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RESEARCH DEPARTMENT

THIRD QUARTER PROGRESS REPORT - 1980

SEPTEMBER 20, 1980

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REMINGTON ARMS COMPANY

RESEARCH AND DEVELOPMENT

THIRD QUARTER PROGRESS REPORT - 1980

HIGHLIGHTS

- |   | <u>Page</u> |
|---|-------------|
| • Extended semiworks runs of the new unibody process were successfully completed on 12 gauge products. The bodies are now being processed through assemble, head and prime at Lonoke, and load development has been started. Semiworks equipment has been upgraded, and the production prototype unit is on schedule. | 1           |
| • 21MM Seismic product produced in the semiworks is being warehoused at the rate of 50,000 rounds per month. This schedule will continue through September and October. Component banks are being built in preparation for startup of production facilities in November at a rate of 250,000 rounds per month.        | 1           |
| • Laboratory quantities of 20 gauge steel shot loads were prepared and shipped to the U.S. Fish and Wildlife Service for proposed field tests.  | 2           |
| • A research program was initiated to design and develop a progressive center fire shell draw process. Prototype facilities will be installed in February, 1981.  | 2           |
| • Equipment for producing integral anvil battery cups was installed at Lonoke. Performance demonstration will begin upon receipt of spare tooling.  | 3           |
| • Further testing of rim fire TLX priming mixtures continues to show encouraging results. Testing of TLX in shotshell primers will begin October 1, 1980.   | 3           |

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AMMUNITION

New Unibody Shotshell Process

The improved one-piece plastic shotshell body process being developed will be capable of producing the complete range of shotshell specifications and is expected to result in an annual cost reduction of about \$1,000,000.

An extended run of 100,000 12 gauge bodies, in both 2-3/4" and 3" lengths, was completed at a machine rate of 80 parts per minute. Frequent monitoring of product dimensions during the run revealed no dimensional drifts, indicating a stable process. Bodies were sent to both the Bridgeport and Lonoke Plant for assembly and loading. The 2-3/4" bodies sent to Lonoke have been processed as both high and low base loads through the assemble, head and prime equipment. Load development is now in progress. Since it is proposed that a single 12 gauge body will replace three of the present bodies (RXP® type, 45 grain dry molded basewad, and 58 grain dry molded basewad), POWER PISTON® wad fit problems are anticipated. Preliminary load development results suggest existing wad designs can be used for 1-1/8 ounce and heavier loads, but a new design may be required for the one ounce load.

The semiworks equipment is in the final stages of upgrading to more closely simulate the proposed production equipment. A new die set and cam have been installed and are ready for check-out prior to resuming product development work in October.

The production prototype system under development is being designed to produce shotshell bodies at a rate of 960 parts per minute. This will provide a system capacity of 220MM components annually. In this work, all design work is complete and orders have been placed for the body former; redesign of the heatset equipment, incorporating improvements determined necessary by semiworks testing, is scheduled for completion in September with order placement expected in October; and, design work is complete on the control system and orders have been placed. Production start-up of the prototype system is scheduled for mid-1981.

21MM Seismic

An electrically fired cartridge and gun system is being developed for MAFCO for seismographic work and is designated as the

Research Department

- 1 -

September 1980

#### 21MM Seismic (Cont'd.)

21MM Seismic Shell. The shell requires an electric primer being developed and produced at Bridgeport, and a compatible gun and firing system being proven at Ilion.

Ammunition production rates have been improving and are currently limited by the dry assembly rate of about 5000 assemblies per day. In July, a total of 70,000 loaded rounds were warehoused and a run of 115,000 primers was completed. These primers will be assembled into bodies and loaded for the September and October commitments of 50,000 rounds each month. There are currently 47,000 rounds in the warehouse.

It is presently planned to begin producing 250,000 rounds per month in November. The first samples of support cups, buttons and primer cups are due from the vendor on October 1st. Product costs were calculated based upon the proposed production process and full book costs range from \$495/M to \$517/M depending upon the outputs achieved from the assembly and charging booth. Comparable costs for the standard 8 gauge product are \$440/M. A technical data package is being prepared which will specify raw materials, tooling, product and process specifications and recommended quality control procedures. It is expected that this will be completed about November 1st when production operations are initiated on the new equipment.

