

CUSTOMER: **Hallmark Cards** □ Kansas City, MO 64108 □ www.hallmark.com

“Finding the Right Words and the Right Process”

Representing about 50 percent of all greeting cards sold in the United States, Hallmark Cards employs more than 18,000 people and is represented in more than 43,000 retail stores throughout the country. These numbers alone justify the title “industry leader” but it is the behind-the-scenes diligence and attention to detail that helped them achieve these numbers in the first place. Hallmark is synonymous with quality where greeting cards are concerned because every facet of their creation is scrutinized – from the paper used to the thoughtful words and images ... and subtly, but most notably, the elegant raised designs embossed in them. This story is about the countless dies needed to produce all of those embossed markings, as well as Hallmark’s decision to abandon the traditional nickel forming method due to irregularities in surface finish and unpredictability in terms of overall thickness and run quality with the dies. Specifically, this study details Hallmark’s selection of high-speed machining and the efficiency and cost-reduction associated with this change (the new process yields press-ready dies that are not only more consistent but are also less expensive to produce).

But, for a 100 year old company breaking tradition and embracing new technology is not always an easy process – particularly when the change can initially be disruptive. But, Doug Bowen, a senior engineer at Hallmark’s Advancing Technologies division, recognized early on that *“Part of successful implementation is clearly articulating that a temporary disruptive impact to a production area may represent the best long-term solution,”* Mr. Bowen explains. *“Sometimes this phase can involve long, often passionate dialogue to determine the most appropriate course of action.”* Plus, since Hallmark is known for quality, any new engraving process would have to maintain the distinctive look of hand engraving.

CHALLENGE:

Hallmark leverages a creative staff of 800 to generate more than 19,000 new and redesigned greeting cards each year. In total, the company offers a product line of more than 48,000 cards at any given time. About 11,200 of these products require dies to produce raised or embossed images, raised or flat foil images and lettering.

CREATIVE CAPITAL:

Embracing a promising technology is the first step. However, technology alone does not provide the means to capture a sentiment in a card. Hallmark derives strength from the talents of a creative staff of around 800 artists, designers, stylists, writers, editors and photographers. Together they generate more than 19,000 new and redesigned greeting cards and related products per year. The company offers more than 48,000 products in its model line at any given time. Of this figure, about 11,190 cards require embossing or lettering using a custom die, and thus require the combined expertise of the company’s hand engravers and digital artists.

The embossing process produces a raised design. Embossed foil is also referred to as “raised rounded” or “raised foil,” whereas “flat foil” denotes no relief or raise in the paper.



Hallmark embossing die engraved on DATRON M8 high-speed CNC.



Phil Hammond examines the batch.



Hand engraving is still the most efficient means to create striking designs. Shown below is Amel Sparks, who has spent 25 years honing his craft at Hallmark.

The notion that digital tools are still not as efficient in creating complex designs as a skilled artisan might seem unfathomable. However, anyone who has met one of Hallmark's seasoned hand engravers would politely beg to differ. With an average of 25 to 30 years of experience, these dedicated "Hallmarkers" use tools that vaguely resemble dentist drills to painstakingly sculpt lavish designs in the magnesium plates. Through a proprietary data-capture process, these magnesium "blueprints" provide the basis for the digital design that will ultimately be used in the machining process.

"Certain repeated patterns or geometric shapes lend themselves to digital beautifully," explains Phil Hammond, team leader of 3D reproduction at Hallmark. *"By and large, Hallmark has been well-known for its organics, florals, landscapes—things of that nature."*

That said, Mr. Hammond conveys that the shift to digital is still a work in progress. Along with determining how to effectively model these intricacies within the realm of CAD/CAM software, the company is also learning how to machine them effectively.

After the design engraved in a magnesium die is scanned and imported into CAD/CAM software specifically for artistic forms—Delcam's ArtCAM Pro 9—the file undergoes tweaking by an engraving artist. The program then creates the G code for the high speed machining centers.

ALL IN THE DETAILS:

Just as it draws on the talents of its creative, dynamic staff, Hallmark must also draw on the capabilities of high speed machining. Taking light, fast cuts enables the quick, consistent production of pristine, press-ready brass tools. But the process wasn't always easy. The company first delved into high speed milling with what it describes as a "middle of the road" machining center. Even though the machine worked well for the dies, it wasn't designed to endure the abuse that the company doled out. It could not withstand the frequent axis reversals within the mere 0.090-inch movement on the Z axis, which is all the dies require. The continual movement eventually wore out the Z axis components.

