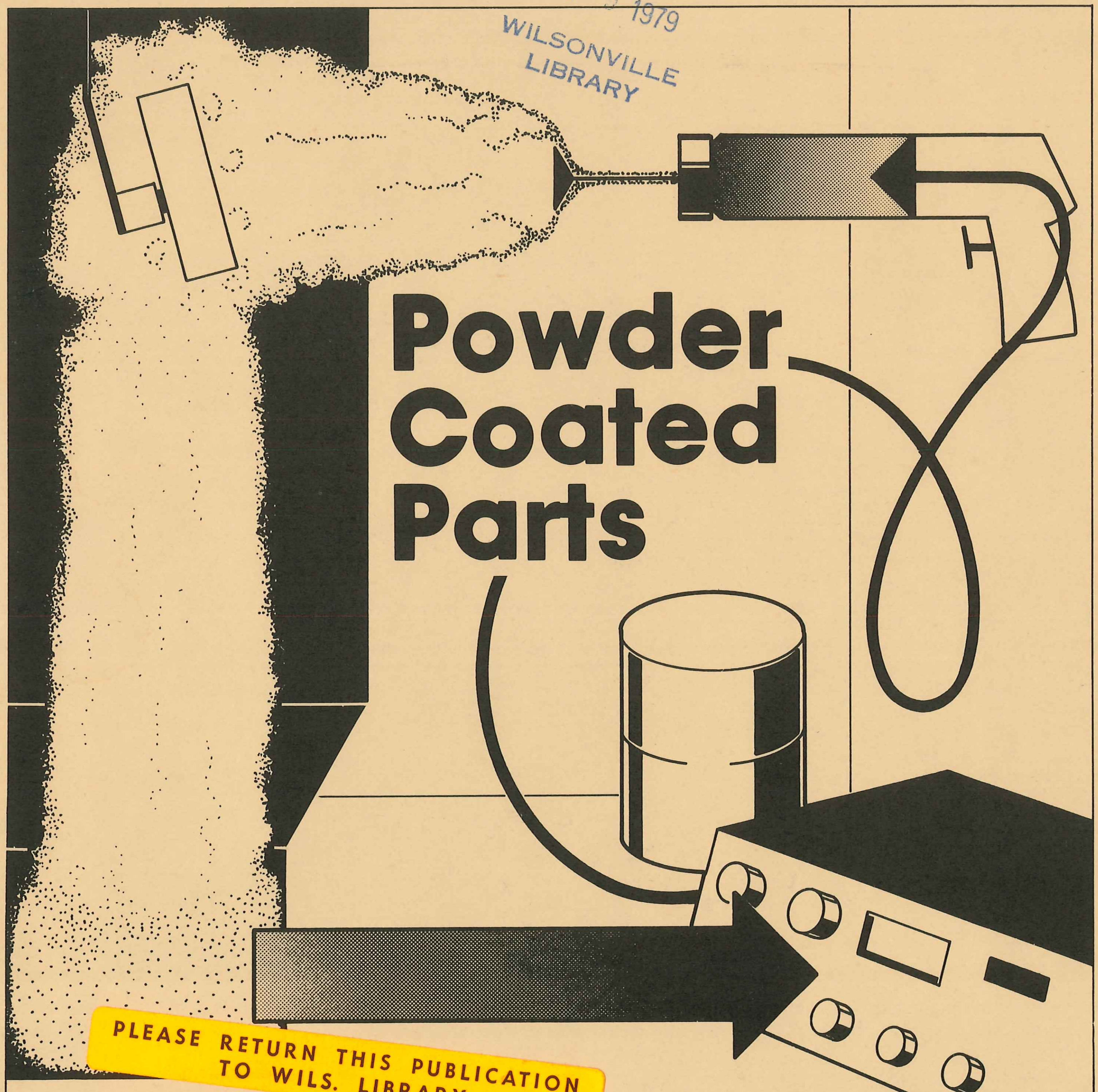
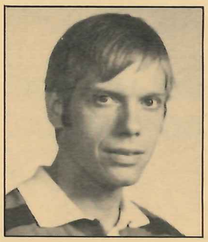
ENGINEERING NEWS

JULY 1979

COMPANY CONFIDENTIAL



POWDER COATING FOR TEK PRODUCTS?



Chuck Bauer, Electrochemical Development Engineering, ext. 5468 (Beaverton).

As part of its charter to provide Tektronix with state-of-the-art components and processes using electrochemical technology, Electrochemical Development Engineering examined powder coating for Tektronix applications such as feature-strips on castings, rear panels, instrument body casings, and some mechanical applications.

INTRODUCTION

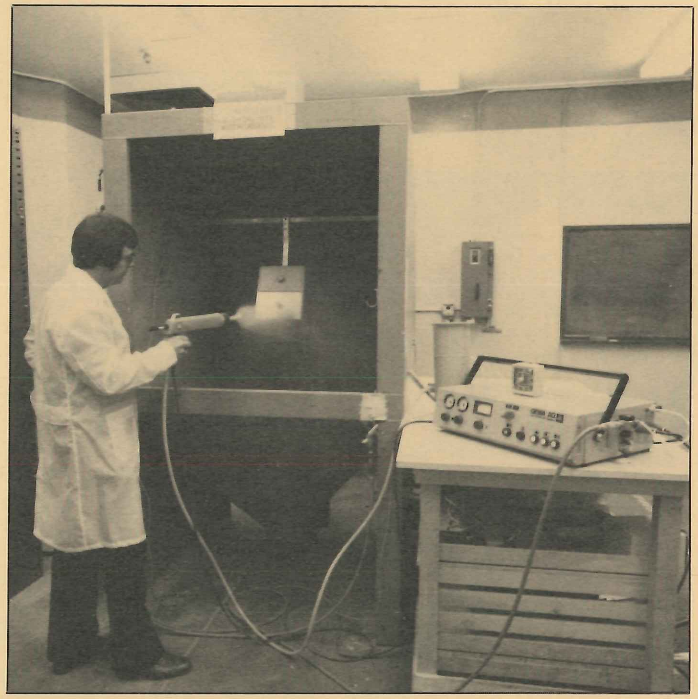
Powder coating is the application of a finely-pulverized plastic over the surface of an object. The applied powder is not a paint or coating until the coated object emerges from an oven in which the temperature is high enough to cause the powder to melt and then coalesce into a continuous layer.

