



# The History of Computerized Traffic Sign-Making

Rick Bergholz and his wife Susan live in Milwaukee, Wisconsin. Rick has been working in the traffic industry for over 32 years, and is the CEO and co-owner of TAPCO which is headquartered in Elm Grove, Wisconsin. Rick is a member of IMSA, ITE, ATSSA, PARC, IPI, DPI, Task Force 13 and APWA. His father Ray founded TAPCO 50 years ago.

The seeds of modern traffic sign-making were sown over fifty years ago. In those days, traffic signs were made reflective by dropping glass beads on to the freshly painted or screen-printed surfaces. Those early reflective signs were known as "bead reflective". A major shortcoming of the "drop on" method of reflectivity was that the sign's visibility would "blank out" when any moisture came in contact with the exposed glass beads. Famous for their ability to innovate new technologies, 3M then introduced their breakthrough product known as "encapsulated reflective sheeting". When 3M encapsulated the glass beads inside of the different layers of reflective sheeting, the sheeting would maintain its reflectivity even in wet conditions. The first encapsulated sheeting was called "Scotchlite", also known as "Engineer Grade". Over the years, many improvements have been made in reflective sheeting, including the recently introduced High Intensity Prismatic and Diamond Grade Cubed, both of which are assured of a place in traffic sign-making history.

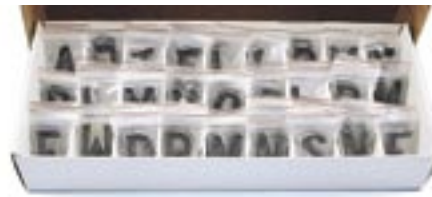
Nowadays, most reflective sheeting utilizes pressure-sensitive backing that adheres to substrates by simply applying pressure. Sheeting products from earlier days had to be applied using a "Heat Activated" (H.A.) adhesive. It required a special machine known as a "Vacuum Applicator" to apply the sheeting to the sign blanks.



HA Mike

The adhesive backing of the H.A. reflective sheeting was dry to the touch, and the vacuum applicator was needed to heat the sheeting to about 200 degrees. When the sheeting heated up sufficiently, the adhesive would ooze out and flood onto the sign backing, which would then bond the reflective sheeting to the substrate. The heat also made the reflective sheeting more pliable and flexible, allowing it to conform to irregular surfaces such as extruded aluminum sign blanks.

The vacuum applicator was crucial to the early acceptance of reflective sheeting because of its unique ability to allow traffic and street name signs to be made "in house." By manually positioning the individual die cut reflective letters onto a street name sign it suddenly became practical and desirable for municipalities to make their own street name signs, as well as other variable traffic message signs. Thousands of City, County, State, Federal and privately owned traffic sign shops were born. Many early die cut letter customers



Font box

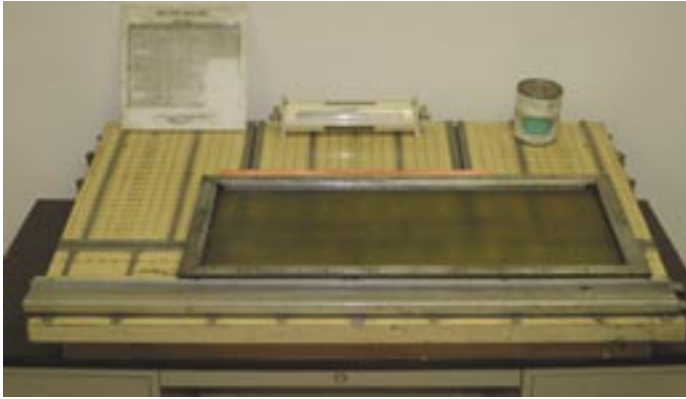
bought "font boxes" that contained all of the numbers and letters needed to make their own street name signs and other variable message signs.

Font boxes contained proportionately more packages of vowels than the less-often used consonants, such as letter Z. TAPCO continues to manufacture packaged die cuts, as well as offering state-of-the-art computerized traffic sign making systems.

