Technical Application Report

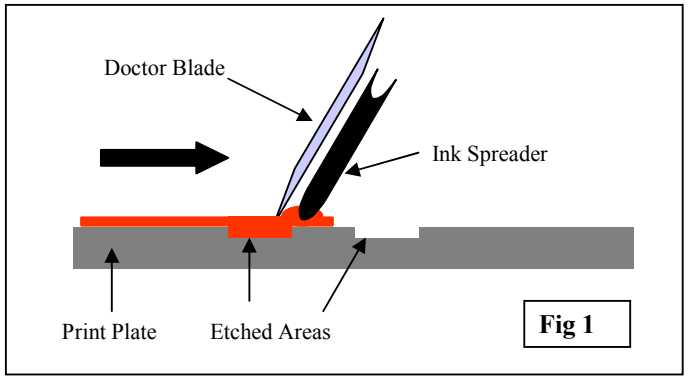
Tampo Pad Printing

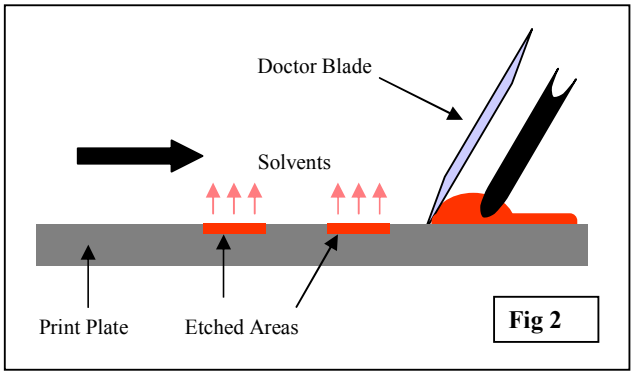
The tampo printing process is used to transfer the ink from an etched printing plate to any kind of surface using a silicone rubber pad. The main advantage of this method of printing is its ability to print on virtually any kind of irregular surface. It is used to print plastics, metals and ceramics for use in the industrial, automotive, white goods and retail markets.

The Pad Printing Process

Step 1 The printing cycle begins by flooding the etched area of the printing plate with ink **(Figure 1)**. Pad printing machines use either an open inkwell (shown below in the illustration) or a closed ink cup, which will prevent solvents from evaporating in the inkwell. The ink must have a low viscosity allowing it to flow out evenly over the surface of the plate and into the etched image area.

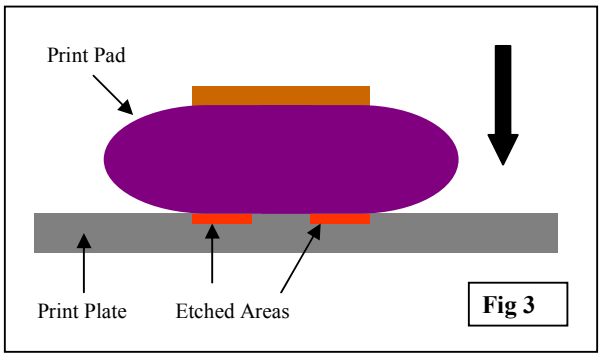
Step 2 The top surface of the plate is cleaned using a doctor blade, leaving the printing ink in the etched area containing the image.

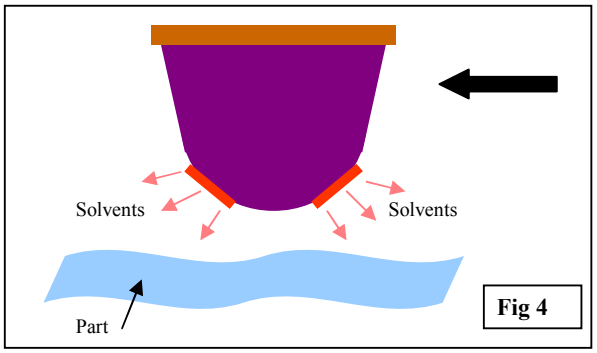




Step 3 The transfer pad is compressed onto the surface of the plate in an even, rolling action, pushing air out of the way as it compresses **(Figure 3)**. As the solvents evaporate from the surface of the ink, the increased tackiness of the exposed ink surface enables it to stick to the pad and be transferred to the pad from the etched surface of the printing plate.

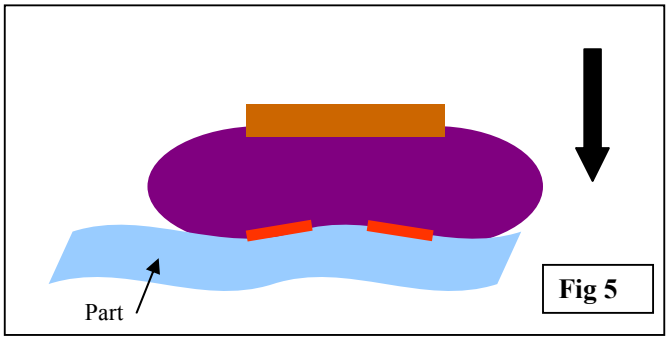
Step 4 After the pad is lifted from the plate the surface of the ink film on the pad starts to dry, making that surface become tackier **(Figure4)**

