

The Significance of Class Characteristics of Die-Cut Footwear

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Introduction:

Footwear produced through a die-cut manufacturing process will vary from sole to sole even within a particular size of a specific model. In one study that examined 78 Adidas Kicks soles of the same size produced through a die cut process, no two soles were identical.¹ In another study that examined 100 pairs of size 10 model 1350 Locals brand flip-flops, no two soles shared identical features.² The die-cut process involves the use of a clicker press that stomps down on dies in the shape of the sole to cut the soles from sheet material. The dies are manually laid on the sheets and it is this fact that creates the variation from sole to sole.



clicker-press machine

Range of Die-Cut Footwear:

Die-cut footwear models range from inexpensive flip-flops that may cost less than three dollars (US) a pair to brand name sandals priced as much as a hundred dollars (US) a pair. Some shoes and boots also have die-cut soles. There are even boots that use discarded tire tread for their soles. While these may not necessarily be die-cut, they are cut will have some degree of variation from sole to sole.

Other Variations:

Aside from the variations that are a direct result of the die-cut process, other manufacturing variations may be present. This appears to be especially so in the less expensive die-cut footwear models. In the the study involving the hundred die-cut flip-flops, variations were found not only in the orientation of the pattern but also the physical dimensions of the pattern (see A below). The cause for this variation in physical dimensions is not known but it is possibly a result of less stringent quality control in the manufacturing of the lower cost sheet material these flip-flops are cut from. Some soles exhibit features that appear to indicate damage coming out of the molds that could potentially be individualizing (see B below). All of these features increase the amount of variation from sole to sole of a particular footwear model.

Discussion:

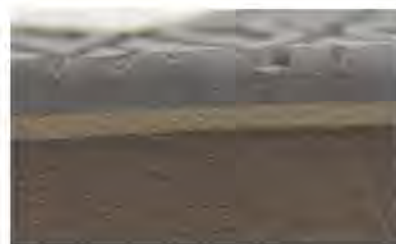
Some information on how the sole is manufactured is required to evaluate the significance of the class characteristics observed in a die-cut footwear model. The possibility of chance coincidence that the crime scene impression will correspond in design with a particular footwear sole that is die-cut from sheet material is much less likely than a crime scene impression corresponding in design to a footwear sole that is individually molded and only die-cut to final size. If the sole unit is individually molded and the die cut process only trims the sole to the appropriate size the variation will be minimal compared to soles that are cut from sheet material. When a footwear model of the inexpensive variety that is die-cut from sheet material containing much variation corresponds in design with an impression at a crime scene this is a significant association. However, this is still not a basis for an identification. In the study that involved a hundred pairs of die-cut flip-flops, there was a pair that was close to being a match, and it would be difficult to distinguish the impressions from these two soles unless they were very detailed impressions (see picture below). As with any other footwear comparison, any clear difference would be the basis for an elimination and the majority of die-cut soles would be distinguishable from each other.

Identifying a Die-Cut Sole:

One of the tell tale signs that a sole may be die-cut is that the left and right soles are not mirror images of each other (A). Striations may be visible from the grinding to smooth out the die cut and even the edges of any join (B). There may also be extraneous material left over from the cutting process that was not cleaned of in the finishing work (C).



(A) left and right soles are not mirror images



(B) striations visible from the buffing process



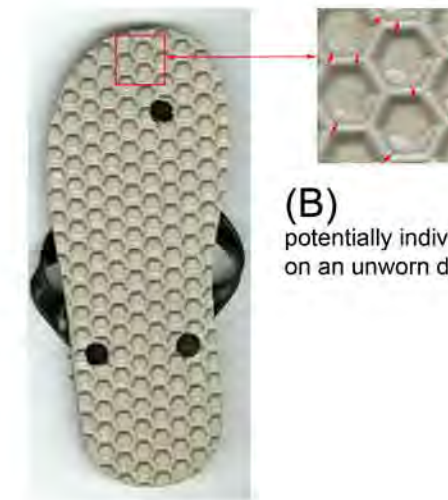
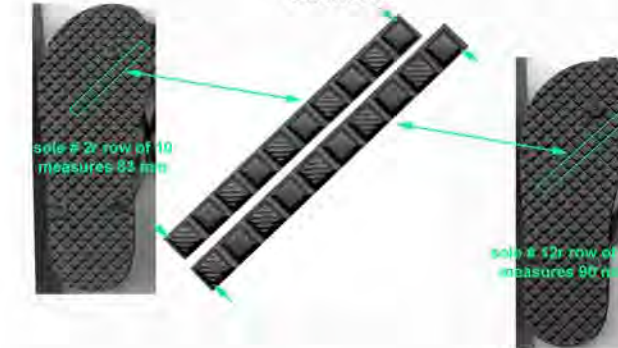
(C) extraneous material left over from the cutting process



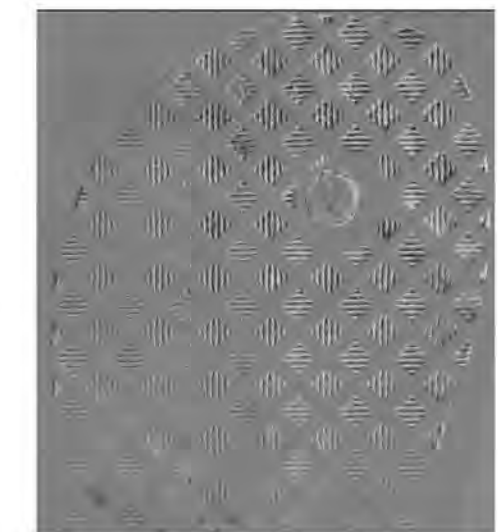
a high priced die-cut brand name sandal and two left soles of this model in the same size, note the difference in specific design features resulting from the die-cut



(A) Two soles with distinct variation in size of elements



(B) potentially individualizing features on an unworn die-cut sole.



overlaid impressions of the closest match from the die-cut footwear study one in white and one in black

References:

- ¹ Birkett, J., "Variations in Adidas 'Kick' and related soles", MPFSL Report #34, Metropolitan Police Forensic Science Laboratory, June 1983
- ² Kainuma, A., "Manufacturing Variations in a Die-Cut Footwear Model", *J. Forensic Identification*, 55(4), 503-517, 2005