Using the ESDA to Visualize Typewriter Indented Markings

Jerry L. Brown and Gary Licht

Questioned Document Examiners, Iowa Division of Criminal Investigation Laboratory, Wallace State Office Building, Des Moines, Iowa 50319-0041

Introduction

Forensic Document Examiners look at papers that may contain indented typed impressions. Normally, these impressions can be seen during the visual examination of the questioned document. One way to process this type of document is to use the Electrostatic Detection Apparatus (ESDA), Electrostatic Vacuum Box, or Indentation Materializer. The ESDA examination results in a darkened sheet of imaging film, but no developed indented impressions of the typed material.

Methods and Materials

A technique was developed to visualize indented typed text employing the ESDA. A document containing indented typed text is processed on the ESDA using *only* ESDA toner or photocopy toner, but no glass beads. A practical method was needed for removing excess toner surrounding the impressions, while leaving toner in the impressions. The basic set-up for this technique is shown in Figure 1.

Two modifications were made to the standard ESDA technique. First, instead of cascading or using the cloud chamber to pread the toner on the mylar film, a spreader is used to physically move the toner across the imaging film. Another change is to use an electrostatic copy machine toner rather than the toner supplied by the ESDA manufacturer, without the glass beads.

The toners used are ESDA toner and Lanier copy machine toner. The Lanier copy machine toner was obtained from the used toner container on the Lanier copy machine.

Results

The overall technique is similar to processing paper for an ESDA examination. Refer to the ESDA Operating Instructions Manual (Foster and Freeman). The indented typed impressions are made by placing two sheets of 20-pound photocopy paper into an IBM Selectric II™ set on the "C" setting for pressure. The backing sheet, the sheet behind the original, is the paper processed for the indented typed text. The paper backing is placed face down into the molded plastic humidifying unit supplied by Foster and Freeman to humidify documents to approximately 100% relative humidity. Once the paper is humidified, it is placed face up on the ESDA vacuum plate. The vacuum pump is turned on and the imaging film is secured over the backing sheet. The Corona is passed over the imaging film numerous times in the prescribed manner.

In each of the following cases the vacuum pump is turned on and a small amount of toner (no beads) is placed on the surface of the imaging film. The toner is deposited on the imaging film with a plastic spoon, as a thin line of powder across the film. Then, using the scraper of choice, the toner of choice is spread over the imaging film. The toner is spread until the latent impressed images are visualized or the text (or letters) are resolved (Figure 2). Best results were obtained some of the time when the toner was scraped, or moved, up and down the page, or sometimes across the page. Occasionally, scraping or spreading the toner at an angle across the page provided the best results. Do not use the Corona on the imaging film before spreading the toner or while the toner is still in small piles. Using the Corona before spreading the toner has a tendency to make the toner fuse or adhere to the place it is applied, making the toner difficult to spread. Using the Corona on toner after it has been spread on the imaging film can be used to advantage, as will be explained later.

The first try at spreading the toner over the surface of the imaging film was done using a flexible plastic scraper that extended across the width of the ESDA vacuum plate. The scraper was a paint edger that is normally placed against surfaces a painter would like to protect from being painted. The problem with this plastic edger was that as it is drawn across the surface of the imaging film spreading the toner, the toner would be spread unevenly. Some places would have heavy deposits of toner and other places would have just the right