Both thermoplastic and thermosetting power coatings are available. Using additives, fillers, modifiers, and resin-blending, manufacturers can custom-formulate powder coatings to provide the balance of properties that meet environmental, mechanical, and decorative requirements.

ADVANTAGES AND BENEFITS

Powder coatings have many attributes which benefit both the product finisher and the end user.

For the end user, powder coatings offer: corrosion-protection; resistance to weathering, abrasion, and chemical attack; toughness; impact resistance; flexibility; temperature stability; excellent adhesion requiring little



Top, **Paul Messmer (Electrochemical Development Engineering powder-coating technician) powder-sprays a sample in a powder-coating booth. The electrostatic gun he is holding is powered by the unit at the right of the photo.** ***Bottom,*** **Paul removes the coating mask before placing the sample in the curing oven.**

pretreatment; and electrical insulation. In addition, the appropriate powder coating blends can provide precise color match, gloss, and texture with excellent batch-to-batch uniformity. Powder coatings also show consistent hiding power, edge coverage, and film coating thickness.

For the product finisher, powder coatings eliminate the need for material mixing, solvent additives, and viscosity control. Since powder coating uses no solvents, fire risks are substantially less than with conventional finishing systems; solvent health-hazards are eliminated, and expensive air pollution control can be avoided. The finishers can also recycle excess powder (overspray) and thus conserve energy.

Electrostatically applying powder limits excessive film thickness on a part to be coated (the electrostatic field strength determines how much powder adheres). Powder coating is usually a one-coat operation requiring no primers. The finisher can produce heavy films without danger of runs or sags. Finally, work-area cleanup requires only compressed air and vacuum cleaners.

CONSTRAINTS AND DISADVANTAGES

The greatest constraint in applying powder coatings is the intricate masking required. To attain smooth well-defined edges on a masked area, the powder spray operator should remove the mask prior to the curing cycle (figure 1 overviews the coating process). In some cases, removing the mask is very difficult, if not impossible.

The product finisher must solve three powder-coating problems: explosion hazards; inhalation danger; and expensive, time-consuming color-change operations. The explosion hazard can be eliminated by using sensing devices which automatically turn off the powder supply before the powder-to-air ratio in the spray booth attains the explosive level. Using inexpensive air-filtration masks for

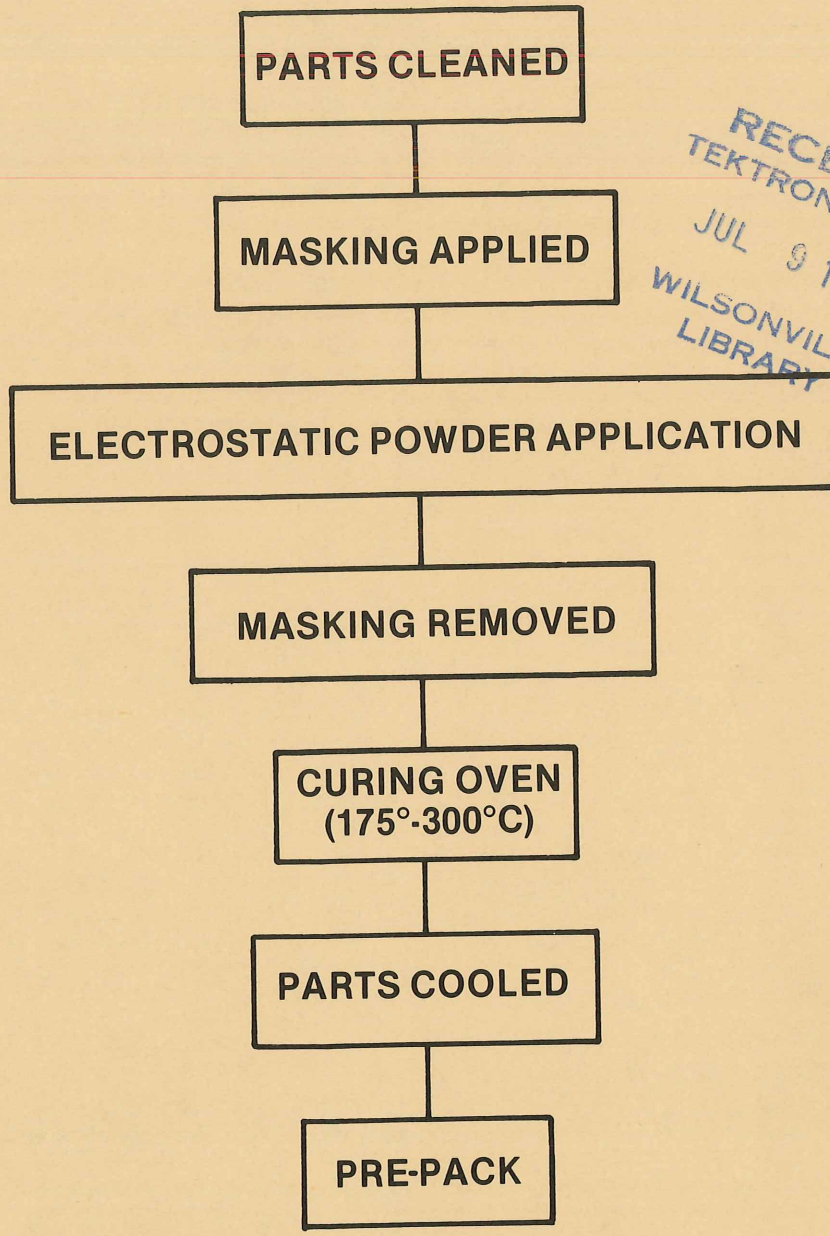


Figure 1. An overview of the powder-coating process.

all powder-area workers eliminates the inhalation danger. New system designs are making color-changing operations faster and less expensive.

