

# Operation Principle of Pad Presses

Pad Printing has five following main components: open inkwell or sealed ink cup, silicone pad, etched plate (cliche), ink and pad press.

## Inkwell or Ink Cup

In general, most pad presses use fixed inkwell or ink cup, especially large pad presses. This type of mechanical configuration is relatively simple, but very solid. The movement of the pad is driven by the sliding assembly. The assembly will have impacts when it is sliding, and inevitably cause the pad to shake, which limits the printing speed of the machines.

When the machine is equipped with a mobile inkwell or ink cup, the pad only moves up and down. It doesn't cause any mechanical impact, so the shake of the pad is reduced. For this reason most high-speed pad presses opt for mobile inkwells or ink cups.

## Printing Process

Pad presses are classified into open-inkwell system (Figure 1) and sealed-cup system. As far as the above two type systems are concerned, the pick-and-place stroke of the pad is the same.

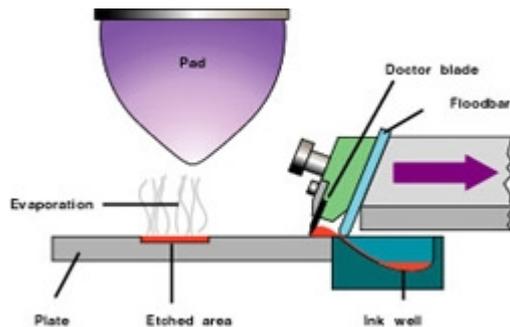


Figure 1: open inkwell system. (Source: Screen Printing Magazine)

## Open Inkwell System

A two-part flooding/doctoring device is hinged over the etched plate (cliche). The device comprises a stainless-steel doctor blade and an aluminum flood bar.

Step 1: When the pad moves forward, pneumatic force propels the assembly, causing the flood bar to dip into the inkwell and drag ink across (flood) the surface of the plate (Figure 2A).

Step 2: When the pad moves backward, the assembly retracts and the doctor blade scrapes excess ink off the plate's surface, leaving ink only in etched (image) areas (Figure 2B).

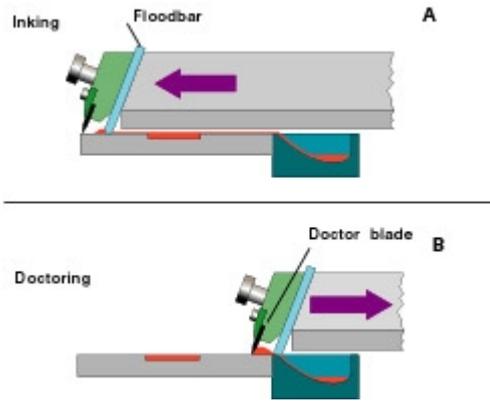


Figure 2A and 2B: inking/doctoring with an open-well system. (Source: Screen Printing Magazine)

### **Sealed-Cup System**

To maintain and protect the properties of the ink, sealed-cup systems (Figure 3 and Figure 4) use a round cup that is closed at one end and has either a steel or ceramic ring secured at the base of the opposite end. The ring of the sealed system acts as both the flood bar and doctor blade.



Figure 3: 4-color pad printer with shuttle & sealed ink cup made by Luen Cheong Printing Equipment Group Limited.



Figure 4: 6-color pad printer with conveyor & sealed cup made by Luen Cheong Printing Equipment Group Limited.

Step 1: When the ink cup is pushed forward, the ring travels over the etched surface and flood the plate with ink (Figure 5A).

Step 2: When the sealed cup retracts, the ring doctors excess ink from the plate surface(Figure 5B).

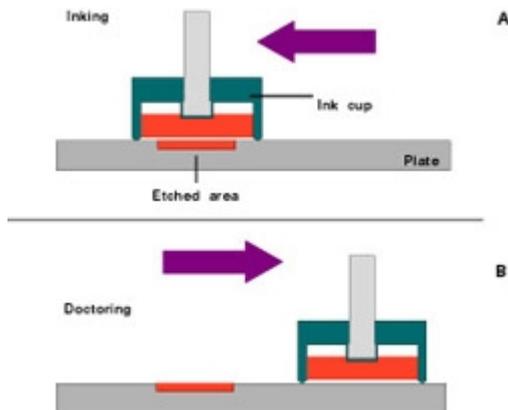


Figure 5A and 5B: inking/doctoring with a sealed-cup system. (Source: Screen Printing Magazine)

Sealed-cup systems are able to print all kinds of extreme fine line, text, pattern and even four-color halftone images. No matter how irregular the shape (flat, cylindrical, spherical, compound angles, textures, concave, convex) of the substrate is, they still can achieve desired printing effects. For example, sealed-cup systems specialize in printing four-color brand on the surface of the golf balls.

Sealed ink cups acts as the ink supply, flood bar and doctor blade all in one. The steel or ceramic ring is in close contact with the etched surface of the printing plate, sealing the ink in the cup and minimizing the exposure to the air, so that the evaporation of the solvent is reduced and the properties of the ink are maintained and protected. As a result, sealed-cup systems can achieve

consistent and perfect printing quality. In addition, the edge of the ceramic ring must be hard and sharp.

### **Secrets of Success for Choosing Silicone Pads and Ink**

In order to achieve clear and sharp printing effects, you should meet the requirements as below when choosing pads:

- Choose round and conical pads as possible as you could;
- Choose pads with a larger angle as possible as you could;
- Choose a relatively hard pad if the products to be printed can withstand the pressure because hard pads have a long life and can print a clearer pattern.

The market is flooded with many kinds of pad printing ink. Screen printing ink is also used in pad printing. Excellent pad printing ink must have the following properties:

- Have a strong adhesion to the substrate;
- Excellent fluidity;
- The ink will become tackier as the thinner evaporates;
- Adding a few of pigments can make the ink more glossy and opaque;
- The glossiness of ink isn't affected by the surface of the substrates;
- The ink can cure quickly, but its tackiness doesn't change.

If the viscosity of the ink is too high, the plate is difficult to clean, resulting in static electricity problems. However, if the viscosity is too low, the transparency of the ink increases, so that the pad has difficulties in transferring ink.

There are a lot of different inks in the market, so it is difficult to determine when and how many times to add the thinner or slow-dry additive.

### **Market Trends**

The pad printing process is suitable for decorating special and single products such as mobile phones, eyeglasses, toy cars, CDs and so on. The modern pad presses are equipped with pad cleaning device and DPS system in order to increase competitive power. Moreover, the machines with high flexibility can meet different printing requirements. Servo motor-driven, multi-pad equipments such as ALIEN system have high printing speed and they are exactly what the market wants.

As the special-and-single-products market is growing rapidly, it is essential to design the machine and provide pad press and software packages carefully. Manufacturers must launch intensive study of the special-product market and learn about more information in order to develop appropriate pad presses and software systems.

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