If I may indulge you for a moment, a story from my youth can perhaps illustrate why some innovations are embraced so wholeheartedly. I can vividly remember when I was in my teens making countless street name signs as described above. My father, Ray Bergholz, who founded TAPCO in 1955, was a firm believer in using the very low cost 'slave' labor of family members to put bread on the table. So it was that I would put the die cuts on one side of the street name sign blank, then flip it over and apply the same combination of letters to the other side of the blank. The vacuum applicator that we had at that time was quite large, enough to make twenty or more street name signs in one batch. While one side of a batch was "cooking", I would prepare an identical batch of letters to apply to the opposite side. In an untimely lapse of concentration, I inadvertently applied the opposite side letters upside down which in "turn" ruined the whole batch of twenty signs. Ray was not a happy camper, and I was thoroughly embarrassed. There was no way to redo them. It was a total loss at a time when we could least afford it. The same types of problems occur in sign shops today, but the advent of computerized systems allows for lower production costs and hopefully a reduction in human error.

I did keep my job, but that incident led Dad (Ray Bergholz) to investigate newer and better ways to make custom street name signs. In 1960, our company bought a Mono-Printer from the B.L. Petty Company in nearby Effington, Illinois.

*Continued on page 43*



*Mono Printer*

This invention was meant to replace the die cut letters by means of screen printing. The Mono-Printer had all of the spacing and layouts pre-designed into the process so that a completely



*MP Screen Drum spacer guide and Flat spacer guide*

mechanical system could screen print custom traffic signs in minutes. The Mono Printer eliminated the need for the two layers of reflective sheeting necessary to produce die-cut letter traffic signs. A specially formulated



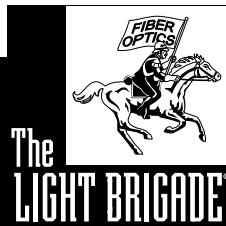
*Enamel*

ink made by Petty stayed workable for many hours without the usual problems associated with ink drying into the silk screens and requiring time-consuming wash-outs and re-starts. After our company began using the Mono-Printer with good success, the company in 1962 started to sell the machines to municipalities. The City of Racine, Wisconsin was

one of the first cities to use the Mono Printer to make traffic signs. Ironically, Dan Johnson, City of Racine employee who used the Mono Printer is now employed in our sign shop.

Meanwhile, on the other side of the Atlantic Ocean, the advent of a very special machine developed. A Danish visionary named Ole Nonbye believed he could make a machine that would produce correctly spaced words and sentences on adhesive strips of film, so that he would not have to fiddle with loose letters. Ole did not like the sight of letters with incorrect spacing, and the idea for an automated sign making machine had been turning over in his

*Continued on page 44*



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head for some time. One spring day in 1976, armed with tons of ideas, a few sketches and an implausible dream to make a machine that would be unique to the whole world, Ole met with an engineer at the Jutland Technological Institute in Aarhus, Denmark. With the optimism of a young inventor, Ole convinced his colleagues to take on the project of building the first automatic lettering machine.

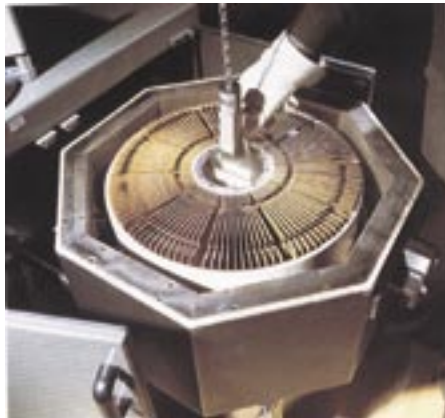
Everyone involved knew it would take a long time and cost a lot of money, but fortunately for Ole the Danish Research and Development Fund granted him low-cost loans for up to 75% of the costs. The concept of using dies in a machine was thought to be technologically impossible and indeed the first generations ended in failure – everyone was rather depressed after each failure but Ole was not a quitter. One of the tasks that would have to be done manually was working out the coding in tables to control pre-spacing. There were over 12,000 combinations for the spaces between the 110 characters in a font and 12,000 more for each type face, so night after night Ole sat at the computer feeding in the necessary information.

After 3 years of hard labor the “brain” for the new machine was ready – at almost the same time the group of engineers working on the hardware were ready with their first generation of hardware. The very first machine consisted of a punching machine with a terminal for the operator and a terminal to track orders. The machine operator would load in a roll of film of a given width and color and the machine would produce text to fit the desired spacing. At Ole’s insistence there was also a direct connection between the machine’s production and the billing department, quite an innovation at the time which has become a widely accepted practice. The first ever computerized die cutter was called the *SpaceMatic I*.



