

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE



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"CONFINE YOUR LETTER TO ONE SUBJECT ONLY" \_\_\_\_\_

September 1, 1981

To: C. B. Workman  
From: J. W. Bower *[Signature]*  
Subject: Trip Report - Millett Industries, Witec California, Inc., Valform

During the week of August 17, 1981, T. L. Capeletti, K. C. Rowlands, and myself visited the above companies, who are all involved in advanced powder metal technologies.

Millett Industries - August 18

Millett employs approximately 20 people in an office and manufacturing facility located in Huntington Beach (Los Angeles area), California. Vice-President Ray Millett was one of the original partners in Parmatech, along with Ray Weich and Karl Zueger. Ray Millett's son, Tom, is the company president, and appears to be the business end of the company, with his father devoting his time to the technical work.

Millett owns an exclusive license to use the Parmatech injection molding process to manufacture firearms parts. Tom Millett said that they researched several industries before settling on firearms. This industry was chosen because Millett believes that a significant portion of a completed firearm can be economically made using the Parmatech process. Tom is also involved with firearms. He currently does combat shooting, and wants to get into silhouette shooting.

Millett is very protective of their process, and would not allow us to view it. Tom said that they had extended the Parmatech Technology, and consider their process - called "Mold Forge" to be proprietary. They are sensitive about having their process referred to as powder metal. They claim the similarity ends with the fact that you start with a powder, and end by sintering.

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Millett is now in the trial and pilot stage of manufacturing scope rings. They currently market open sights, and expect to eventually offer a complete line of firearms accessories.

The scope rings, which they expect to have in full production by mid-October, are of extremely good visual quality. Two styles are offered, with the difference being the top half of the ring, which can be either plain or engraved. The engraved ring has very fine detail, and includes a stippled background. The engraving is produced by an insert in the molding die, and should be relatively easy to change.

We discussed the possibility of Millett manufacturing scope rings for us. Tom Millett appeared very receptive to this, though he would like to see some changes to the rings, probably in the engraving, as they expect to market their own line.

The potential capacity at their facility was estimated by Tom Millett to be 4,000 rings per day. As the market develops, their long range plans are to build a second plant outside of California (Denver was mentioned), and a third plant on the east coast. Colt has apparently expressed an interest in a joint venture to build a plant in the east, and Millett would also be receptive to talking to Remington.

We also discussed several Remington parts that Millett has previously quoted:

- XSG slide block — good part for Millett. Coring would be necessary to meet wall thickness restrictions (\$1.15 each).
- M/700 magazine follower — stainless steel is not available for Millett, though they would be capable of making it out of nickel-iron (\$2.80 each).
- S/G extractor — Tom Millett thought this would be the easiest part to make, but questioned whether his nickel-iron alloy was tough enough (\$.61 each).
- M/700 bolt plug with bolt latch cuts — Millett was very hesitant to commit to this one (\$4.89 each).

Tom admitted that he has very little experience on what their process actually costs. He regarded the above costs more as preliminary.

The best approach with Millett would be to pursue their scope rings, revised to what would fit into Marketing's plan, and wait on other parts until they get production lines operating.

Witec California, Incorporated - August 19

Witec operates out of three relatively small units in an industrial park in San Diego. They are in the business of supplying equipment and pre-mixed powders for a thermal extraction variation of the Parmatech process. We spoke with Sales Manager Jim Markham, President Al Roshon, and (title unspecified) Ray Welch. It was quite obvious that Welch runs the show. He was one of the original partners in Parmatech, and we heard conflicting stories of why he left. Ray Millett told us that Welch was only interested in research, and when Parmatech went commercial, he disagreed with their approach and left. Welch himself told us that he left because of a health problem (confirmed by Millett) working with the binder solvents. Because of this problem, he developed a thermal extraction system and started Witec. Welch still has a legal connection with Parmatech, and shares in the fees Remington is paying Parmatech. In fact, Witec and Parmatech use the same patent attorney.

While Millett has so far restricted themselves to nickel-iron powders, Witec is also offering 316 and 17-4 PH stainless steels, and is developing pre-mixed powders for monel, 304 stainless, and maraging steels.

