

# Bonding Screenprinting Mesh to Aluminum Frames

*By Günter Perner, Kissel & Wolf GmbH*



In screenmaking, the primary material used is polyester, which is bonded to an aluminum frame. Constant striving toward high quality is placing high demands on mesh tension and solvent resistance making proper adhesive application even more important.

The challenges of mesh adherence are discussed step-by-step to make you aware of the critical points and to ensure maximum bonding results.

## **Screenprinting Frame & Sub-surface Preparation:**

One can achieve the best bonding results using pre-treated aluminum frames from well-known manufacturers. Smooth aluminum surfaces are not ideally suited for adhesive applications; the sub surface preparation has to include roughening this surface. The roughening should not be too coarse. A depth of 20 – 40 µm is sufficient. Some frame manufacturers roughen the surface of new frames by sand blasting.

Before adhesive is applied, dust particles have to be removed from sand blasted surfaces by degreasing with a fast acting solvent which won't leave a residue (such as ethyl acetate or acetone).

Sanded frames are prone to be more problematic. Too often sanding results in deep grooves in the aluminum surface preventing complete contact between mesh and frame. This can result in the formation of voids in which ink and solvent may accumulate during printing, potentially resulting in release of the mesh. One can easily remove grooves and level the surface using a belt sander fitted with 80-100 grade sandpaper. By degreasing and cleaning the newly leveled surface, one can achieve good bonding results.

Pay special attention when applying new mesh onto existing adhesive of previously used frames. If the remaining adhesive is level, hard, clean and completely covers the surface of the frame, you can apply a new layer of adhesive over the old. In many instances,

however, the adhesive remnants are uneven a broken up. In such cases removed the old adhesive with a sander or a chemical solvent.

For smaller screenprinting frames you can immerse the frame for five minutes in boiling water then immediately pull off the old mesh together with the adhesive.

## Choice of Adhesive

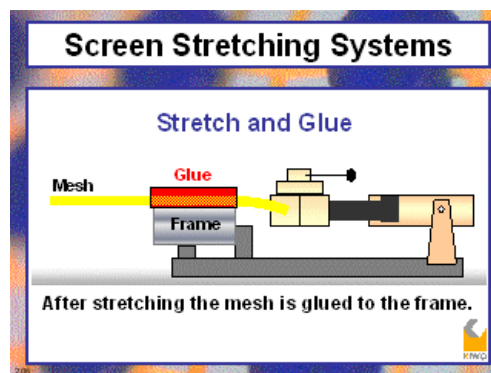
Well-known screen making services offer different adhesive systems for different requirements. In addition to simple adhesives designed for application on a variety of frame materials, there are "high performance" frame adhesives. These are designed to have the highest resistance to solvents and cleaning agent's and are capable of maintaining the high-tension values of low elongation mesh. Quick hardening as well as short dwell time in the stretching frame are additional requirements. The cost of the adhesive, relative to that of the material to be bonded, is a small consideration. In any case a high quality adhesive should always be given preference.

## Adhesive Processing

The KIWOBOND frame adhesives have two components: a solvent based polyurethane adhesive which has to be mixed with a hardener before application. The product is sensitive to moisture throughout its storage, (sealed or open), because of the hardener's isocyanate content. Containers of hardener must be resealed "airtight" after each use, and too high humidity during processing should be avoided. Ideal are room temperatures around 21°C or 69.8°F with a relative humidity of 35-65%. The frames themselves should be at room temperature to avoid condensation.

You can obtain the full performance of these adhesives only by mixing adhesive and hardener in the correct ratio. Weigh the components accurately; then stir the mixture thoroughly until it is homogenized.

Mixed adhesive has limited processing time (pot time) in which it has to be used. Apply the adhesive with a solvent resistant brush or rigid plastic squeegee. Two methods are commonly used:



1. Adhesive application with a short hard brush or rigid plastic squeegee

Apply the adhesive with a short, hard bristled brush, or rigid plastic squeegee, forcing the adhesive through the mesh onto the surface to be bonded. The advantage is that a good bond between frame and mesh is created with a minimal amount of adhesive. This relatively thin adhesive coat dries and hardens quickly. Also, when applying new mesh, the old one can, as a rule, be easily removed.

## **2. Adhesive application with a soft round brush**

As in painting, apply a larger amount of adhesive and spread evenly. Because of capillary action the adhesive soaks into the mesh and bonds to the frame. This application is less strenuous; though requires a longer time in the stretching device and is harder to remove when the frame is to be re-meshed.

Regardless of the method you use to apply the adhesive, it is critical that frame and adhesive are in directly and completely in contact. Unfortunately, there are many frames, which are buckled or have low spots at the corners because of uneven or vigorous sanding.

The overall volume of solvent-based frame adhesive consists of approximately 75% solvent that evaporates during the drying process. As solvent evaporates from an uneven surface, the adhesive shrinks and hollow spots can form leaving a "honeycomb" pattern of voids where there is no direct contact between mesh and frame.

These voids are evident visually and appear as crystalline formations similar to ice crystals on a winter window. As in a sponge, cleaners are later trapped in these hollow areas, resulting in release of the mesh. In many cases it is enough if you press the mesh onto the frame with the help of weights to prevent formation of voids.

As an experienced screen maker, you will spot these problematic areas before applying adhesive and weigh the mesh down sufficiently. If you require an exact tension, placing weights within the actual screen might cause problems later as the tension can decrease after the weights are removed.

## **Processing Factors**

In most cases the adhesive mixture is ready to use. For very fine mesh, such as those used for printing UV inks, we recommend adding 5% thinner particularly in warmer environments. This facilitates the solvent in penetrating the fine mesh.

Polyurethane frame adhesives, such as KIWOBOND, are characteristically elastic enabling application in a wide band (2–5 cm or 1–2 in) extending onto open mesh. The inside border can be outlined with the help of tape.

Allowing the mesh to relax sufficiently before applying the adhesive is as important as leaving the adhesive on the frame for a long enough period to hold the required tension. The adhesive dries and hardens in three interactive steps:

**Physical drying through evaporation of solvent:**

The solvent evaporation phase is influenced by good ventilation. For this reason as well as for health related issues, it is important to ensure fast and complete ventilation at the workstation.

**Re-crystallizing of adhesive polymers**

This phase occurs immediately after evaporation of the solvent and is definitive in maintaining high tension with fidelity. This clearly differentiates the adhesives available in the market.

**Chemical hardening**

When added to the adhesive, it is the hardener which gives the resulting resistance to solvents and cleaners. The chemical reaction begins from the first moment of contact (initial mixing) and is completed, depending on temperature and humidity, after approximately 72 hours. The hardener reacts both with the adhesive and with humidity in the air. Therefore it is important to store the frame in ambient conditions after removing it from the stretching device. This area should have sufficiently humid and should not be too cool. This is a particular consideration in wintertime.

In general, frames stretched using KIWOBOND can be removed from the stretching unit within 10 – 20 minutes of application. The mesh itself should have the opportunity to bond overnight before further processing. If necessary, a protective lacquer can be applied after 2–3 hours.

Bonding mesh to a screenprinting frame can be done quickly and cost effectively, producing a long lasting screen when these points are considered.