

June 25, 1991

MONTHLY REPORT JUNE 1991 Bill Warren

INTRODUCTION: This is my first progress report since the dissolution of the last SPC Implementation Team in third quarter of '90. This report emphasizes recent process control activity on behalf of the M522.

SUMMARY OF CURRENT ASSIGNMENT: "Obtain measurements, summarize and review results with those responsible to resolve process capability with product needs."

See attachment entitled: "Model 5 Molded Parts Process Study Activity"

PROCESS CONTROL: I encouraged and facilitated the actions of other specialists needed to provide automatic CMM measurements on major 522 molded parts and to convert the results into MINITAB format for detailed analysis. A measurement undertaking of this scale would not have been practical without automatic measurement and electronic file manipulation. example: Housing; 56 dimensions, 30 samples, multiple molding runs.

Method of presentation of results: I developed a way of illustrating study results which, I believe, enhances understanding. This is color-marking model drawings in a way that depicts both closeness to aim and variability and implies priority for corrective action. This visual medium also facilitates recognition of patterns of relationships between dimensions and encourages discussion of how these patterns relate to the mechanics of the mold tooling and process variables. An example of this pattern recognition was the realization that many "length" dimensions on an early Housing sample were off aim in the same direction by a similar amount. This insight ultimately led to improved closeness to aim for all these dimensions by altering the datum surface in the mold.

Status of machine/process studies:

- o vended metal parts: most studies have been completed on parts such as pins, springs, screws. Many of these were completed in the last quarter of last year.
- o major molded parts: There is additional work to do as future runs correct unsatisfactory conditions noted by measurement, assembly and live testing. These are major studies on parts such as the housing and receiver.
- o minor molded parts: There are mold runs coming up before shutdown on magazine guides and firing pin carriers. The f.p. carrier has been molded and studied approx. one-half dozen times.
- o bolt and barrel: We have taken some measurements. A very quick intuitive review indicates to me that priority and emphasis should be on molded parts. That's where I've placed it.
- o study of permanent assembly processes: This should be done. Many of these processes on the M522 are irreversible; some parts must be scrapped if the assembly is disassembled. I would like to increase our study activity here as these come on-line.

- o specific limited studies: These have come up to answer additional questions posed by a major study or to trouble-shoot a particular condition; especially on housing, receiver and f.p. carrier. I expect these to continue well into such time as we achieve full production volume.
- o design of experiments: I initiated the meeting process for the housing and receiver at which we established beforehand a strategy and plan to systematically adjust process variables and record the resulting dimensions.
See attachment, "Housing 4-24-91"

Note: Not every measurement or study is analyzed and recorded.

MANPOWER: R. Deller has been on loan to me from R&D for M522 metrology jobs for the last two months. During this time, he has spent about 85 % of his time on the M522. I returned him back to E. Munson on 6-20-91. He has very good metrology skills and is the only one on site, as far as I know, who is proficient on the CMM located in the former Q.C. Metrology Lab. His availability has allowed us to accommodate both the major molded parts studies and more specific requests without major delays.

Others who have contributed:

- J. Smith
- M. Paestella
- Purchased part inspectors

TRAINING: Year to date

- o Autocad, 20 hours, Feb.-April
- o OGP programming school, optical gauge, 40 hours, March
- o Cutting tool insert seminar, 3 hours, May
- o Twist drill seminar, 3 hours, June
- o Dupont "Contract Administration", 8 hours, June

DEPT. REASSIGNMENT: This month I was transferred, at my request, from 9255, Continuous Improvement; to 9281, Rifle Process Engineering.

OTHER MAJOR ACTIVITIES THIS PERIOD:

- o Resourced the Marketing Quality Audit of warehouse product conducted late in Feb. The changes made at that time were to communicate the results to a much larger plant audience and make the sample guns available for review by any employee.
- o Assisted T. Hawkins with the acceptance run-off of the new Monarch shotgun lathe and swing-away steadyrest. He requested this as follow-up to the steadyrest feasibility study conducted last fall.

SPECIAL INTEREST:

Cryogenic treatment of molded parts to correct post-mold distortion: Analyzed results of experiment conducted and measured by R. Aubin. There was an improvement in the desired direction but only 5 to 10 % of the magnitude needed to provide a practical improvement. I issued a written summary to help reduce the "room temperature fusion"

mania that was developing on this one.

Elevated temperature test for M522 housings: request of K. Soucy.
Any dimensional changes at 150 *F. for two days? Test is completed.
The write-up has not been completed.

FOLLOW-UP TO PREVIOUS RECOMMENDATIONS:

R&D has reviewed their spring design program and has begun making changes to it. These will be more in accord with guidelines promoted by the Spring Manufacturers' Institute. The Remington spring design program specified significantly tighter tolerances on inspection loads and permitted departures from good spring design practice without making the designer aware of it. These differences became apparent thru the process capability analyses and vendor exceptions to specifications on spring quotes for some M522 springs. Both J. Balio and I believe it is better to address such conditions at the design stage; so we proposed last fall to R&D that they undertake this activity.

TRAINING SUGGESTION:

The M522 is the first Remington model to be designed using the Geometric Tolerancing system. This has now become quite common elsewhere. All of our Engineering Techs. and some of our Engineers can benefit from additional training on this system, especially the need to locate from specified datum surfaces for measurements.

SIGNIFICANT PROBLEM:

The previously purchased software, intended to convert data files generated by the R&D CMM into a format usable on the VAX system, has not worked with such a large file size. Therefore, while this condition is being corrected, the Receiver measurements are being analyzed with the much more modest CMM software.