

## Description

### Image



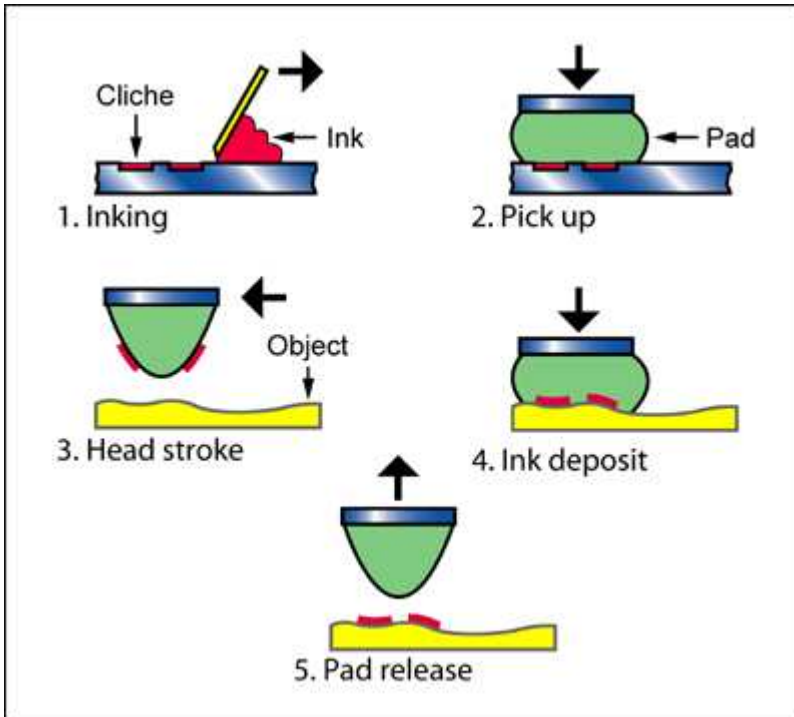
### Image caption

(1) Pad printing machine © Swoolverton at Wikimedia Commons (CC BY 3.0) (2) Golf ball with pad printed logo © Collusor at Pixabay [Public domain] (3) Pad printed mug © Edar at Pixabay [Public domain]

### The process

PAD PRINTING is a little like printing with rubber stamps; instead of rubber, the image is cut into a steel or copper plate, from which it is lifted by a rubber pad. It is used as a decorating process for irregular shapes, and for those shapes which cannot be easily printed by silk screen. The steps are as follows. (1) The image to be transferred is etched into a printing plate commonly referred to as a cliché. The cliché is flooded with ink and wiped, leaving ink only in the image area. As solvents evaporate from the image area the ink's ability to adhere the silicone transfer pad increases. (2) The pad is pressed onto the cliché lifting the ink. Solvents evaporate from the outer ink layer where it is exposed to the atmosphere, making it tackier and more viscous. (3) The pad is pressed onto the component to be decorated, conforming to its shape and depositing the ink. Even though it compresses considerably during this step, the contoured pad is designed to roll away from the substrate surface without smudging the image by sliding. (4) When the pad is pressed onto the product, the adhesion between the ink and substrate is greater than the adhesion between the ink and pad, resulting in complete transfer of the ink, leaving the pad clean and ready for the next cycle. Automatic methods, with several pads in series (transfer pad printing), allow cheap multi-color decoration. Manual machines are used for low production volumes; for these, multi-color prints require separate steps and require set-up time.

### Process schematic



**Figure caption**

Pad printing

### Material compatibility

|                           |   |
|---------------------------|---|
| Composites                | ✓ |
| Glasses                   | ✓ |
| Metals - ferrous          | ✓ |
| Metals - non-ferrous      | ✓ |
| Natural materials         | ✓ |
| Polymers - thermoplastics | ✓ |
| Polymers - thermosets     | ✓ |

### Function of treatment

|                 |   |
|-----------------|---|
| Decoration      | ✓ |
| Color           | ✓ |
| Reflectivity    | ✓ |
| Surface texture | ✓ |

### Economic compatibility

|                         |     |
|-------------------------|-----|
| Relative tooling cost   | low |
| Relative equipment cost | low |
| Labor intensity         | low |

### Physical and quality attributes

|                                 |   |
|---------------------------------|---|
| Surface roughness (A=v. smooth) | A |
|---------------------------------|---|

|                         |      |   |      |         |
|-------------------------|------|---|------|---------|
| Curved surface coverage | Good |   |      |         |
| Coating thickness       | 6    | - | 10   | µm      |
| Surface hardness        | 5    | - | 10   | Vickers |
| Processing temperature  | 16.9 | - | 36.9 | °C      |

## Process characteristics

|          |   |
|----------|---|
| Discrete | ✓ |
|----------|---|

## Supporting information

### Design guidelines

The advantages of pad printing are the ability to print on irregular surfaces (such as a golf ball) and the ability to print wet on wet multi-colors. Its excellent quality of detail makes pad printing attractive for flat items. Pad printing is limited to relatively small images compared to screen printing - usually less than 0.1 m<sup>2</sup>. Large opened areas can be difficult to cover, requiring special, screened clichés.

### Technical notes

Polymer, glass and metal products can all be printed. 3D, irregular shapes are possible. The inks are pigmented resins suspended in organic thinners.

### Typical uses

Cups, pens, glass frames, lighters, golf

### The economics

Capital and tooling costs are low. The process is fast, and the product can be handled immediately after printing.

### The environment

Thinners can give toxic fumes, requiring

## Links

MaterialUniverse

Reference