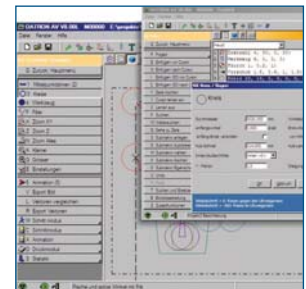
A search for an appropriate high speed solution that would meet the company's requirements of performance, quality and serviceability ultimately resulted in the selection of an OmniRaptor (now called M8) from Datron Dynamics.

Used for making dies, the gantry-style OmniRaptor has all the trappings of a machine built for high speed batch engraving of detailed workpieces, including a 60,000-rpm spindle. It also has a work area measuring 30 inches by 40 inches, ample enough to accommodate numerous dies to be machined at the same time.

Bob Murphy, sales manager at Datron Dynamics, recalls that Hallmark wanted to load about ten or 12 brass dies and then let the machine run unattended.

"They can basically generate one huge tool path and let the machine run and cut however many dies at once," he explains. *"The large bed minimizes operator intervention because it accommodates this full batch."*

This structural characteristic proves especially useful for Hallmark's three-man machine shop because an operator can load a batch and then tend to other duties throughout the day. Also minimizing operator intervention is the engraving machine's integrated probing apparatus.



According to Mr. Murphy, the Z-Correction probe reduces setup time, helps reduce operator errors and maps the surface of a part for precise depth engraving. The device compensates for uneven surfaces. Because it is mounted next to the spindle, the probe does not get in the way of the tooling. The pneumatically-retractable probe can be extended to measure either single points or custom matrices.

“Even if the plate was crooked, the probe would evaluate the surface and calibrate so that Hallmark could engrave over it,” Mr. Murphy says.

The engraving machine’s PC controller is useful for the company’s 3D artwork, as the file formats are typically rather large. The machines can be networked to foster easy data transfers. The Windows XP operating system affords the operator the flexibility to print files or even surf the Internet.

Rounding out the process are pre-balanced toolholders and collets as well as small cutting tools, which are mandatory for the fine detail work. Because the material is brass, high-end tooling generally is not needed. In fact, Hallmark has been able to standardize its tooling library, thereby minimizing the number of tools required for the sake of efficiency. Mr. Hammond adds that the shop can buy quality end mills in bulk to further maximize cost savings.

A VIRTUAL PALETTE:

Aside from the gains in machining efficiencies, the process is also significant for the consociation between the company’s hand engravers and digital artists. Following engraving in magnesium dies and scanning, these digital artists work with the designs in ArtCAM Pro 9. Senior artistic/digital engraver Rick Olsen is one of the digital artists that process the nearly 500 dies that brush through the computer-aided engraving department each month.

Working from the CAM software’s streamlined toolbox, he not only models a spectrum of designs using the features, but also generates tool paths efficiently by applying pre-defined milling strategies. The “Smart Engraving Wizard” has predetermined feed rates and depths of cut.

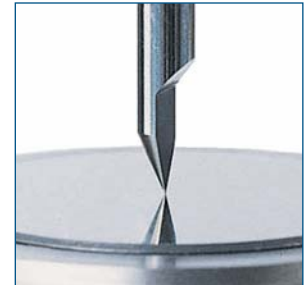
According to Mr. Olsen, the majority of dies will not be remachined. In fact, of the 6,000 dies machined on a yearly basis, very few of them will be duplicated. This means that generating correct tool paths in a timely fashion is essential, as there will not be a chance to use the program again. Equally as important is the capability to simulate cuts prior to making them.

“We are able to simulate every mill cutter path prior to machining with this package,” Mr. Olsen says. *“We review everything but the G code, as we use a separate verification package for that.”*

CROWNING ACHIEVEMENT:

As made evident by Hallmark’s notable savings in die machining in the first year alone, the company’s strategy has paid off. A healthy portion of the immense savings can be attributed to one final significant advantage of the new process—the precision fit between the die counter.

“There was a noticeable variance when producing dies with the old method,” Mr. Hammond says. *“In the past, we might have wasted hours leveling dies to achieve uniformity. Now that we can supply manufacturing with tools that fit very precisely, we can increase press speeds and achieve better quality with less effort.”*



In fact, by reducing the make-ready time, the company reports that it can also limit the extent to which it outsources the machining of its dies. Thus, the process not only makes both the machining and the press work more efficient, but it also gives the company better response time and greater internal control. Now that's something to write home about.