OPTIONS

Both thermoplastic and thermosetting powder-coating resins are available. Thermoplastic powders include polyethylenes, polypropylenes, nylons, polyvinyl chloride, and some thermoplastic polyesters. These materials provide optimum weatherability, impact resistance, and chemical resistance, but require higher curing temperatures than thermosetting powders require and may involve some adhesion problems.

Thermosetting powders include epoxies, polyesters, epoxy-polyester blends, urethanes, and acrylics. Thermosetting powders generally provide optimum abrasion resistance, hardness, electrical isolation, and thermal-shock resistance; show excellent adhesion; and can be cured at temperatures as low as 175 degrees Centigrade.

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APPLICATIONS

Consumer goods manufacturers use powder coatings on major appliances, tools, furniture, and hardware fixtures. Industrial applications include pipelines, business machines, farm equipment, transformers, and product handling machinery.

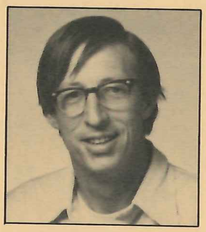
For most applications, epoxy powder coatings are the best choice. However, polyesters are used more in outdoor environments to maintain long-term surface appearances.

AVAILABILITY

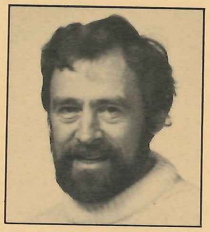
At Tektronix, we have one electrostatic gun and a manual powder-application booth. This booth is available for coating any parts for testing and appraisal of powder coatings. Since the *electrostatic* powder coating technique is the only one available, the parts should be electrically conductive, although this requirement may be avoidable with special techniques. Most powders available at Tektronix are epoxy-based systems, except for several polyester and nylon powders. □

PATENT RECEIVED No. 4,110,659

PHOSPHOR MIXTURE INCREASES CRT TARGET LIFE



Bill Mason, Bistable Storage CRT Engineering, ext. 5378 (Beaverton).



Jerry McTeague, Bistable Storage CRT Engineering, ext. 5378 (Beaverton).

This patent is for the use of an admixture of yttrium oxide, or yttrium oxysulfide, activated by a rare-earth element, and P1 phosphor, in cathode ray tube bistable storage targets. Rare-earth phosphors lengthen the useful life of crt targets, but they do complicate the process of applying materials to the crt screen.

Replacing no more than 20% of the P1 with rare earth avoids processing complications while doubling the useful life of 4014 Computer Display Terminal crt's.

This mixture is an improvement on the phosphor part of the target discussed in the June 1979 **Engineering News** Patent Received article entitled "Cobalt Collector Target Fabrication Produces High Yields."

The inventors of that process were Jerry McTeague and Ken Stinger (Electronic Technology Applications). □

EAC OPENINGS AVAILABLE

Interested in participating in the Engineering Activities Council?

Bill Walker, executive vice president, has announced that applications are now being accepted for an 18-month rotation on the Council. (Bill originally chartered the Council three years ago.)

The basic purpose of the Council is to provide engineers with a forum in which they can present, to multiple levels of management, what engineers themselves consider to be important in their areas of technology.

If you are an engineer interested in participating in the EAC and would like to apply for one of the openings, call Bill on ext. 7008 or drop him a note at d.s. 50-475. □

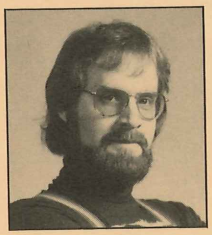
NEW GPIB CODES AND FORMATS STANDARD

In July, Technical Standards released a new Tektronix GPIB Codes and Formats Standard. This is a revision and extension of the previous GPIB standard. The formal definition of the GPIB communications protocol is the same, but more clearly presented. Syntax diagrams now supplement the difficult-to-read BNF notation. The main change is the addition of Appendix A, a collection of down-to-earth, practical recommendations on how to design instruments and controllers based on the Tektronix Codes and Formats Standard.

The goal of Appendix A is to make Tektronix instruments easy to use with existing controllers and to provide bus communications features that allow the instrument to be used in systems. Many of the Standard's recommendations are a result of Tek engineers' experience with designing and using our own GPIB instruments.

For a copy of the Tektronix Codes and Formats Standard 062-1780-01 REV.C, call ext. 5577. For further information contact Maris Graube, Corporate Interface Engineer, on ext. 6234. □

PRODUCING SUCCESSFUL SLIDE SHOWS



Richard M. Anderson, Technical Marketing Communications, ext. 5173 (Beaverton).

In one form or another, scientists and engineers need to communicate the results of their work to their managers and to their peers inside and outside Tektronix.

If you are preparing a slide show for an audience outside Tektronix, Technical Marketing Communications (TMC) can provide the skills for designing and producing the slides, as well as help you develop the skills for effectively presenting your slide show.

THE SLIDE SHOW PROCESS

Figure 1 shows how the process of producing a slide show is very similar to Tek's New Product Introduction (NPI) process.

In the concept phase, you define the purpose of the presentation: *What are the main points I want to tell my audience?*. Next, define the structure of the slide show. For example, a slide show presenting a new display technology might begin with an introduction (a preview of the show and perhaps a discussion of terminology). Then, you might describe the new display technology itself, the manufacturing process, and, third, compare the new technology to other technologies. The last part of the presentation might be either a summary (a review) or a conclusion (*What concepts do I want the audience to extrapolate from the information I've presented?*).

In the design phase, roughly sketch each slide (whether the content be words or graphics) and then contact a TMC editor who will suggest the most efficient and effective ways to present your main points.

In the evaluation and verification phase, the editor makes overhead transparencies of the slide sketches. In the first of several "walkthroughs," you can use the overheads to simulate the final slides. A walkthrough answers two questions.