Even for materials currently available, the combination of powder morphologies and binder systems required to get good products is still not straight forward. Witec reported problems with powder consistencies from their suppliers. They screen the powders before adding the binder and supplying to their customers. While Remington could do the same, it may be advantageous for us, at least initially, to buy from Witec.

Witec offers two sizes of reactors (sintering furnaces). Their 10 cu. ft. reactor is only usable for nickel-iron alloys. They also have a 1.5 cu. ft. reactor which can generate a dew point sufficiently low ( $-40^{\circ}\text{C}$ ) to also produce stainless steel. Witec is doing no work, at this time, with ceramics. Either size of reactor uses hydrogen for its atmosphere, which may require special safety precautions.

The Witec equipment uses a thermal system for removing the binder from the molded parts. The debinderizer is capable of heating to  $400^{\circ}\text{F}$  with a cycle time ranging from 8 to 17 hours. (In contrast, the Parmatech solvent extraction system takes over 100 hours).

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Witec's equipment is tied together with a microprocessor which is preprogrammed to control time and temperature rates. While Remington could develop their own software, it may save a significant amount of development time to buy a turnkey package.

Jim Markham told us that if we ordered a system before September 30, we would beat a scheduled 30% price increase. He also said that prior to that date they could give us a 3 month delivery time. After that, it was expected to go to 8 months.

Six M/7600 ejection port covers, and one M/552 grip cap, molded on one of our plastic injection molding machines using Witec's 2% nickel-iron powder, were left at Witec for further processing. Witec will retain some of the samples for their evaluation and return the remainder to us.

Valform (Division of Valeron Corp.) - August 20

Valform operates out of a one-year old building in Monument (Colorado Springs area), Colorado. They start with water atomized powders, pressed either isostatically or mechanically, and vacuum sinter to produce finished parts of near net shape, with physical properties very close to wrought material. Their principle business is cutter blanks, including rock drills for Hughes. Valform is represented in our area by Bill Halliwell and Sales Manager Rob Fisher, who have an office in Syracuse.

The mechanical process does not appear to be much different than our powder metal operation. I talked briefly with Hal Munson about it after our return. Hal said that they had experimented with high carbon powders from the same source that Valform uses (a British firm), and had excellent results, achieving densities much higher than they normally get. No work has been done beyond the experimental run.

In their isostatic process, they pour the powder into an inexpensive silicon mold. After sealing and evacuation of the mold, isostatic compaction produces a semi-dense preform ready for sintering. Prior to sintering, the green part has a substantial amount of its finished strength. Sintering is the same regardless of whether the part is pressed mechanically or isostatically.

The production rate on the rock drill we saw being produced by the isostatic process was 12 pieces every 5 minutes. Parts being produced by mechanical pressing have a much higher production rate.

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The raw material appears to be critical to the process. Valform buys from only one supplier, and inspect it when received. They are working primarily with alloys with about 1.5% carbon, though they have successfully produced parts with carbon levels as low as 0.4%. They are developing a process for 304 and 316 stainless, but have increased the carbon level to .15%.

The primary advantage to this process is the elimination of machining operations on structurally significant parts by molding to near net shape. Valform has supplied isostatically pressed blanks which we are machining into M/7400 breech bolts. These will then be tested to verify Valform's claim of wrought material physical properties.

We reviewed prints of several firearms parts previously sent to them by Purchasing. They will now give a firm proposal on M/7400 breech bolts and M/700 bolt assemblies. We further agreed to send them prints of S/G breech bolts and receivers.

Divisional manager Bob Anderson admitted that this was a very new business. It was started primarily to supply cutter blanks (cutters being the predominant business of the parent company), and they are just now looking at other areas. He indicated an interest in a joint development venture between Remington and Valform to develop applications with mutual benefit to both companies.

Valform has quoted an experimental quantity of XSG slide blocks. I have prepared the paperwork to buy these to evaluate dimensional control and physical properties. If these, and the 7400 breech bolts in process, are successful, we should seriously consider a joint venture arrangement.

JWB:ws

Firearms Research Division