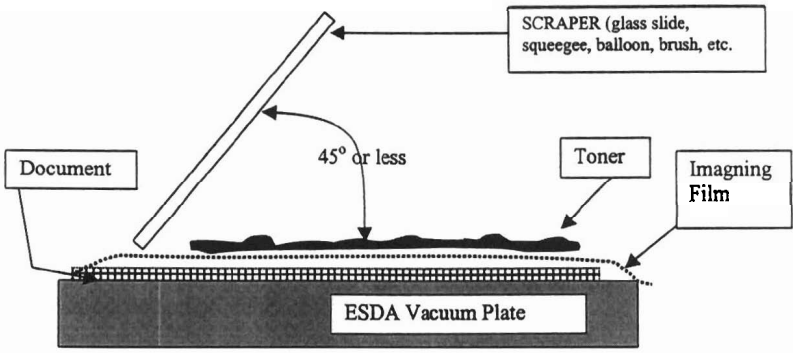

Figure 1. The technique utilizes various items as toner scrapers or spreaders: glass slides, razor blades, plastic cards (similar to credit card), balloons, brushes or any other item that can spread toner evenly across the imaging film. The toners used are ESDA toner and Lanier copy machine toner. The Lanier copy machine toner was obtained from the used toner on the Lanier copy machine.

amount. This may have been due to the flexibility of the plastic scraper or an uneven vacuum plate surface. Ultimately, we found this to be a common situation with all the ridged scrapers, glass or plastic. The typed impressions could be visualized in some areas of the imaging film but not others. The use of the large plastic scraper was abandoned.

Next, a glass microscope slide was used. The toner was placed on the imaging film as before. The glass microscope slide was held at an acute, 45° (or less) angle, to the surface of the ESDA vacuum plate and pulled across the surface of the imaging film. When using a glass or plastic scraper, it was necessary to make sure all beads are removed from the surface of the vacuum plate, document, or imaging film, as the imaging film tears easily. This method worked well sometimes and was less successful at other times. Processing the document did not give reproducible results without a lot of effort. If this technique is used, practice and patience are necessary. The Lanier toner gave better results than the ESDA toner.

Some procedures could be employed in conjunction with the techniques above which improve the developed images. First, once the best image was developed, the Corona was again passed over the imaging film. This acted to "fix" the toner in the impressions so that additional development of the impressions could be accomplished with added toner. Also, after the second application of the Corona and toner, clear (washed) glass beads could be cascaded over the impressions and this would even out the excess toner on the surface of the imaging film, providing more contrast between the developed typed images and the remainder of the imaging film surface. These techniques may be used on any of the methods mentioned in the following paragraphs. Figure 3 shows the results of this process using ESDA toner, a glass microscope slide, and cascading clean glass beads after the Corona was used to fix the typed images.

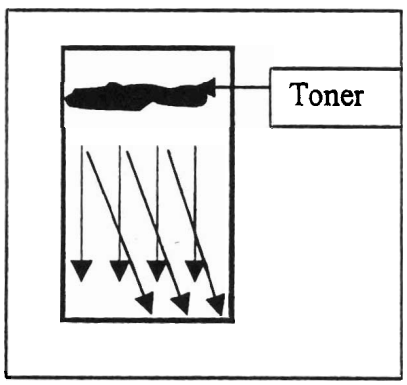

Figure 2.

An inflated balloon was also tested as scraper or spreader. This is a take-off of the old technique of visualizing indented marks using an inflated balloon and Fluorescent Lycopodium powder, or "Lumogen UV White," and a UV light (Given, 1977 and Harrison, 1966). The toner is spread over the imaging film surface using an inflated balloon substituted for the plastic scraper or glass slide. The results are that the whole surface of the imaging film can be developed at a consistent density and all of the typed impressions can be visualized. The optimal method for using the balloon was to first rub the balloon over a piece of wool. This seems to be an important step in the process. Then use the balloon to smooth out the toner on the surface of the imaging film. It was also determined that if the toner was wiped off the surface of the balloon each time the balloon was moved across the surface of the imaging film, better results were obtained. This was also an important step in this technique.

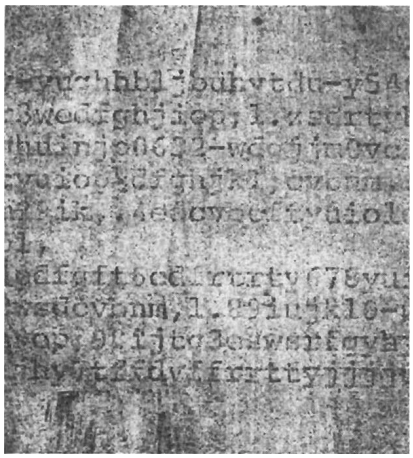

Figure 3. ESDA toner, glass scraper, clean beads.

