Adhesive Tape Separation with Un-du®

Jon T. Stimac
Oregon State Police
Forensic Services Division, Bend

Abstract
Pressure-sensitive adhesive tapes applied to porous surfaces are commonly submitted to forensic identification laboratories for separation from their applied surface followed by latent friction ridge processing techniques. The use of a commercially available adhesive "neutralizer" (containing heptane) was tested to determine if this product could successfully and consistently remove various pressure-sensitive tapes from their applied surface, while also allowing for latent friction ridge development.

INTRODUCTION

For a friction ridge specialist, one of the most challenging surfaces on which to develop latent friction ridge detail is the adhesive surface of the many different industrial and household pressure-sensitive adhesive tapes. There are many types of pressure-sensitive tape available, including, but not limited to - utility, packaging, electrical, surgical, masking, duct and adhesive labels – with each having their own unique application, as well as differing adhesive properties.

Fundamentally, there are two types of pressure-sensitive adhesives used on the various assortments of tape – rubber-based and acrylic. Rubber-based adhesives were first patented in the United States and the traditional adhesive used for the original Scotch™ brand cellophane tape [1]. These rubber adhesives penetrate porous surfaces and after extended periods of time, become brittle, losing their adhesive quality.

First introduced in Europe, synthetic polymers are the basis for acrylic adhesives. Unlike rubber-based, these adhesives do not penetrate, or migrate through most porous surfaces. They are also known to maintain their adhesion over long periods of time, actually increasing their adhesion to its applied surface [1].

Most types of masking tape use a natural rubber and resin solvent based adhesive, while packaging tapes traditionally use synthetic rubber or acrylic adhesives. Duct tape uses a synthetic rubber adhesive, and most other tapes for the home and office use acrylic adhesives. Typically, the required adhesive is tailored to the needed application. With some exceptions, pressure-sensitive tapes that need to have high adhesion and are designed for short duration applications, use a rubber-based adhesive, while low to medium adhesion requiring the need for longevity, use acrylic adhesives [2].

FRICTION RIDGE DEVELOPMENT

For many years crystal violet (gentian violet), a dye that stains components of sebaceous friction ridge deposits producing purple ridge detail, has been a primary method for latent friction ridge development on pressure-sensitive adhesive surfaces. Recently, powder suspension solutions such as Sticky-side Powder™, have been described as a more effective method for latent friction ridge development on many adhesive surfaces [3,4], while others may promote the use of modified physical developer, SPR or even direct cyanoacrylate fuming (followed by dye staining). Despite which technique one uses, a greater initial concern may persist - what is the best method for the separation of these pressure-sensitive adhesive tapes from their applied surfaces so that effective latent processing procedures can be conducted?

The application of heat via a hair blow dryer or microwave oven has been documented [5] to be useful in the separation of adhesives. However, too much heat may cause damage by creating the adhesive to separate from the tape and remain on its attached surface; thus, damaging the hidden friction ridge detail. High temperatures can even increase some acrylic pressure-sensitive tapesí adhesion to its applied surface [1]. Freezing the adhesive tape through either a traditional freezer or commercial/medical freezing agent has also been a means of adhesive separation; however, separation is hindered by uncontrolled thawing, condensation and frosting, each being a possible detriment to separation of the adhesive. Chemical means of separation via a blend of aliphatic and halogenated hydrocarbons has been documented [6] to be effective, but may be difficult to obtain and utilize for a small laboratory or identification bureau.

A new product being touted as a commercial adhesive remover, effectively removing stickers, tapes and labels from most surfaces, might be the answer to many of the previously mentioned problems. Un-du® is a retail adhesive remover that temporarily “neutralizes the adhesive”, allowing for easy separation from its applied position. Yet unlike other adhesive removers containing organic solvents that dissolve the adhesive [7], Un-du® is reported to not dissolve the adhesive properties of most pressure-sensitive tape. The adhesive surfaces of the tape attach and preserve sebaceous secretions and epidermal skin cells [8] left by an individuals contact with the tape and if dissolved by chemicals or damaged by poor separation techniques, any possible latent impressions might easily be destroyed. Since the adhesive is not dissolved by Un-du® and is actually preserved for possible future applications, a friction ridge specialist would hope that latent friction ridge detail likely to have been left on the adhesive surface would then also be preserved for latent processing detection.

TESTING

Manufacturer instructions for using Un-du® recommend squeezing several drops of the product into the attached scraper tool and then allow the solution to find its way underneath the adhesive item. The itemís adhesive is then “neutralized” and the scraper tool can be used to remove the item. Once the item has been removed, the solution quickly evaporates from both the adhesive and its applied surface. Whenever possible for porous surfaces, writer would recommend against applying the solution directly on the adhesive item and avoid the use of the attached scraper tool, but rather, apply the needed amount of solution to the opposite side/surface of where the adhesive item is located. By allowing the solution to soak through the porous item, onto the adhesive surface of the tape or label, the two items can easily be separated without excessive application (or saturation) of the solution and prohibiting possible damage created by the scraper tool.

For experiments with Un-du®, several duplicate types of pressure-sensitive tape samples from both forms of adhesive (rubber and acrylic) were prepared and handled so that known friction ridge detail would be affixed to their adhesive surfaces. The tapes were then applied to differing porous surfaces and exposed to varying periods of adhesion (from 1-hour to several months). By applying Un-du®, each duplicate tape sample was removed from its assigned surface and then processed for latent friction ridge detail, one duplicate in crystal violet, the other with a powder suspension process.