Space Matic Console

It required a separate heating cabinet to keep the dies warmed to 200 degrees Celsius. The warm dies were then transported (see picture) in a special holder and placed in to the *SpaceMatic* cutting machine for programming by the computerized control panel.



Dies Inserted

The *SpaceMatic I* gave Ole’s company a huge advantage over its competitors because of the ability to deliver finished jobs in 24 hours or less. Prior to the advent of the *SpaceMatic I*, sign making was a traditional craft type of product. Suddenly the mass production of specials was a reality. The *SpaceMatic I* was capable of working with 4 different typestyles, in 20 different sizes and had a production speed of 15 characters per minute.

When the *SpaceMatic I* was finished, 3M salesmen lined up to see the new marvel. 3M had watched closely the development of the *SpaceMatic I* and they could see big market prospects for the machine. In 1980, 3M brought a series of potential buyers to Denmark to see the *SpaceMatic I* demonstrated. There was enormous interest, and the first 2 or 3 machines were ordered – the first machine went to Finland and the second machine went to Germany. Over the next two years the machine was refined to add more letter sizes, and to run at a faster speed.

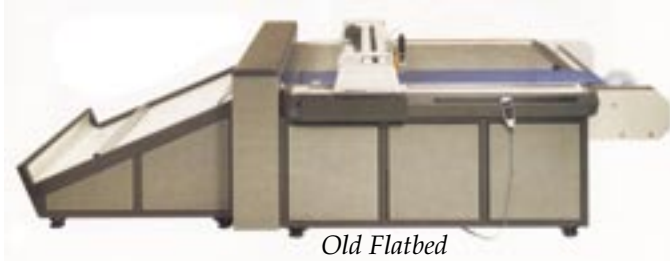


SM Delivery

In late 1982 a large American business named Gerber introduced a lower-cost computer-controlled cutting plotter called the Gerber GSP-4B. Rumor has it that Gerber personnel had been among the first batch of potential customers to see the *SpaceMatic I* demonstrated in Denmark. The new Gerber method of pre-spacing and cutting with a knife blade instead of heated dies was a revolutionary advancement in computerized die cutting technology.

This Gerber knife technology caused Ole a lot of sleepless nights as he pondered the question of “What now?” Ole had founded a separate company called Sign-

Tronic to sell the *SpaceMatic I*. Not wanting to compete head-on with Gerber's product, they set out to create an even higher output machine that used the new knife method. Ole and the directors of Sign-Tronic had heard of a Swiss company that was interested in working with them. They visited their facilities and saw the machine had to run off of sheets and not rolls, and Ole concluded that the machine was not up to his standards. Based on their previous experiences and a growing demand for a faster system, Ole developed the first flat bed knife cutter system called the *SysteMatic*. Even before the bugs were worked out, Sign-Tronic received orders for 10 machines from the same customers who bought the *SpaceMatic I*.



Old Flatbed

The *SysteMatic* consisted of a flat bed plotter, digitizer, scanner and all the necessary computers and software. The digitizer and scanner made it possible for the first time to make automated logos and other specialized artwork.



Gerber GSP

Once again, Ole was a step ahead of his time and Sign-Tronic grew and prospered, as did Gerber. Throughout the 1980's the products of each company were improved upon, and many new American competitors came on to the scene to challenge Gerber, including HTD, Anagraph and Letteron. As with many industries, some of their new competitors failed and some survived.

Since the traffic market had been largely ignored by every other company in the business, TAPCO decided in 1985 to try and create its own Traffic Sign making software. The first commercially successful product was sold by TAPCO in cooperation with HTD, and the software was run on an XT computer. Many generations later TAPCO is still heavily involved in the traffic sign-making business, both in sign manufacturing and offering the latest in sign-making soft-



Printer-Cutter Flatbed

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Today we can put the entire knowledge of all mankind on a small chip and, with mankind doubling its knowledge doubling every 20 years, anything seems possible in the future. A new generation of color printers capable of printing onto reflective sheeting is around the corner, and when the durability of the finished product is sufficiently lengthened it may render screen printing and die cutting obsolete. However, the advent of today's amazing computerized sign-making systems and development of future products still ride on the coat-tails of the early inventors.

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