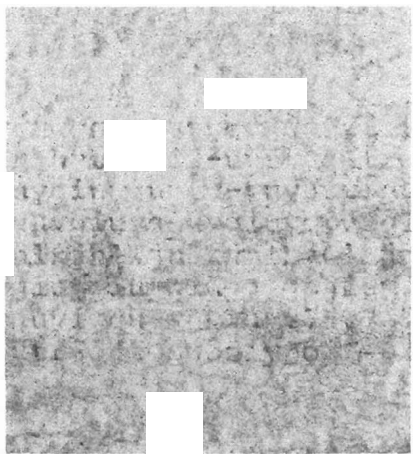

Figure 4. ESDA toner, balloon.

Both Lanier toner and ESDA toner were used. The Lanier toner gave superior results (Figure 4).

Results using the Lanier toner were good, with good contrast between the impressions and the remainder of the imaging film (Figures 5 and 6). Figure 6 shows the results after normal processing, using the Corona a second time, then using the inflated balloon a second time. It should be noted that a latex glove over a finger was also tried. Marginal results were obtained but, with practice, this method might be successful.

Another scraper or toner spreading device used was the latent print squirrel tail brush (Rusk et al., 1993). Those using the Indentation Materializer or Electrostatic Vacuum Box should be familiar with this technique (Carney, 1992). Again, the results were good. Both the ESDA toner and the Lanier toner gave satisfactory results. The results of the image obtained with the Lanier toner and brush are noted in Figure 7. The results with ESDA toner, brush and then using the Corona and brush a second time is illustrated in Figure 8.

Two types of rubber squeegees were used as toner spreaders. One has a thin, pointed surface and the other a broader, rounded surface. At first these devices did not render satisfactory results. Practice provided satisfactory results with the thin, pointed surface squeegee. The broad, rounded squeegee left numerous striations on the imaging film surface. This method yielded better results using the Lanier toner. Success of this method depends a lot on the pressure and care with which one draws the squeegee across the surface of the imaging film.

Discussion and Conclusion

A number of other methods were used with varying success. It was determined that using the glass slide, inflated balloon, latent print squirrel tail

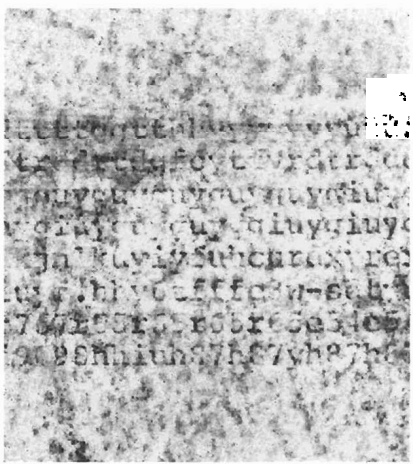

Figure 5. Lanier toner, balloon.

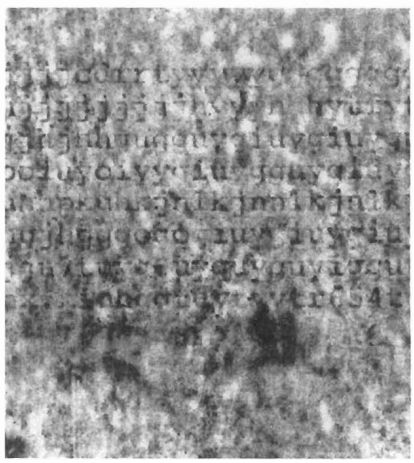

Figure 6. Lanier toner, balloon, corona again, balloon.