#### 20 Gauge Magnum Steel Shot Loads

In support of a proposed field testing program, the Fish and Wildlife Service, U.S. Department of Interior, requested that Remington provide 5500 rounds of steel loads and an equal number of lead loads for a test control. The steel loads were prepared in the Research semiworks facility and both types of ammunition, along with 12 Model 1100 LT-20 magnum shotguns (specially prepared with double gas ports for reliable function with the experimental steel loads) were shipped to the Tulare National Wildlife Refuge on September 15, 1980. No further work on steel load development is anticipated at this time.

#### C.F. Ammunition - Progressive Shell Draw Development

Work is underway to develop an improved process for manufacturing center fire ammunition cases and bullet jackets. The proposed new process is based on progressive forming of components from cup to final draw length in a continuous operation on one machine without the customary interdraw anneals.

Research Department

- 2 -

September 1980

#### C.F. Ammunition - Progressive Shell Draw Development (Cont'd.)

The plan is to have all hardware ready for initial testing in February, 1981. The primary development goals are to establish progressive draw feasibility, define equipment speed and efficiency, determine lubrication requirements and tool usage, and provide a data base to assist in further tooling development. This work is proceeding on schedule.

#### Integral Anvil Battery Cup

The objective of this program is to develop an integral anvil battery cup to reduce primer manufacturing costs, improve consistency of primer quality, and provide greater opportunity for process automation.

The die was successfully tested in June with approximately 830,000 components being made. The system was shipped to Remington in July. It has since been received and installed. Five anvil support punches were broken due to a misfeed during start-up. One coil of metal has been passed through the system at design speed without these punches to gain operating experience and finalize safety requirements. Upon receipt of spare tooling, the performance demonstration, (production of twenty-five million parts) will begin.

Preliminary supporting documentation necessary for proper operation of this equipment is complete. A Process Record describing component, material and lubricant specifications, the tooling progression and gauges for product acceptance, die set-up, and material inspection has been prepared. A Technical Data Pack containing vendor catalogues, reproducible engineering drawings, a spare parts list, and operating manual was also assembled.

Hand operated equipment for covering the flash holes has been satisfactorily tested at thirty parts/minute. The paper covering concept requires only one tooling station and has been forwarded to Legal for comment on patentability or infringement.

#### TLX Priming Mixtures

The purpose of this program is to improve primer manufacturing safety by developing a priming mixture which is significantly less sensitive to detonation during manufacture.

The proposed TLX mixture contains nitrocellulose to take up excess moisture and improve charging characteristics. Using 4% nitrocellulose and an increased mixing time, the rim fire mixture has passed all product evaluation tests to date. Drop tests,

TLX Priming Mixtures (Cont'd.)

ballistics and accuracy results were comparable to the standard control mixture and the candidate mixture indicated acceptable compatibility with the high speed rim fire shell inspection machine. A total of 27,500 rounds have been fired in pistols and rifles with no misfires or malfunctions. After 11 weeks under high humidity, hot storage conditions, the candidate mixture held up well showing less misfires than the control. The mixture has been tested under mass detonation conditions and was found to be insensitive to #8 blasting cap detonations at various stages of the mixing cycle. A plant scale run of the rim fire candidate mixture is scheduled for the week ending October 3, 1980, with more extensive testing to follow.

In order to test the candidate mixture in shotshell primers, a new, 1.1 grain pellet weight charging plate has been purchased and experimental work in this area will commence October 1, 1980.

Research Department

- 4 -

September 1980

## STATUS PRODUCT DEVELOPMENT

### Polymer Improvement

Shotshell body cutoffs on reloading have been reported in the field. The primary cause has been traced to the body polymer. To correct the problem, a program was initiated to correlate specific polymer characteristics with the severity of shotshell body cutoffs, and to identify acceptable alternative resins. The first to be evaluated, Chemplex 2203, processed well through the extruder and gave high tensiles in finished product. However, it produced an unacceptable level of body defects going through the body forming operation. In response to this, Chemplex provided three experimental samples of polymer with different levels of internal lubricant. These could not effectively be processed through extrusion. Two additional samples from Chemplex, one of slightly lower density and one produced with a different catalyst are yet to be tried, along with two samples from USI and one sample from Marlex.