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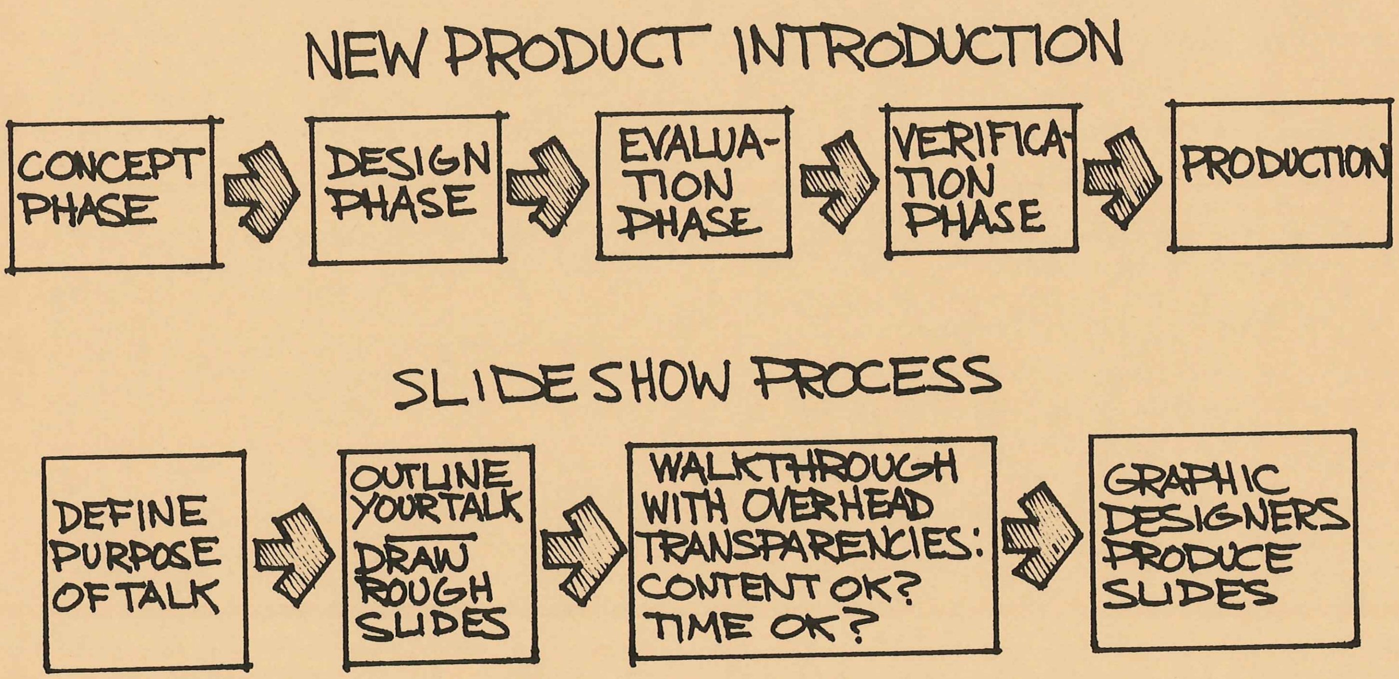


Figure 1. The process of producing a slide show is very similar to Tek's New Product Introduction process.

Continued from page 5

Is the slide show too long? (Most conference sponsors restrict presentations to about 20 minutes plus time for questions at the end.) If you are submitting a written paper as well as a slide show, remember that you can't tell the whole story in your talk. Your goal is to communicate the most important concepts in a way interesting enough to encourage your audience to read your paper for details.

Do the slides support the talk? The slides *aid* the speaker, but are not the presentation itself. With few exceptions, slides shouldn't show more than you say, but should (1) show key concepts, or (2) show what you can't conveniently say (equations, graphs, and circuit diagrams are examples).

After the first walkthrough, you and the slide editor will correct the slide sketches and the editor will give the sketches to TMC's graphic design group. These graphic designers select type faces and colors; place type; draw graphs, charts, diagrams, and illustrations; and arrange for the photography department to take photos.

Before photographing the artwork, the designers will show you copies for technical review to catch errors such as typos or misinterpreted technical symbols.

The designers make two sets of slides, one for you and one for TMC's indexed slide file.

HOW MUCH IS ENOUGH?

Ok, let's talk about the 35mm slide medium. Slides aren't an end unto themselves, but an aid to help you communicate your ideas clearly. You provide the message; the slides support that message.

Graphic designers use several criteria to evaluate slide content. The first criterion is **clarity.**

An illustration suitable for a paper may not be suitable for a slide. Readers have the leisure to slowly and carefully examine complex illustrations in a paper. Slide-show viewers don't have that leisure. The speaker may project a slide for less than a minute and the viewer must listen to the speaker as well as examine the slide.

Usually, a slide should contain considerably less information than what you say about it. If you have a complex idea to show, break it up into several slides and step your audience through it.

In slides showing equations, charts, graphs, and diagrams, omit notes and explanations. If notes and explanations are essential, say them rather than clutter up the slide.

A slide must be clearly visible to every member of your audience, including the people in the back row. Bold type and bold illustrations work best. Graphic designers use a rule of thumb to determine the size of type and illustrations. To be legible to a viewer at a distance six times the width of the projected slide, type must be no smaller than 1/50 the height of the original artwork. For example, if a graphic designer lays type on an art board 6 inches high and 9 inches wide, the type must be at least 1/8-inch high (0.02 x 6 inches).

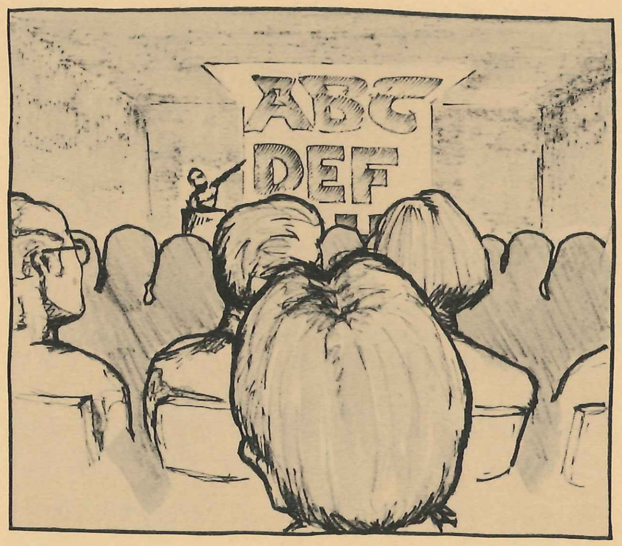


Figure 2. Vertical slides aren't visible to as many viewers as horizontal slides.