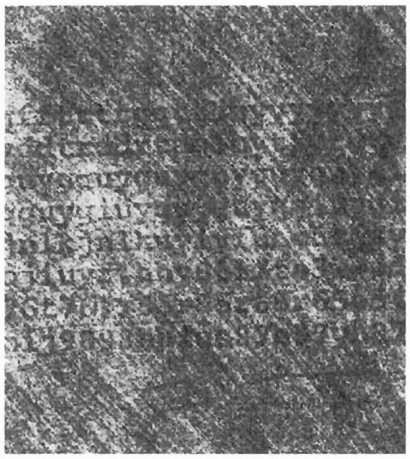

Figure 7. Lanier toner with brush.

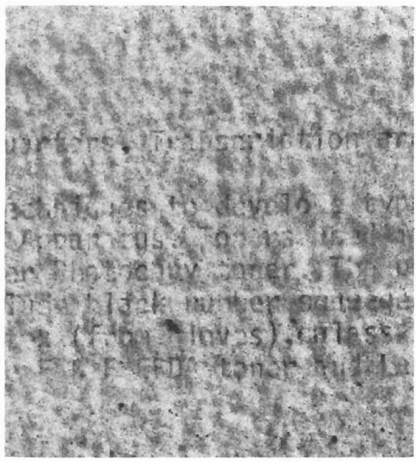

Figure 9. Lanier toner, sharp edged squeegee.

brush, and thin, pointed surface squeegee resulted in visualized typed impressions that were acceptable. Of these methods, the balloon and brush provided the most consistent results when utilized with the Lanier photocopy toner. The glass slide, when it worked, provided the greatest contrast but also involved the most work to develop acceptable images. Whichever method is used, it takes practice and skill.

It should be noted that the document used for the processing, except for the results noted in Figures 3 and 8, was processed immediately after preparation and again nine months later. After 9 months, satisfactory results were still obtained using these methods.

These methods were applied to shiny, thick magazine covers with marginal to poor results, but there would be sufficient information present on the imaging film to be able to compare to a document that contained the original writing from which the indentations might have come. Additional research should be done in this area.

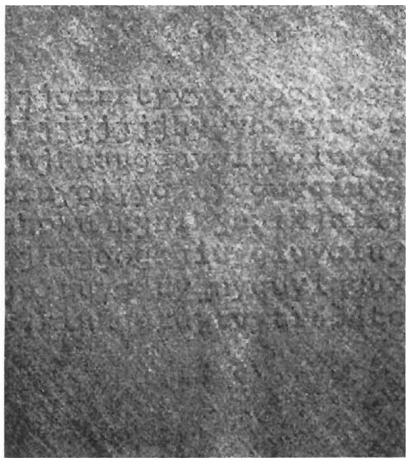

Figure 8. ESDA toner, brush, corona, ESDA toner, brush.

Additional studies that could be explored are to compare other photocopy toners; compare humidifying the document to not humidifying, and refine the scraper or spreader methods. Additional testing needs to be done utilizing a combination of methods. Good results were obtained using the brush method in combination with the squeegee. Also, one might try using the wool cloth directly on the imaging film in place of the Corona to determine if the imaging film could be pressed down into the impressions, thus giving better results. Some of these techniques may be applicable to other types of ESDA examinations.

Acknowledgments

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References

ESDA Operating Instructions Manual, Foster and Freeman Ltd., England.

Carney, B. (1992). "An Evaluation of the Kinderprint Indentation Materializer—An Electrostatic Document Device," presented at the ASQDE meeting, Milwaukee, WI, August.

Given, Bruce W. (1977). Techniques for Visualization of Indented Writing. *Identification News*, **27**: 3–8.

Harrison, Wilson R. (1966). Suspect Documents—Their Scientific Examination (Second Impression with Supplement), Sweet and Maxwell, London, pp. 559–560.

Rusk, P., Trizna, L., and Wooton, E. (1993). Indented Typewriting and the ESDA, *ASQDE Newsletter*, Winter.