### 30 Caliber "Accelerator" Sabots

Due to the problem of excessive sprue lengths on molded polycarbonate sabots, the use of Lexan® 141 is being considered as a direct replacement for Lexan® 191. During an experimental molding run at the vendor's plant, this polyethylene-free material totally eliminated the excess sprue lengths on molded product. To determine the compatibility of this resin with the single base powder (DuPont 4198) used in the 30 cal. "Accelerator" products, severe long-term environmental testing was initiated. Results obtained mid-way through the six-month storage period continue to show positive indications of compatibility with the powder. The final series of tests, after six months storage at 150°F, are scheduled on November 21, 1980.

### 357 Remington Maximum 158 Gr. SJHP

Case splits resulted when 357 Rem. Max primed shells, made from standard 357 magnum components, were loaded to 50,000 psi and fired in a prototype Ruger handgun. These cases have performed satisfactorily in UR barrels and their wall thickness variation is within 357 magnum specification. The handgun chamber dimensions plug-gauge satisfactorily. Further examination of these cases is in progress.

A second experimental run has been initiated to produce cases from shells made in a three-draw process. These cases will have a wall geometry identical to those that split. Plans for a third experimental run to produce a heavier walled shell are being made.

Research Department

- 5 -

September 1980

7mm BR Remington Case

Second and third taper dies, due mid-October, are on the critical path for conducting an experimental run in November. All other tools are on hand. Two samples of shells, each based on a different draw process, are being made on production equipment.

7mm Mauser 140 Gr. PSP

An experimental run, using commercial bullets identical to those currently loaded in 7mm-08, was conducted with satisfactory results. Efforts to procure bullets and packaging materials for a December production run are in progress.

117 Primer

Testing of the 117 has shown that it is acceptable for use in the nitro mag and steel loads and possibly all other field loads. With respect to the target loads, recent testing indicates that the level of sensitivity, particularly off-center, with the proposed primer is not satisfactory. A program that does not involve major changes to the primer has been developed to accomplish the required improvement in sensitivity for these loads. This program, involving reduction in the metal hardness and/or thickness of the primer cup, will be complete by November, 1980, when a schedule for production implementation can be detailed.

Research Department

- 6 -

September 1980



STATUS - PROCESS DEVELOPMENT

3" 12 Gauge RXP® Shotshell

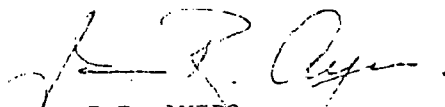
It was demonstrated that with tool modifications and press adjustments 2-3/4" product slugs could be successfully processed into 3" bodies at full speed using one row of modified tooling. These bodies were assembled, headed and primed with only minor equipment adjustments, and a portion were production loaded (SP12HMAG-00BK) with no difficulties encountered. Product acceptance testing was completed and the ammunition met all performance criteria. Additional tooling is now being fabricated for the remaining rows of the press. Upon receipt, a trial and pilot/production run will be scheduled by the Bridgeport Plant.

Asbestos Basewad Elimination

The purpose of this project is to eliminate the asbestos dry molded basewad from Remington's complete line of "SP" shotshell products by conversion to a high density polyethylene material.

At Bridgeport, all gauges, with the exception of 8 and 10, have been converted to plastic and are in production. Work on 8 gauge conversion is presently underway.

In August, an attempt was made to extrude and cut off 8 gauge plastic basewad slugs. Extruder instability problems, possibly caused by the heavy wall of the rod, allowed only a negligible portion of the extrudate to be maintained within dimensional specifications. However, some of the acceptable product was cut to slug length and hand assembled, headed and primed in the Research semiworks facility. These shells will be production loaded and product acceptance tested on a preliminary basis before further work is done on improving the extrusion process.

  
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Research Department

- 7 -

September 1980