A second criterion for evaluating slide content is **simplicity.** Slides so complex they have to be studied for more than 60 seconds can be visually fatiguing. If your message is so complex that the audience must study it, but you can't break it up, provide handouts which the audience can review later.

THE SLIDE FORMAT

Wherever possible, graphic designers use a horizontal slide format. A proportion of 3 units wide to 2 units high is standard because it is pleasing to look at and it provides maximum viewing area to the entire audience.

If you have attended slide shows in the Beaverton or Wilsonville auditoriums, you know the problems associated with using a vertical slide format. People sitting in the first row block the view of the bottom of the slide for the people in the back rows, and the top of the slide spreads across the ceiling. Figure 2 illustrates this problem.

TYPES OF SLIDES

Using content as a criterion, there are two types of slides: word slides and graphic slides. Two kinds of slide film are available: Kodalith (black and white) and Ektachrome (color film). A designer may use either film with either type of slide, but each film type offers drawbacks as well as benefits.

Consider word slides first. As figure 3 illustrates, a word slide may have either a color background with words in white (or in a second color) or a black background with words in one or more colors.

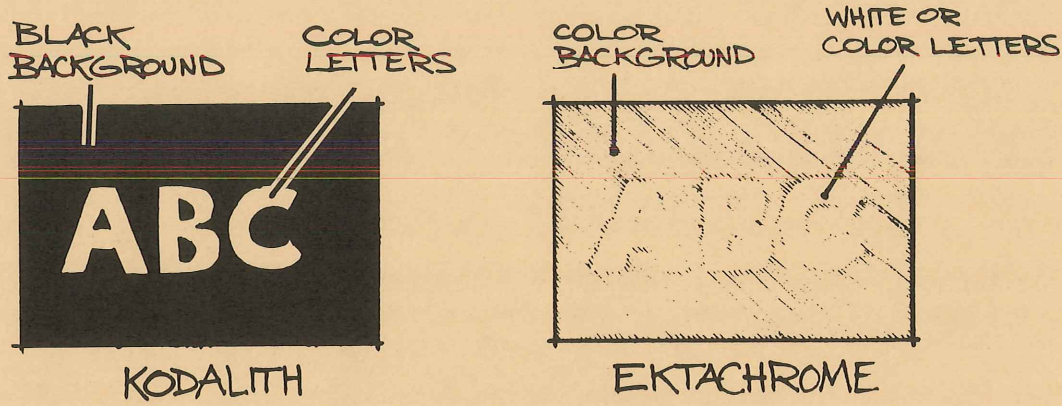


Figure 3. Ektachrome film offers a well-defined color background and easy integration with pictorial slides. Kodalith film offers white or color letters on a black background, which enables the speaker to project the slide on a wall even in a brightly-lit room.

Color-background slides require Ektachrome film. A color background defines the full area of the projected slide and integrates well with pictorial slides (such as color photos of work areas or equipment).

For projection, Ektachrome requires a darker room than Kodalith slides. A second drawback is that color-background Ektachrome slides require an intermediate negative which TMC must send outside Tektronix for processing — an expensive three-day process (a faster turnaround is possible for a 100% rush-charge).

For a variety of reasons, TMC uses Kodalith for most slides. First, the words float on a darkened screen, allowing the speaker to project the slide on a wall, even in a brightly-lit room. Second, TMC can process Kodalith film in-house the same day the designer photographs the original art, providing lower processing costs and shorter turnaround.

Consider graphic slides next. TMC uses Ektachrome to photograph complex charts and graphs that require color for contrast. Because there is no intermediate negative (to introduce white letters), TMC can process these Ektachrome slides in-house.

Kodalith is satisfactory for graphic slides that don't require color for differentiation.

TURNAROUND TIME

How long does TMC require to produce a slide show? That depends on many factors: the number of slides, their complexity, the ratio of graphics to word slides, the type of film required, the accuracy of the input (last-minute changes and additions are time-consuming), and the TMC graphics group's workload.

For an average-size (20 slides), average-complexity (half word-slides, half charts and graphs) slide show, TMC requests about 25 work days: 10 work days for discussions with the slide editor and for one or more walkthroughs, and 15 work days for artwork production (specifying type, typesetting, illustrating, and layout), artwork review, photography, and mounting.

Figure 4 summarizes the slide show process and shows times required for each step.□

TIMETABLE

20 35MM SLIDES.

WEEK 1:
Review presentation concept with slide editor. Make detailed outline or first draft of presentation.

WEEK 2:
Slide input to slide editor. Each slide should be represented by a single sheet of paper (slides are easier to track this way). Slides may include text, diagrams, charts, or photos. For photos, indicate the subject. This input should be the final slide content and final outline.

WEEK 3:
The slide editor makes overheads of the rough draft slides and schedules the first walkthrough with the speaker. This first walkthrough tests the slides (Do the slides show enough? Too much? Is the presentation too long?).

WEEK 4:
Slide editor gives tested rough draft slides to Technical Marketing Communications's Graphics Group for design and production. Allow 15 work days. In the following weeks (5 and 6) the author will receive copies of the artwork for review. This gives the author a chance to correct any misinterpretations.

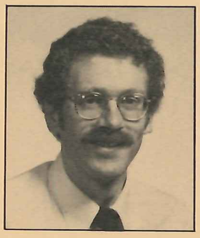
WEEK 5:
Slide production.

WEEK 6:
Production. Final review of finished artwork. Slides in speaker's hands at the end of this week.

Figure 4. Ideally, a speaker should begin defining a slide show six weeks before presenting it.

PATENT RECEIVED No. 4,135,160

PULSE-WIDTH NORMALIZER



Larry Gagliani, Microprocessor Software Support, ext. 6653 (Beaverton).

The pulse-width normalizer circuit shown here stretches narrow pulses to a wider, minimum pulse width without affecting the width of pulses already exceeding the minimum target width.

Two conditions restrict the minimum width of the pulses that the normalizer will accept. (1) The pulses must be wide enough to trigger the normalizer circuit's logic family. (2) The pulses must be separated by more time than the target (normalized) pulse width (to prevent countdown errors).