Consistent development of latent friction ridge detail was achieved with many of the mentioned tapes (utility, masking, packaging and labels); however, just as alluded to in reports [3,4] conducted with crystal violet and/or powder suspension solutions, both the control and test samples used for each of the mentioned experiments responded according to the processing technique recommended for use on certain types of adhesive. For example, crystal violet is the initially recommended process for household utility tape. Utility tape control and test samples removed with Un-du® and processed in crystal violet, revealed greater ridge detail and minimal background distortion then the same adhesive control and test processed with a powder suspension process. In a broader scope, most acrylic adhesives appear to react favorably to crystal violet, while many rubber-based adhesives show better results with a powder suspension process.

Age appears to be a factor. As mentioned earlier, both rubber-based and acrylic adhesives have different, but obvious effects with the duration of adhesion time. Both scenarios – the drying of the rubber-based adhesive and the increased adhesion created by the acrylic adhesive – can be detrimental to possible latent friction ridge development. Within the scope of these experiments, it seems apparent that the separation and processing of these items, with the appropriate technique, should be conducted in an expedient manner.

ADDITIONAL TESTING

In an attempt to duplicate actual case submissions and with the purpose of determining if Un-du® would successfully and consistently remove pressure-sensitive adhesives from their applied surface, an additional 200 envelopes, each providing an acrylic self-adhesive postage stamp and sent via the United State Postal Service were collected for testing. It was also hoped that, once removed from their applied surface, latent friction ridge detail might be developed from their adhesive surface.

All envelopes and their adhered stamps were originally handled and posted by random individuals with no knowledge or intent of applying friction ridge impressions on the adhesive surface of the applied postage stamps. Before being processed for latent friction ridge detail, all envelopes and their stamps were postmarked within a 3-month period.

The self-adhesive stamps on all 200 envelopes were removed by using Un-du® and then processed with crystal violet. Considering the method of initially applying a self-adhesive postage stamp to an envelope - minimal friction ridge contact with the stamps adhesive - nearly twenty-five percent of these developed stamps yielded friction ridge detail. Granted, analysis of most of these stamps lacked indication of Level 1 detail (pattern characteristics), while others displayed insufficient Level 2 detail, there were still impressions developed from this process that were suitable for individualization.

CONCLUSION

Un-du® worked well when separating most rubber-based and acrylic adhesive tapes from various porous surfaces. Once the pressure-sensitive adhesive tape was removed, very little adhesive residue (especially on items having shorter adhesion periods) remained on the porous surfaces.

The results of the envelope test affirmed the ability of Un-du® to successfully and consistently remove an acrylic adhesive stamp from a porous surface, while subsequently allowing for the development of latent friction ridge detail. Through the use of either crystal violet or powder suspension solutions, many of the applied friction ridge experiments also resulted with friction ridge detail suitable for individualization.

Testing was not conducted to detect which separation technique (heat, freezing, Un-du®) yields an increased amount of quality friction ridge detail once processed with a preferred technique. Testing was only conducted to detect if Un-du® might be another effective means of adhesive separation from an applied surface.

With varying success, a limited amount of separation testing was conducted between pressure-sensitive tape and non-porous surfaces.

From the results obtained during the mentioned testing, Un-du®'s use as an additional method of adhesive tape separation, including applications within the trace evidence discipline (separation of hair/fiber from adhesives), should be explored with additional experimentation conducted.

SAFETY

Inhalation of this product's vapor may cause irritation, therefore its application should be conducted with adequate ventilation (fume/exhaust hood) [9]. Appropriate safety equipment (gloves, lab coat and eye protection) should be worn. This product is extremely flammable, avoid heat, open flame or other source of ignition [9].

ACKNOWLEDGEMENT

Very special thanks to Technician Glen Spencer and Interns Robin Joyner and Bre Seems for their assistance and additional testing of this method.

Jon T. Stimac
Technical Leader-Latent Prints
Oregon State Police
Forensic Services Division
63319 Jamison St.
Bend, OR 97701
541-388-6150
jon.stimac@state.or.us

REFERENCE:

1. Lawrence, K., "Pressure-Sensitive Adhesive United States Stamps," *Salm Reports*, Report No. 5, May 1999.

2. Germain, D., 3M™ SPD Technical Service, personal communication, September 1999.

3. Burns, D. S., "Sticky-Side Powder: The Japanese Solution," *Journal of Forensic Identification*, 44(2), 1994, pp 133-138.

4. Gray, M. L., "Sticky-Side Powder Versus Crystal Violet," *Journal of Forensic Identification*, 46(3), 1996, pp 268-272.

5. Campbell, B., "Separation of Adhesive Tapes," *Journal of Forensic Identification*, 41(2), 1991, pp 102-106.

6. Choudhry, M.Y. & Whritenour, R.D., "A New Approach to Unraveling Tangled Adhesive Tape for Potential Detection of Latent Prints and Recovery of Trace Evidence," *Journal of Forensic Science*, 35, 1990, pp 1373-1383.

7. Lee, H.C. & Gaensslen, R.E., Editors, *Advances in Fingerprint Technology*, CRC Press, 1994, p 154.

8. Federal Bureau of Investigation, *The Science of Fingerprints*, U.S. Department of Justice, 1984, p 183.

9. Un-du® Adhesive Remover, Material Safety Data Sheet, Doumar Products, Inc., 1998.

Un-du®; Doumar Products, Inc., 12784 Perimeter Dr., Ste. B-100, Dallas, TX 75228 USA (www.un-du.com)

This paper is pending publication within The Fingerprint Society's Fingerprint Whorld and is reprinted with the permission of the author.