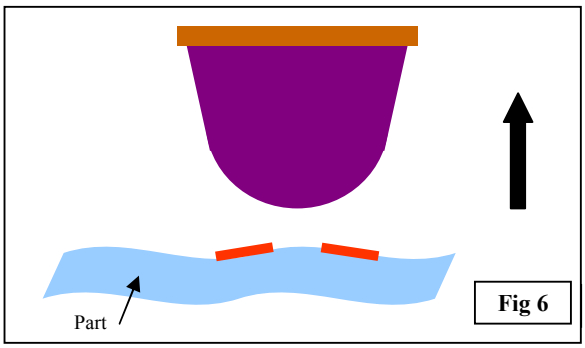




Step 5 As the pad is compressed onto the surface of the substrate, the tackiness of the ink's surface enables it to leave the pad and stick to the substrate. The pad will compress considerably during this step, the contour of the pad is designed to roll the image onto the substrate rather than press flatly against it **(Figure 5)**. In fact, a properly designed pad will never form a 0° angle of contact with the substrate, preventing the trapping of air between the pad and the substrate, which can result in an incomplete transfer of the image.

Step 6 The pad lifts away from the surface of the substrate, assuming its original shape. If the variables involved with all six steps are properly controlled, the pad will lift away clean and ready for the next print cycle **(Figure 6).**





The Silicone Rubber Pad

The pad is the defining part of the printing process. Shape, hardness, and surface finish determine the pickup and transfer characteristics of each pad and thus, the final print quality of the finished article.

It's a relatively simple process to mould silicone rubber pads. Moulds can be made in different ways using vacuum-formed plastic, machined and polished metal or epoxy resins. There are two basic types of silicone chemistry used in the formulation of 2-Part RTV silicones which can be used to form a tampo print pad. They are referred to as addition cure (using Platinum catalyst) and condensation cure (using Tin catalyst). Each system has its own merits.

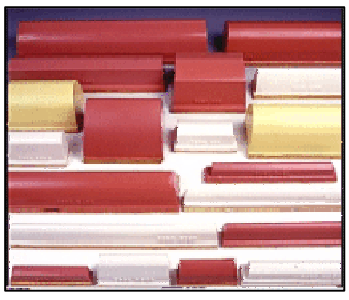
Pad Hardness

The final hardness of the cured pad is vitally important. With a variation of as little as 4 Shore A from the expected hardness level, you will begin to notice changes in the print quality produced by the pad. Some pads may vary more than 4 degrees from standard and this can significantly alter the printed results. In general, softer pads are less efficient in transferring ink. Pads manufactured using materials that have not been formulated correctly will harden over time leading to a change in print quality. When pads are too hard, they do not compress and will not pick up the image correctly.

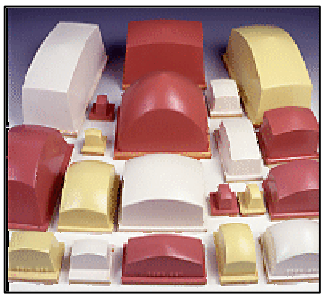
Example of Tampo Print Pads

Depending on the object to be printed the pads can have different shapes:

Round Pads



Bar Pads



Square Pads

Shaped Pads

ACC Addition Cure Silicones

Addition cures are normally two part A/B systems with a mix ratio of 10:1 or 1:1. They have excellent mechanical properties, relatively high hardness (>25 Shore A) and a very strong solvent resistance. ACC addition cure rubbers are particularly suitable for highly aggressive solvented inks. The rubbers will cure at room temperature and curing times can be accelerated by heating the silicone after the mixing and pouring process has taken place.

The final hardness of the cured print pad is controlled through the addition of silicone fluid to the compound before it is cured. This enables one base silicone rubber to be used for the production of a wide range of pads with varying hardness's. We recommend using **F111/50** a low viscosity silicone fluid.

ACC Addition Cure Products suitable for Tampo Pads

Product	Colour	Mix ratio	Hardness	Mixed Viscosity
MM230	Red	10:1	30 Shore A	20,000 mPa.s
MM242	Red	10:1	42 Shore A	11,000 mPa.s

Choosing an Addition Cure

The final choice of which silicone to use is very much down to each customer. Each user will have the own unique blend of ink, retarder, thinner, antistatic additive, adhesion promoter and hardener depending on what surface they are printing on to. ACC Silicones can only offer very broad guidelines and final choice should be made after a careful evaluation of samples used in the printing environment.

MM242 does not have a polar surface and is well suited for use with inks, retarders and thinners using polar hydrocarbon solvents. It has excellent durability and tolerates high percentages of silicone fluid.

MM230 has a more polar surface and is well suited for use with inks, retarders and thinners using polar solvents such as alcohols. It requires less fluid to make a soft pad.

ACC Condensation Cure Silicones

These two part A/B systems use a mix ratio of 20:1. They have a wide range of hardness' down to 1 Shore A and produce pads with excellent mechanical properties.

The hardness of the condensation cure pad can be modified by blending two different products; the resulting hardness can be calculated algebraically, i.e. to get a 9.5 Shore A pad you blend 50% of MM918 with 50% of MM709. In the condensation cure systems we don't recommend the use of silicone fluid, as it would cause an excessive bleeding of the pad.

ACC Condensation Cure Products suitable for Tampo Pads

Product	Colour	Mix ratio	Hardness	Viscosity
MM918	White	20:1	18Sh A	16,500 mPa.s
MM50T	Pale Grey	20:1	6Sh A	12,000 mPa.s
MM709	Translucent	20:1	1Sh A	18,000 mPa.s

For further product technical data or information on how to use ACC Silicones materials, please contact your local sales manager or email us info@acc-silicones.com