This pulse-width normalizer circuit enables the 851 Digital Tester to respond to narrow, but relatively infrequent, input signals. Only the 851 front-end and normalizer need the high-speed, high-power, and high-cost logic family required for processing such fast input signals.

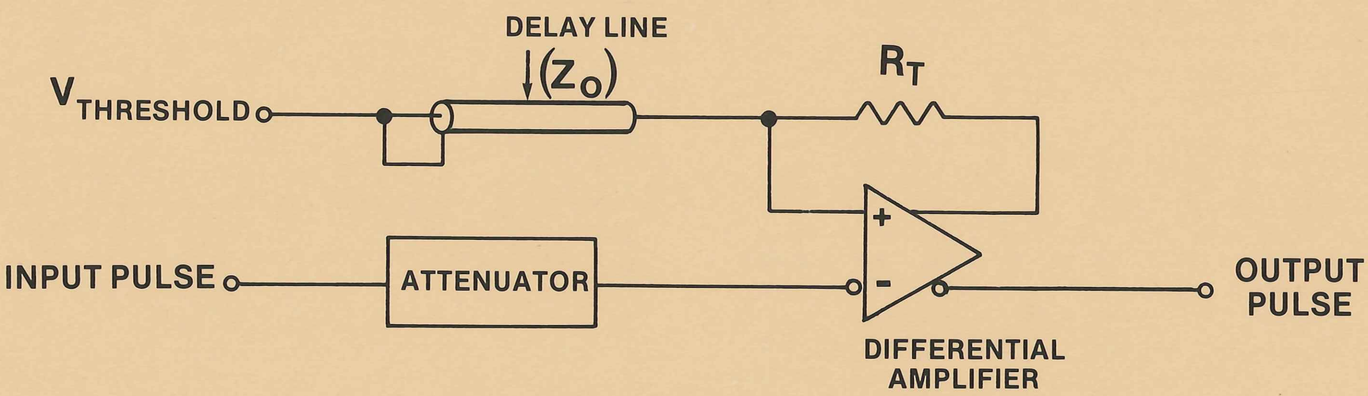
If the entire 851 had been designed with the higher-speed logic family required to detect extremely narrow input pulses, parts costs and power requirements would have been much higher than they are using the normalizer circuit.

The pulse-width normalizer uses a shorted delay line to set the normalized pulse width. Conventional pulse-width normalizers have two drawbacks. (1) They use temperature-sensitive RC and LR timing networks. (2) They have exponentially-decaying energy storage tail which produces a memory of previous inputs. A delay-line approach does not have an exponential energy-storage tail and therefore has no memory of previous inputs. Because the circuit uses only one delay line, circuit response is symmetrical (without adjustment) for both positive and negative input pulses.

The pulse normalizer consists of an input attenuator, a differential amplifier, a shorted delay line, and input and output buffers. A voltage divider biases the differential amplifier's noninverting input at the midpoint of the input logic swing through the shorted delay line. An input pulse transition changes the differential amplifier's output state and drives the delay line through series termination resistor R_T equal to the delay line's characteristic impedance Z_O.

While the pulse propagates down the delay line, the differential amplifier's noninverting input sees a voltage large enough to swamp out any subsequent change in the input pulse state because of the attenuation in the input pulse path.

After the pulse propagates down the delay line and reflects back, the pulse termination resistor R_T absorbs the reflected pulse and the noninverting differential amplifier's noninverting input returns to the logic threshold, ready for another transition of the input without any memory of prior inputs. □



THE TEKTRONIX PATENT PROCESS

As a follow-up to the discussion of engineering notebooks in the June 1979 Engineering News, the Patents and Licensing Department has answered the following commonly-asked questions.

Who is responsible for notifying the Patent Department about new inventions?

You, the inventor. Fill out an Invention Disclosure form, have it witnessed by two persons who understand the invention, then take or send the form to the Patents and Licensing group at D.S. 50-419. To obtain Invention Disclosure forms, call ext. 5385.

What happens then?

The invention disclosure is reviewed by the Patent Committee at one of their periodic meetings. The Committee is composed of various engineering managers and members of the Patent Department.

If the Committee decides that Tektronix should try to obtain a patent on the invention, a "novelty" (patentability) search is made in the U.S. Patent and Trademark Office. This is done to determine if someone already has a patent on the same or a very similar invention. If the search results look good, a patent application is prepared and filed by the Patent Department.

What if the Patent Committee decides not to seek patent protection on an invention?

Some inventions are more valuable to Tektronix as trade secrets and are classified as such by the Committee. Chemical processes or machines often fall into this category. The Patent Committee may decide to put a disclosure on "hold" and review it again later. This may happen if an invention is not going to be used in a product in the immediate future but may be used later on. If the Patent Committee decides Tektronix has no interest in an invention, the inventor may then request that it be released to him (or her) to pursue as he or she wishes. Tektronix retains "shop rights" in released inventions. This gives the company the right to make and use the invention on a royalty basis.

Could you be more specific about the kinds of things Tektronix patents?

The majority of Tektronix patents are on electronic circuits and instrument components, such as crt's, switches, attenuators, and similar devices.

What is the life of a patent?

United States patents last for 17 years from their issue date, except for ornamental design patents, which have a life of 3-1/2, 7 or 14 years. Foreign patents vary, but typically last for 20 years from the application date.

How long does it take to obtain a U.S. patent?

It varies greatly, but two to three years is typical.

How many patents does Tektronix have?

At present we have more than 400 U.S. patents and about 600 foreign patents. A large number of applications are pending worldwide.

If two people, working independently, come up with the same invention and both file patent applications, who gets the patent?

In the United States, the first inventor is entitled to the patent, even if the first inventor was not the first one to file the application. *This makes routine, careful use of engineering notebooks vitally important.* If properly witnessed, these notebooks are considered the best evidence of when an invention was made.

In foreign countries, the first one to apply obtains the patent.

If I want to write an article or present a paper on a potentially patentable idea, must I file a disclosure first?

