental loading run was completed in July.

Primer Improvement Program

Evaluation of nitrocellulose from Olin, China and EXPRO has been continuing. All three appear to produce ballistics comparable to the Du Pont Amber NC in Target Loads and Magnum Loads.

The EXPRO and Chinese materials showed good ability to absorb water whereas the Olin material does not. The ability to absorb moisture is desirable for chargeability. Some water would have to be removed from the Olin NC just prior to mixing to produce an acceptable mixture.

An experiment was conducted to determine the contribution of each mixture ingredient to ballistic performance in magnum loads. The findings were essentially as found in target loads in that the order of importance of the fuels in -20°F ignition is Al > NC >> Sb_2S_3. Aluminum also produces breech flash. The balance of the ingredients in 1024 mixture appears to be very good. The test indicated that higher pellet weights of all mixtures improved ignition and reduced the variation in ballistics caused by temperature and was more important than chemistry.

Primers for ballistics tuning testing and sensitivity/piercing testing have been produced and are ready for loading and testing.

357 Rem. Max. 158 SJHP

Approximately 300M bullets have been made for the trial and pilot run. These bullets meet all performance criteria.

Production of cases is in the headturn operation and no unusual problems have occurred.

A sufficient quantity of propellant powder (WC 669, Lot 21) has been ordered.

Trial and Pilot loading has been put on hold pending resolution of a 300 fps velocity loss between the vented test barrel and Ruger's revolver.

177 T Large Rifle Primer Study

Research tests have shown that high pellet weight EV's can be detected by weighing finishing primers.

The Lonoke plant has initiated a quality control standard requiring that 177 primers be within the following weight tolerances:

± 10% individual

± 5% average

Quality Control is currently rewriting primer acceptance standards for Lonoke.

Center Fire Modernization

Five of the center fire modernization prototype machines are installed and four are in start-up. The sixth machine is in final assembly at EDL. By mid-October, four systems will be in trial and pilot with the remaining two systems starting trial and pilot runs in January. The machines are bullet jacket draw, bullet assembly, header, turret trim-head turn, anneal-taper-anneal, and loader.

Laser Inspector for Shotshell Primers

Optics and electronics modifications have been completed and tested. The changes resulted in excellent differentiation between good and bad primers. The Coherent Radiation laser was replaced with a more reliable Hughes laser. This will necessitate repackaging of the electronics because of size differences. Final testing and BRH report upgrade will be completed end of August. The unit will be ready for loader installation first week of September.

RESEARCH PERSONNEL

Remington Roll

	Actual 6-30-82	Actual 7-31-82	Forecast 12-31-82
EXEMPT	64	64	69
NONEXEMPT	23	23	23
WAGE	24	24	24
TOTAL	111	111	116

PATENTS & TRADEMARKS

Summary of Activity

July 1982

Patent Applications Filed

N O N E

Trademark Applications Filed

"SLUGGER" filed in Intl. Class 13 for Ammunition	T-54 US
"VIPER" filed in Intl. Class 13 for Ammunition	T-55 US

Patents Received

PERCUSSION FIRING MECHANISM FOR INDUSTRIAL GUNS — RA-0236
Palmer/Rowlands

ABSTRACT: The hammer and sear profiles are so formed that they cooperate to automatically cock and fire the gun as the breechblock closes. The timing of hammer release is easily adjustable to compensate for wear.

Inventions Reports

N O N E