

J35 A Study Into Additive Manufacturing to Clone Stamping Device Impressions

*Muskan Vir**, Ontario Tech University, Oshawa, ON L1G 0C5, CANADA; *Kimberly Nugent, MSc**, UOIT-Faculty of Science, Oshawa, ON L1G 0C5, CANADA; *Rachael M. Carew, MSc**, University College London, London WC1H 9EZ, UNITED KINGDOM; *Liv Cadola, MSc**, Université du Québec à Trois-Rivières, Trois-Rivières, PQ G8Z 4M3, CANADA; *Cyril Muehlethaler, PhD**, Université du Québec à Trois-Rivières, Trois-Rivières, PQ G8Z 4M3, CANADA; *Mylène Falardeau, BSc**, Université du Québec à Trois-Rivières, Trois-Rivières, PQ G8Z 4M3, CANADA; *Tobin A. Tanaka, BS**, Canada Border Services Agency, Ottawa, ON K2E 7M6, CANADA

Learning Overview: After attending this presentation, attendees and, in particular, forensic document examiners will be introduced to the potential of additive manufacturing, which includes in colloquial terms 3D printers, to produce a stamp that mimics a stamping device impression.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by increasing awareness of the features that may be present when a stamping device impression has been cloned via an additive manufacturing (3D printing) process. Limitations on what can be cloned via this process will be outlined.

Inked stamp impressions arise in many document-related transactions and may be subject to forensic examination. The stamp dies used to make inked impressions may be made of rubber, photopolymer, gel, or metal and are hand-applied to a variety of items such as: business documents, envelopes for postal use, invoices, receipts, legal documents, passports, and other official documents.¹

While there are a variety of means that may be employed to clone a stamping device impression, there have not been published works in the forensic community on the potential vulnerabilities that stamp impressions may have to cloning attempts by additive manufacturing.

Additive manufacturing is a means to produce objects by the addition of materials instead of a traditional means whereby materials are removed by processes such as milling or other mechanical means. The lower cost and increased availability of additive manufacturing devices in the past decade may mean that additive manufacturing methods are now exploitable for the purpose of stamp impression cloning. To address this growing concern, this study investigated whether it is possible to successfully clone stamping device impressions using additive manufacturing, and whether it is possible to identify if a stamped impression on paper was simulated from a manufactured clone.

For this study, a number of stamp impressions made from new stamps and those that have been heavily used were cloned on a variety of different additive manufacturing devices. The new stamps included both custom-designed stamps with a variety of typefaces and stock stamps that are produced in bulk by stamp manufacturers. The stamps that were heavily used were decommissioned stamps obtained from a government surplus sale. Self-inking and traditional stamps, the latter requiring a separate ink stamp pad, were used in both the new and heavily used stamp types.

The impressions to be cloned were made onto a variety of papers with different degrees of printing, writing, and other interfering elements. Multiple impressions of the same stamp were made to portray some of the variations that may be expected from the stamping process. Working from the impressions only, images and subsequent rendering of files suitable to be used for the additive manufacturing process were made. Materials were selected that allowed for ease and economics of manufacture along with sufficient inking capabilities to permit stamping action onto the page.

The resultant cloned stamps were then impressed onto different papers using an ink stamp pad. Cloned impressions were then examined for their characteristics to see: (1) if any artifacts were present; (2) if such artifacts could be attributed to the additive manufacturing process; and (3) the degree of congruence to the original impression.

Reference(s):

- ¹. ANSI/ASB Standard 117, Standard for Examination of Stamping Devices and Stamp Impressions, First Edition 2020

Stamping Devices, Additive Manufacturing, Stamp Clone