Yes - to preserve our rights in foreign countries, we need to have a patent application on file before the invention is publicly disclosed.

For further information, call John LaRue, ext. 5266; John Winkelman, ext. 7675; Tom Noe, ext. 5290; Tom Spence, ext. 7994; or Bill Haffner, ext. 5403.

GPIB CONTROL WITH SPS BASIC

The June 1979 issue of **Software News** carried "GPIB Control Using Tek SPS Basic," a four-page article by Roberta Taussig (Signal Processing Systems/TM 500 Software Development).

The article discusses data transmission, SPS BASIC commands that handle GPIB data, bus control, and interrupt- and error-handling.

For a copy of the article, call Technical Marketing Communications on ext. 6795. □

FLUKE 5101A CALIBRATION PROGRAM FILE

The Electrical Standards Lab maintains a master file of programs used on 5101A cassettes. If you write a 5101A calibration tape, please let us have it long enough to copy. We can then furnish you another if yours is lost or destroyed. In addition, we can furnish programmed tapes to others, saving them from developing their own and helping to standardize calibrations throughout Tektronix.

For more information, call Gene Brox at ext. 5540 or drop by d.s. 58-188. □

A View Point ......
STANDARDS VS. CREATIVITY

John David, Digital Products Coordination, ext. 5285 (Beaverton).

To many people, the word "standards" conjures up thoughts of authoritarian tyranny. To such individuals, standards are the opposite of freedom, thwart creativity, and are to be avoided at every opportunity. Yet, in industry, standards are one important factor in advancing technology and increasing productivity.

As an example of how industry relies on standards, consider an engineering decision to use a nut and bolt as a means of fastening two metal pieces together. Having decided to use a nut-and-bolt approach, the question of what size to use comes next. A number 8-32 x 1/2-inch long with a Phillips head seems good for the bolt. Or, maybe it should be 10-32? The nut should be a hex nut and it should be 3/32-inch on each side. There are plenty of decisions to make, but notice how many standards are implied in these alternatives:

- standard bold diameters. (#8, #10)
- standard units of measure (inches).
- standard threads-per-inch (32 tpi is one of several standard tpi commonly available).
- standard nut and bolt head types (Phillips and hex are only two).

Without such standards, everyone would have to machine nuts and bolts from scratch. To do this, businesses would need to build a variety of complex machinery to accomodate the different units of measure and different dimensions. Standards enable businesses to achieve manufacturing economies so that nuts and bolts, for example, can be built in large volume by specialized companies and can be used by many different customers. That's far better than every company having to invent and build its own hardware.

EFFECT ON CREATIVITY

How does this affect creativity? Do standards stifle creativity? In a certain sense, they do, but creativity is not the highest value in many areas. Continuing the example, our economy no longer needs creativity in nut and bolt design. Having readily-available suppliers and customers for standard nut and bolt sizes is far more important.

Standards should be adopted when more is to be gained by channeling creative efforts elsewhere. In fact, creativity becomes a *disvalue* when it consists of continually revising and changing what is better left alone. Unfocused "creativity" is one of the worst enemies of progress.

Where *does* creativity belong? Should we forever standardize on nuts and bolts as a means of fastening metal pieces together? What about rivets, welding, or new types of glue? In electron devices manufacturing, having standard types of vacuum tubes created tremendous benefits for the electronics industry and its customers. But standardizing on vacuum tubes forever would have kept the electronics industry in the dark ages. The role of creativity, if it is to be *productive*, must be to develop new technologies which offer real long-term benefits over existing technology. Of course, there must always be the *freedom* to develop and adopt new solutions to achieve these benefits. But without standards, creativity and change come cheap. Chaos reigns.

Standards define and make possible the widespread adoption of a given technology or way of doing something, creating economic benefits which make change itself expensive. The cost of change thus presents a hurdle for the adoption of new technology and new standards. This hurdle constrains us to advance by quantum leaps rather than immersing ourselves in continuous revision.

THE ISSUE

The issue of "standards vs. creativity" is really: "Have we *sufficiently optimized* the solution to a problem such that there is more to be gained (including the cost of change) from the solution's widespread adoption than there is to be gained from continuing the status quo?" To propose a standard for something is to answer "yes" to this question.

A standard needn't be the *best* solution. In fact, the best solution is, almost by definition, a *non*standard solution because it is unique. It is usually also the most expensive!

FRAMEWORK

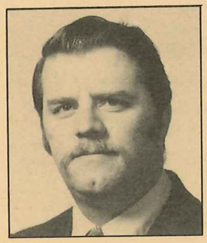
All of us who are directly affected by standards should think of them as a framework for useful creativity. As designers and manufacturers, if we never develop standards, then we solve the same problems over and over again and productivity stands still. Further, without standardization, each solution is unique and common solutions are not found: the benefits of adopting a common solution to a common problem (economies of scale and specialization) are not realized.

To be sure, standards can be proposed in haste and can be poorly thought out, but the risk involved in *not* developing standards is far greater: creativity never has its sights raised to deal with the truly challenging, and is thus wasted. ☐

PATENT RECEIVED No. 4,130,775

Increasing The Stored Writing Rate of Charge-Image Charge-Transfer CRT's

Steve Blazo, Materials and Process Development, ext. 5319 (Beaverton).



Pete Perkins, Product Safety Engineering, but formerly with Storage CRT Engineering, ext. 7374 (Beaverton).

The world's fastest stored-writing rate (2500 centimeters/microsecond), found in the Tektronix 7834 Fast Storage Oscilloscope, is achieved primarily by a number of design innovations used in the recently patented T7830 cathode-ray tube.

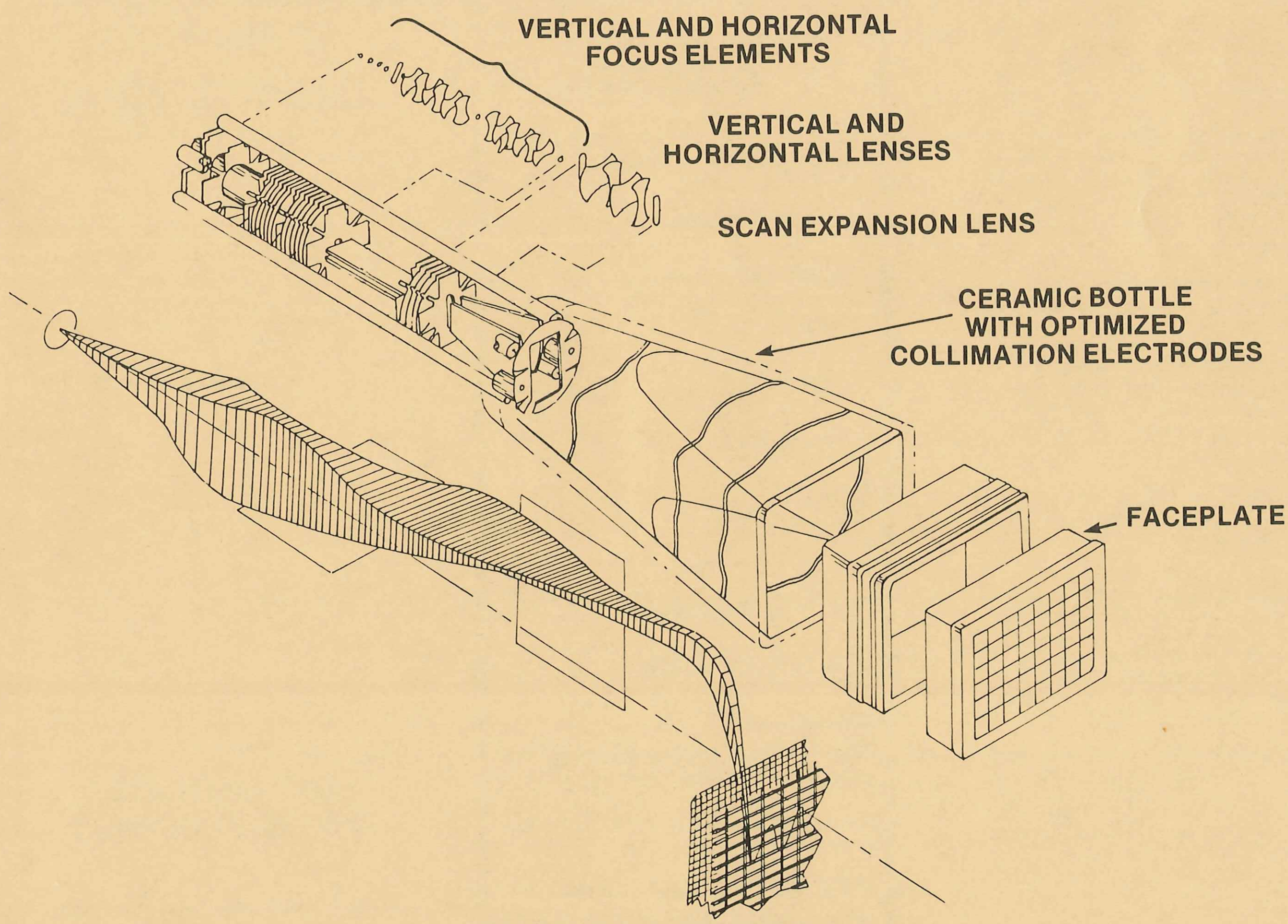
The T7830 is an improved version of the Charge-Image, Charge-Transfer crt, for which Tektronix holds the basic patents.

To achieve the T7830's record performance, Storage CRT Engineering had to (1) increase vertical sensitivity, (2) reduce spot size, and (3) collimate the flood beam to increase writing-speed performance.

The most efficient way of increasing vertical sensitivity without reducing writing-beam energy or using an impractical (for storage tubes) post-deflection acceleration system, is a scan-expansion scheme. (See "Meshless Scan-expansion Schemes", Bill Tomison, **Forum Report 5**, pages 4-8.) This scheme places a quadrapole electrostatic lens between the vertical and horizontal deflection plates.

The lens acts like a divergent lens, in that it enhances the beam deflection produced by the vertical deflection plates. In this way, relatively small deflection voltages can impose large screen deflections on a high-energy beam. Because this technique requires independent beam focusing in the X and Y axes, two additional quadrapole lenses must be placed between the electron gun and the vertical deflection system.

Continued on page 12



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After deflection, the sharply focused beam strikes the storage target. Because this improved design concentrates the beam energy in a smaller target area than previous designs, a faster writing rate can be achieved.

All storage tubes require auxiliary electron guns that "flood" the storage target in much the same way a slide projector illuminates a viewing screen. These flood guns, however, must be mounted to the side of the tube axis to maintain geometric symmetry of the writing beam deflection. Low energy electrons from these flood guns thus strike or pass through the target at an angle, rather than perpendicular to it, making it difficult to achieve a uniform distribution of electrons over the entire target area. Lack of a uniform distribution, in turn, limits the stored writing rate.

To overcome this limitation, Storage CRT Engineering developed an analytical technique which allows the mapping of electron trajectories through an electrical field that meets the end conditions corresponding to the operating storage system. An optimization program (PROSE) was used to find the best operating condition by yielding the constants in the partial differential equations describing individual electron trajectories and minimizing their landing error at the target surface.

The data thus acquired determined the configurations of collimation electrodes placed on the inner surface of the tube envelope between the horizontal deflection plates and the storage target. The electrodes alter the flood beam electron trajectories so that they strike or pass through the target perpendicular to its surface. This provision reduces the "differential cutoff" (a measure of distribution uniformity) by more than 20% over previous designs, with a corresponding increase in stored writing rate. □

PLASTICS TOOL ENGINEERING GROUP

The Plastics Tooling Engineers and the NPI Process Coordinators have remained in Beaverton while the rest of the Plastics organization has moved to Vancouver. Having a group in Beaverton facilitates communication with mechanical design engineers during product development and introduction. This communication includes part-design consultation, material selection, tooling, and part cost estimates. The end result should be components which satisfy both engineering design and manufacturing process requirements.

The group is located in Mechanical Components (Building 16) and can be reached by calling extension 5380.

For more information, call Ric Meyer, Plastics Process Support Manager, ext. 7211. □

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